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of
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CASE REPORTS

an OSSAP Monograph

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Editorial Team

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OSSAP

Case Reports

Vol III, 2021

Dedication

This book is dedicated to my mother Late Dr IA Kantamma

who has shaped me into who I am today

&

I seek the blessings of my teacher Dr G Narasimha Reddy

- Dr. Amarnath Surath

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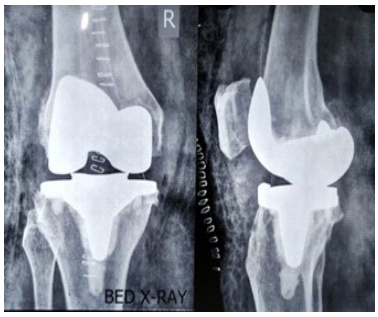
Discussion

Peri-prosthetic fracture post - TKR revised to Distal Femoral Replacement and Rotating Hinge

Dr Suman Pendyala, Consultant Orthopaedic Surgeon,
Aayush Hospital, Vijayawada

Seventy eight year female who underwent bilateral TKR ,slipped and fell at home 2 months after surgery and sustained peri-prosthetic fracture of femur to her right knee.



The surgeon tried closed reduction and internal fixation with cannulated screws under image intensifier.Reduction looked satisfactory,patient immobilized for 8 weeks, but eventually fixation failed.

What are the options available now?

- Conservative treatment
- Open reduction and internal fixation +/- Bone grafting
- Isolated femoral component revision with a semi-constrained implant
- Isolated femoral component revision with metaphyseal sleeve for bone defect
- Complete revision with semi-constrained implant for femur and rotating hinge knee
- Complete revision with distal femoral replacement(Mega prosthesis) and rotating hinge knee

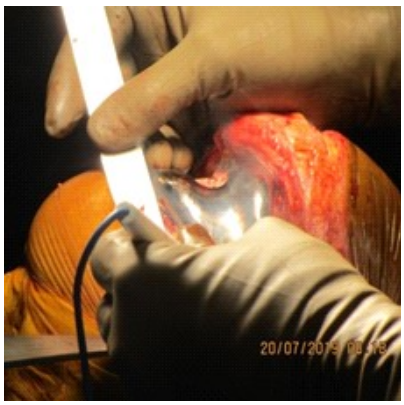
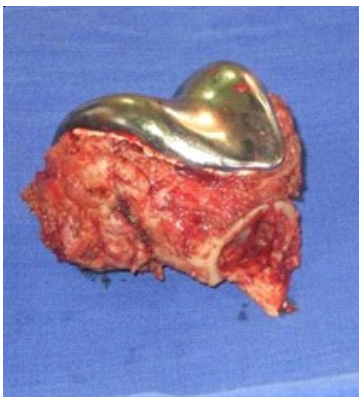
Points considered :

Age, failed attempt at fixation , doubtful medial collateral, absent condylar fixation,chance for early mobilization

Hence planned for complete revision with distal femoral replacement prosthesis

and rotating hinge knee (LPS- DePuy).

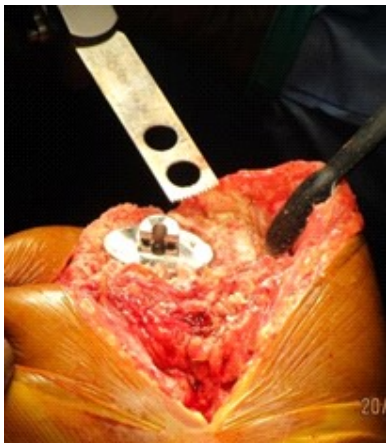
Midline incision ,medial para-patellar arthrotomy(extended),level of femoral osteotomy marked, osteotomised with saw, canal reamed ,prepared for cemented stem and trialled after marking appropriate rotation of femoral component.

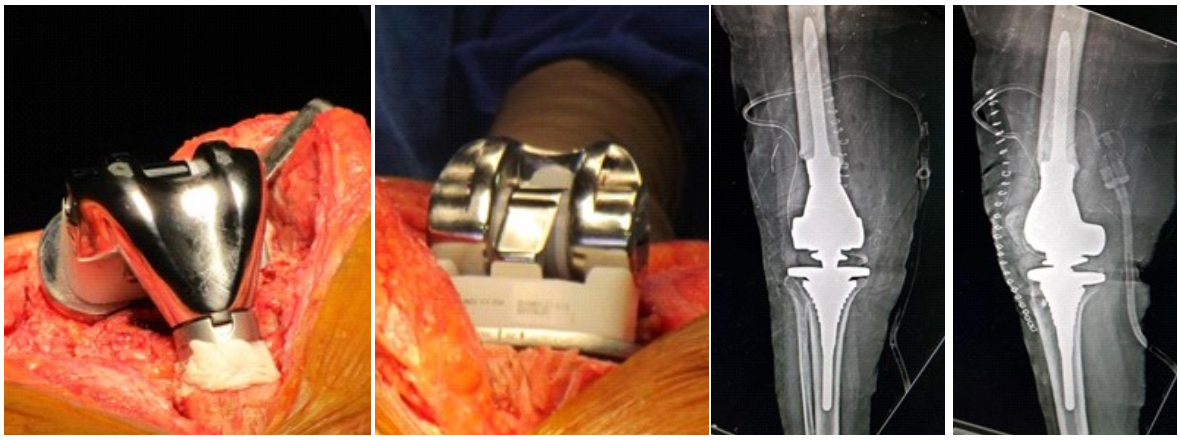




Key steps : marking the level of osteotomy & appropriate femoral rotation

Tibial preparation done after extraction of tibial component and cement, reaming and preparation for uncemented metaphyseal sleeve with stem and trialling.

Rotating hinge trial insert placed and checked for stability,balancing and patellar tracking.

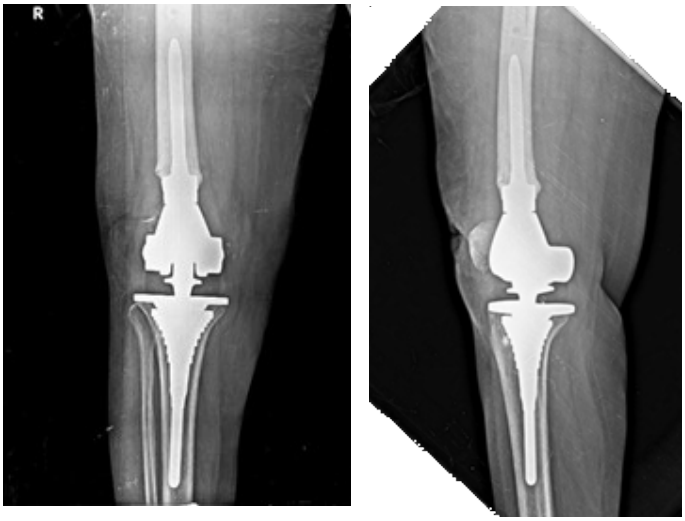




Original impants cemented in and closure done in layers.

Post-op period was un-eventful and check X-rays were good.

Post-op mobilization with brace started on day one and discharged home after achieving pre-discharge targets. Patient followed-up at six weeks, three months, six months and one year.



Last X-ray taken at one year follow-up.

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Revision of Hip Hemiarthroplasty to Caged cup and Long Stem THR

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Introduction

Hemiarthroplasty of the hip is one of the most common procedure performed in orthopaedics. Revision of a hemiarthroplasty to Total Hip Arthroplasty can be challenging and the requirements varied and dependent on the reason for revision. Defects of the femur and acetabulum and osteoporosis dictate the implants used in this revision surgery. Defects in the acetabulum and femur have been classified by Paprosky et al[1,2]. We present a challenging case of a failed bipolar hemiarthroplasty of the hip with protrusion and osteoporosis of the acetabulum and an impending fracture of the femoral shaft due to erosion by the tip of the stem, managed by an acetabular cage and cemented cup and a long stem femoral prosthesis. The challenge in this case was the unexpected osteoporosis in the acetabulum necessitating the need for a cage and cup.

Case Details

We report a 45-year-old lady who underwent a Right Hip hemiarthroplasty about 4 years ago for fractured neck of femur, presented with pain in the hip and thigh area for 2 months duration, progressively increasing in severity and causing difficulty in walking. Past medical history includes abdominal hysterectomy 25 years prior to presentation. On examination, she had painful movements of the hip, difficulty actively straight leg raising the leg and a leg length discrepancy of 1.5cms with shortening on the right side. Infection screening was negative. Radiographs of the pelvis with both hips showed a hemiarthroplasty

implant in situ on the right side. The acetabulum was eroded medially resulting in protrusion of the cup and the tip of the stem of femoral implant was impinging on and eroding the lateral cortex of the femur resulting in thinning of the cortex with an impending fracture appearance. It was decided to revise the hemiarthroplasty to a Total Hip Replacement with a long stem implant.

Through a posterior approach, the hip was exposed and the previous implant removed. Preparation of the acetabulum revealed a very osteoporotic and thin acetabular wall concentrically. It was decided to reinforce the support for the cup with an acetabular cage. So a cage was implanted and fixed with two screws. A polyethylene cup was cemented into the cage. The femur was prepared to fit in a long stem uncemented implant. Trial implants revealed a stable hip and good soft tissue balance. Final implant was placed and the hip reduced. The bearing was metal on polyethylene. Postoperative radiographs showed a satisfactory position of the implants. Her leg length discrepancy was corrected. She was kept non weight bearing for 6 weeks and weight bearing was then encouraged. Her last follow up was 2 months post operatively. She did not complain of the preoperative pain and has been walking full weight bearing without any supports.

Figure 1 : Preoperative radiograph and CT scannogram showing erosion of the lateral cortex of femur at the tip of the femoral stem, erosion of the medial wall of acetabulum with protrusion and a discontinuity in the Kohler's line.

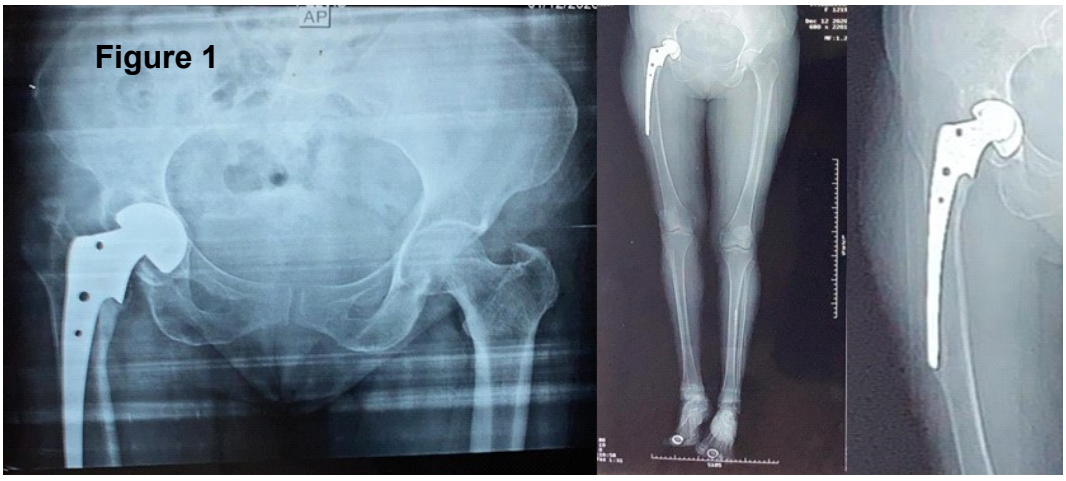

Figure 2 : Immediate post op radiograph

Figure 3 : Post op 8 weeks. AP and Lateral views

Discussion

Revision of Hemiarthroplasty to THR could be challenging surgery especially when associated with osteopenia and protrusion of the acetabulum. Preoperative planning forms a major part of preparation for such surgeries. In the present case, the issues faced were 1) a failed hemiarthroplasty which needs revision 2) Impending fracture of shaft at the tip of the stem which could cause problems during reaming for a longer stem prosthesis 3) Planning for longer stem implant so that the eroded cortex is bypassed by the new stem by at least 5 cms to prevent refractures 4) choosing the type of stem (cemented Vs Uncemented) 5) Choosing the type of bearing.

Preparation of such revision in the presence of protrusion should include bone allografts to bring the center of cup

more laterally, large uncemented or cemented cups and cages to provide support to cemented cups in the presence of a weak medial wall, medial femoral head migration and a disrupted Kohler's line. Options for acetabular reconstruction in presence of acetabular defects would include impaction bone grafting and cementing acetabular cup, ring and cage reconstruction, allograft with cement, uncemented metal shell or allograft reconstruction, Jumbo cup and porous metal augments and cup-cage reconstructions and custom triflange reconstructions[3]. Options for the femoral side include tapered cemented femoral stem, extensive or proximally porous coated cementless stem, a cemented stem with impaction bone grafting for large canals. Modular grit blasted titanium taper stem used for severe cortical stem and an interlocking stem with established fracture[4]. The acetabulum was very osteoporotic with weak walls that would not support a cup in addition to a breach of the medial wall. This could be due to the Total Abdominal Hysterectomy done 25 years ago although it was not clear whether an ovariectomy was done at the same sitting and she was not on any bone strengthening agents. It could also explain the occurrence of fracture of neck of femur at a young age. Care should be taken in patients who had hysterectomy at a young age while performing arthroplasty procedures.

Preparation for the femoral side should include a potential fracture during surgery with a long stem implant as well as an interlocking type of implant in the event of a fracture. Conformity of the femoral stem to the shape of the stem of femur is also critical in deciding the length of the stem. If required a CT scan may be taken to study the cortex of the femur near the tip of the stem as well as the acetabulum for defects which was done in our case. It does require having multiple sets of implants on standby to get an optimal result. It is also important that the patient understands the procedure, including consequences and results of this procedure as it would require cooperation from the patient postoperatively for rehabilitation.

Limitation of this report is the short follow up. The purpose of this report is to highlight the issues related to a failed hemiarthroplasty of the hip and the principles of management of these isssues.

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Unconventional solution for a complex elbow problem, 12 year followup : a case report

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Abstract

Introduction : In the past, the indications for elbow arthroplasty were quite limited and included cases of rheumatoid arthritis and post-traumatic arthrosis. Nowadays, the use of elbow arthroplasty may be necessary in selected cases of complex fractures of the elbow, with good functional results. Several methods have been developed to deal with massive bone defects during revision surgery. Complex surgical steps also bring more injury, thus increasing soft tissuerelated complications. The aim of this case report is to evaluate the role of elbow arthroplasty as a primary option and the challenges in subsequent revision surgeries.

Case Report

We describe the case of a 14 year old male student, who presented to our emergency department with a side swipe injury to the right elbow on 28 may 2008. He presented with a large open wound with triceps muscle loss and missing entire distal humerus along with a part of olecranon, neurovascular structures intact. After 1 month complete healing of the flap a custom made uncemented total elbow arthroplasty was done through anterior approach. In 12 years he underwent 2 revisions with ROM of 0-80 degrees and 4cm shortening of upper limb. Restricted pronation and supination compensated by shoulder. He completed his graduation and now working as a software engineer.

Conclusion

Total elbow arthroplasty is a good alternative for elbow complex fractures. Revision scenarios pose various challenges and sometimes need outside

the box thinking. Inserting an ulnar prosthesis into the radius is a novel procedure for patients non reconstructable ulna. It is a safe, quick, and effective treatment with a promising outcome.

Introduction : In the past, the indications for elbow arthroplasty were quite limited and included cases of rheumatoid arthritis and post-traumatic arthrosis [1,2]. Even in those cases, it was recommended in elderly patients with a low functional demand, due to its low durability [3,4]. Nevertheless, in the last few years, a reasonable evolution has occurred in terms of its indications and outcomes [5-7]. Nowadays, the use of elbow arthroplasty may be necessary in selected cases of complex fractures of the elbow, with good functional results [8,9]. Several methods have been developed to deal with massive bone defects during revision surgery. Surgeons have tried using an allograftprosthesis composite to repair the bone defect,[18] however, the associated complication rate is rather high. Complex surgical steps also bring more injury, thus increasing soft tissuerelated complications.The aim of this case report is to evaluate the role of elbow arthroplasty as a primary option and the challenges in subsequent revision surgeries.

Case Report : We describe the case of a 14 year old male student, who presented to our emergency department with a side swipe injury to the right elbow on 28 may 2008. He presented with a large open wound with triceps muscle loss and missing entire distal humerus along with a part of olecranon, neurovascular structures intact (figure 1,2). We performed surgical debridement, provisional

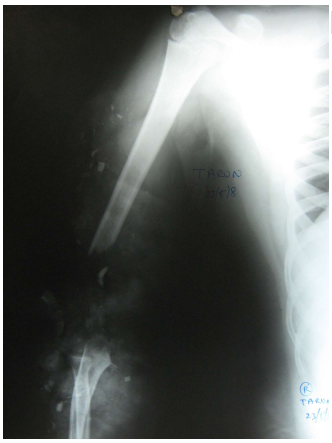

Fig 1 & 2

fixation with an external fixator. After 2 days, assessment of the wound, our plastic surgeons performed a pedicled latismus dorsi muscle flap reconstruction of triceps attached to the remaining proximal ulna with skin grafting was done.

After 1 month complete healing of the flap a custom made uncemented total elbow arthroplasty was done through anterior approach (figure 3). Postoperatively no infection and movements of 0-90 degrees were obtained (figure 4, 5).


Fig 3


Fig 4


Fig 5

After 4 years patient developed aseptic loosening of the implant, and revision1 was done using cemented custom made elbow prosthesis, patient gained rom of 0-90 degrees (figure 6, 7).


Fig 6

Fig 7

After 4 years of revision1 patient sustained slip and fall from motorcycle and presented to us with broken ulnar stem of the prosthesis (figure 8, 9).


Fig 8


Fig 9

Revision 2 was planned, as humeral component was intact, broken ulnar component was deep inside the bone , Revision 2 was performed through anterior approach and new cemented ulnar component was fixed into the proximal radius (figure 10,11).


Fig 10


Fig 11

Patient had 4 year followup after Revision 2 with ROM of 0-80 degrees and 4cm shortening of upper limb. Restricted pronation and supination compensated by shoulder. He completed his graduation and now working as a software engineer (figure 12,13,14).

Discussion : The case presented to us with loss of distal humerus and proximal ulna, it became mandatory to do a custom made elbow prosthesis to restore elbow function and mobility.Some last resort procedures have been described, such as immobilisation with orthosis, arthrodesis or amputation [10]. However, these are associated with functional limitations and with worse aesthetic outcomes [11].In this sense, a procedure that permits the reestablishment of the limb structural integrity, with pain remission and with strength and function improvement, is desirable. The total elbow arthroplasty emerges as a viable option in these cases. In contrast with previous reports, several authors have recently shown favourable results with this procedure in traumatic injuries [11-14]. Despite some pronation-supination limitations and strength deficits, satisfactory motion, that permits daily activities, can be obtained [15].

The long-term survival rate of elbow arthroplasty is still lower than that for hip or knee arthroplasty, [25] and almost half of the patients need revision surgery within 10 years[26]. Bone defects are a critical problem in arthroplasty because both humerus and ulna are smaller than

the femur and tibia. Furthermore, less bone storage exists in the ulna, thus making it more difficult to stabilise the prosthesis during revision surgery. Several methods have been suggested for patients with a massive bone defect, including an allograft-prosthesis composite, autograft from the iliac crest, arthrodesis, resection arthroplasty, and Ilizarov frame;[18,22,24,27,28] however, none of these methods is completely satisfactory, patients suffer from a high complication rate as well as risk for nonunion in the long-term.

In this case the major challenges were faced during revision surgeries as extensile posterior approach cant be used as it would compromise the viability of the flap, both revisions were done using anterior approach

Particularly in revision 2 we were faced with a dilemma on how to approach and revise the entire elbow prosthesis as it would require an ulnar osteotomy, removal of cement, use of a larger stem and fixation might compromise ulnar component stability.This is where our out of the box thinking helped and with the anterior approach we revised ulnar component into the radius bone.There are several surgical considerations and techniques involved in inserting the ulnar prosthesis into the radius [20]: (1) surgery is indicated for patients who have had several surgeries in the past, leaving a massive bone defect in the proximal ulna, to which the prosthesis is unable to fix, and a poor soft-tissue condition such that the prosthesis is barely covered. Therefore, this method should be provided to patients as a salvage procedure, not as the first choice for revision surgery. (2) Given that the radius is connected to the elbow for improved extension and flexion, the rotation function of the radius is sacrificed. We put the forearm in the neutral position. There is no obvious

functional disability as well-functioning shoulder can compensate for part of the loss in forearm rotation. This surgical method involves less soft-tissue trauma, is simpler procedure requiring less surgery time, and the bone marrow cavity of the radius is theoretically a completely clean environment, which could prevent periprosthetic infection after the operation.

Conclusion :

Total elbow arthroplasty is a good alternative for elbow complex fractures. Revision scenarios pose various challenges and sometimes need outside the box thinking. Inserting an ulnar prosthesis into the radius is a novel procedure for patients with non reconstructable ulna. It is a safe, quick, and effective treatment with a promising outcome.

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Arthroscopic Subtalar arthrodesis by Sinus tarsi ALAPSTA technique – Abdul Khan

Dr Abdul Khan

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Case Report: A 50 year old female presented with symptomatic Subtalar joint OA since the last 2 years not responding to conservative treatment. She was treated with rest, analgesics, physiotherapy and brace with little relief.

She had MRI scan which showed severe subtalar joint OA and large osteophyte in the sinus tarsi.

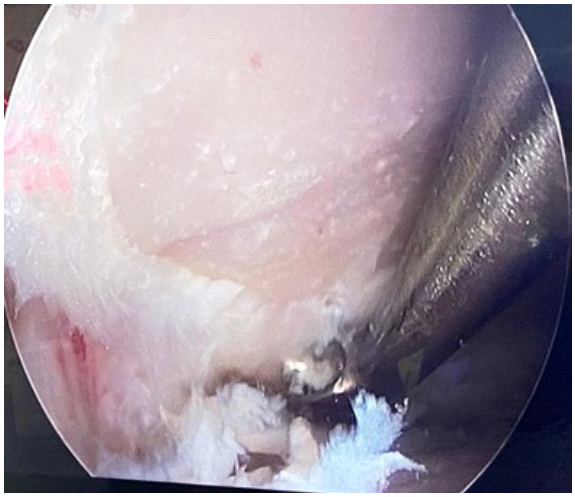
After informed consent, we did subtalar arthrodesis through Lintzs Sinus tarsi ALAPSTA

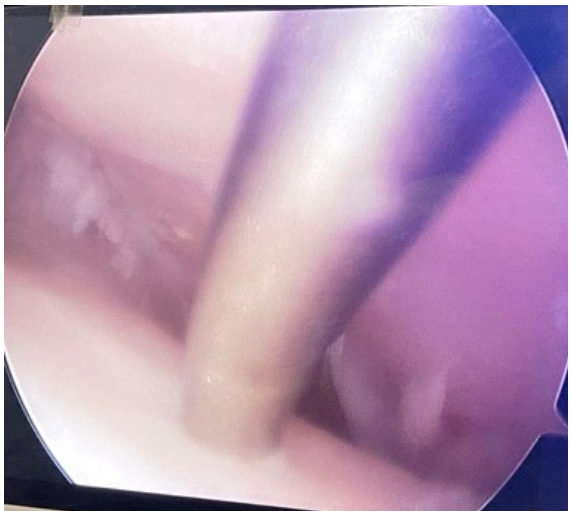
(Antero lateral arthroscopic posterior sub talar arthrodesis) technique.

We did the procedure in lateral decubitus position under tourniquet control with 2 sinus tarsi portals.

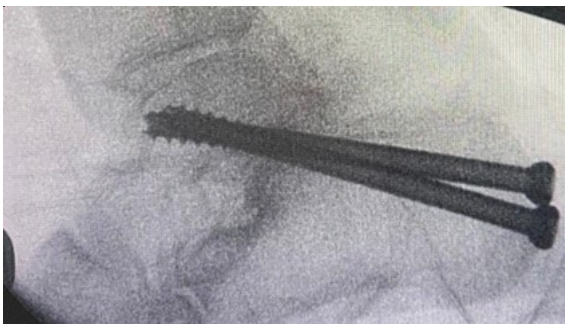
We did debridement of the subtalar joint, excised the remaining articular cartilage. Also, there was a large osteophyte in the sinus tarsi which we removed through one of the portals.

We then fused the Subtalar joint with two 6.5mm partially threaded cannulated screws inserted through 2 stab incisions in the posterior aspect of the heel. We applied a below knee back slab.





The patient is presently 3 weeks post op. Her sutures were removed 2 weeks after the procedure which were well healed. She continues to be in a below knee POP back slab. We will remove the below knee slab after 3 weeks. Then we will keep her in a SP walker boot and allow partial weightbearing further 6 weeks.



Discussion : Normally, for this condition as per the current practices in our region, open surgical arthrodesis (joint fusion) is done. Open surgery can lead to wound healing problems, infection, neurovascular injury, ligament injury and disruption of blood supply to the talus.

Also, sub talar joint arthroscopy is done in prone position with posterior portals.

The posterior portals have risk of injury to the tibial neuro vascular bundle just behind the FHL on the medial side and sural nerve on the lateral side.

Also access to the anterior aspect of the joint can be difficult often needing an accessory lateral portal.

We chose this ALAPSTA technique as it is the safest of all the various arthroscopic procedures described.

Arthroscopic procedure in the sub talar joint has significantly lower complication rate (wound healing problems, wound infection, neuro vascular injury, ligament injury, disruption to the blood supply to talus) compared to open procedure.

Time to union and return to work are also significantly shorter.

Conclusion : Arthroscopic subtalar joint arthrodesis through sinus tarsi (ALAPSTA) technique is a safe procedure avoiding the risks of open surgery and posterior arthroscopy.

Dislocation of proximal tibiofibular joint in a patient with multi - ligament knee injury : a case report.

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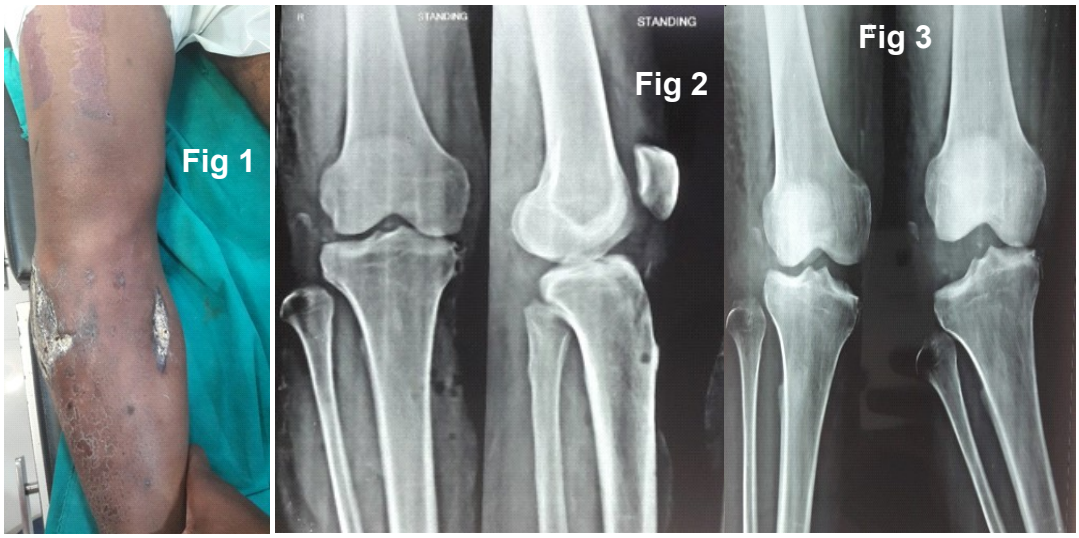
Abstract: Instability of proximal tibiofibular joint is relatively more frequently associated with multi ligament knee injuries rather than an isolated entity. The diagnosis of this rare variant is often missed if there is no proper clinical and radiological evaluation. Diagnosing and addressing the instability of proximal tibiofibular joint is very much important in the treatment of multi ligament knee injury patient because, if this joint is left unstable, repair of a co-existent injury of the posterolateral corner may fail, regardless of the proficiency of the technique. The co-existence of dislocation of proximal tibiofibular joint in the setting of multi ligament knee injury is poorly reported worldwide. We came across only 14 cases in pubmed search since 1990. Here, we present a rare case of multi ligament knee injury with dislocation of proximal tibiofibular joint complicated by impending compartment syndrome and foot drop.

Case report : A 23-year-old male was hit from side by a lorry while riding on a motorcycle. The patient fell down from his bike and had injury to his right knee joint. Two days later patient developed huge swelling in the knee and leg. He visited a local orthopaedic hospital where immediate fasciotomy was done for impending compartment syndrome. Two weeks later skin grafting was done for fasciotomy wounds and patient was referred to our centre three weeks after skin grafting. On clinical evaluation at the time of presentation to our centre (five weeks after injury), patient had grade III posterior drawer sign and grade III opening on varus stress. Dial test was also positive. He also had an unstable proximal tibiofibular joint along with foot drop [Fig 1].

Plain radiographs revealed that the patient had anterolateral dislocation of proximal tibiofibular joint and also there was excessive opening on the lateral side



in varus stress view [Fig 2 and 3]. MRI of knee showed that there was complete tear of posterior cruciate ligament and lateral collateral ligament along with partial tear of anterior cruciate ligament and medial collateral ligaments [Fig 4]. Vascular status of the limb was intact as confirmed by colour doppler study and also there was no venous thrombosis.

On diagnostic arthroscopy patient's anterior cruciate ligament was found to be intact but there was complete disruption of posterior cruciate ligament [Fig 5]. There was excessive gap in lateral compartment and arthroscope could easily drive into posterolateral compartment [Fig 6]. This confirmed that there was posterolateral corner injury also.

We proceeded with arthroscopic reconstruction of posterior cruciate ligament using ipsilateral quadrupled Semitendinosus and Gracilis tendon graft. Graft was fixed on both femoral and tibial sides using titanium interference screws [Fig 7].

Then a longitudinal incision was given over the fibular head instead of giving it in the midway between fibular head and gerdy's tubercle to avoid a raw area of skin graft. Lateral popliteal nerve was identified intact and neurolysis was done to release the adhesions [Fig 8]. The proximal tibiofibular joint was reduced and held with a Kirschner wire of 2 mm in diameter. One 4 mm partially threaded cannulated cancellous screw with a washer was then used to transfix the proximal tibiofibular joint [Fig 9].

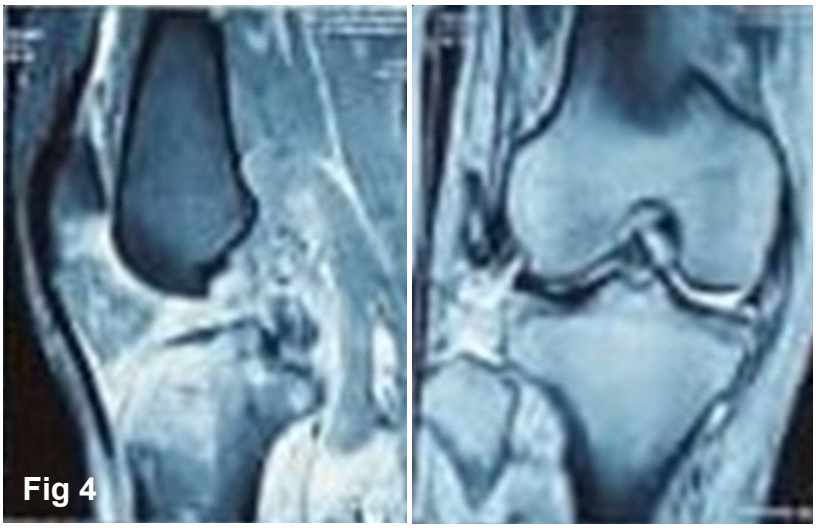


Fig 4

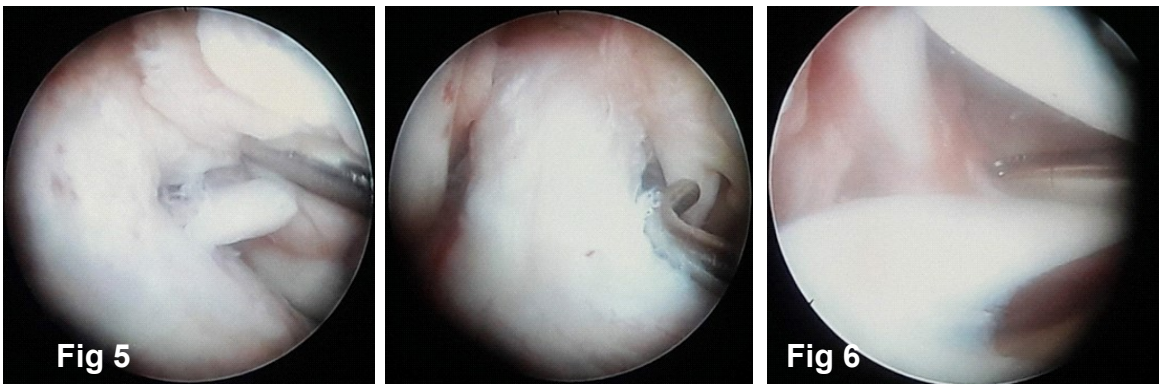


Fig 5

Fig 6

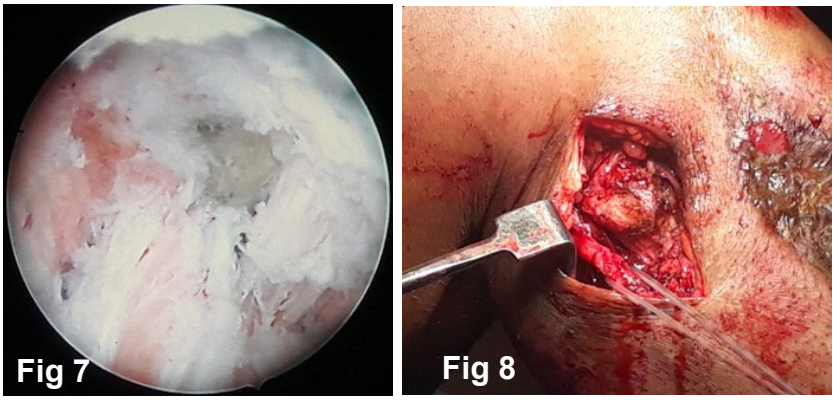


Fig 7

Fig 8

We next proceeded with reconstruction of posterolateral structures of knee using contralateral Semitendinosus tendon graft. We did the posterolateral corner reconstruction using fibular based modified Larson's technique. A guide pin was drilled from the distal anterolateral aspect of the

fibular head (FCL attachment) to the proximal posteromedial portion of the fibular head. After ensuring proper positioning of the guide pin, a 4.5-mm reamer was used to drill


Fig 9

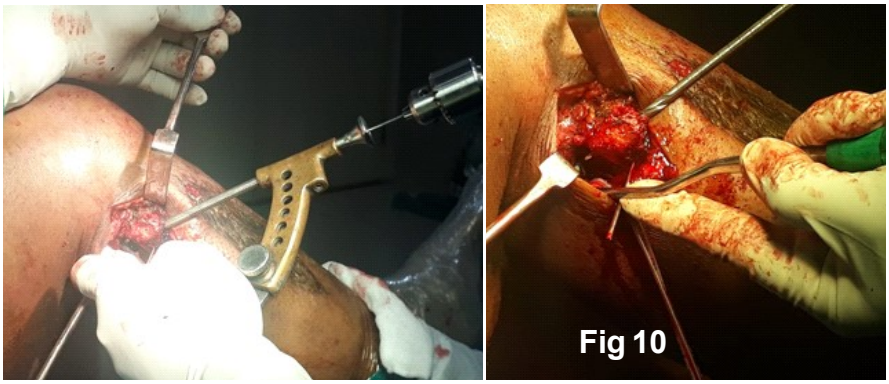
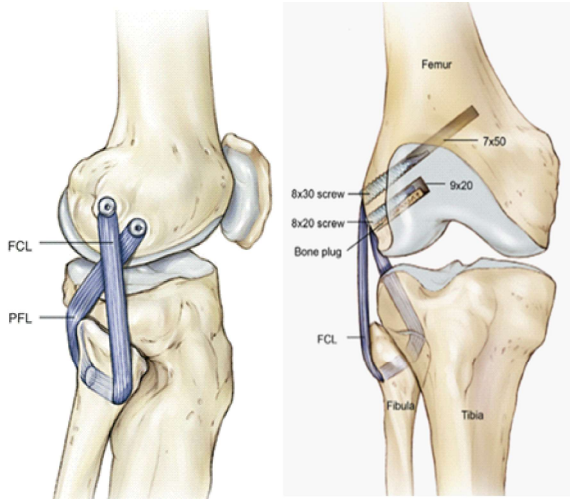


Fig 10

the fibular tunnel [Fig 10]. Another longitudinal incision was given over the lateral femoral epicondyle. Tensor fasciae latae was incised longitudinally. Anatomical insertions of lateral collateral ligament and popliteus tendon at lateral femoral condyle were drilled with 2.4mm guide pins aimed towards the flare of medial femoral condyle, followed by overdrilling using a reamer matched to diameter of graft. Graft was passed through the fibular tunnel from anterior to posterior keeping half of graft anterior and half posterior. Both the anterior and posterior limbs of the graft were passed underneath the biceps muscle and tensor fascia latae into femoral tunnels [Fig 11]. Anterior limb of the graft was fixed into lateral collateral ligament tunnel using a titanium interference screw and posterior limb of the graft was fixed into popliteus tunnel using another titanium interference screw [Fig 12].

Postoperatively knee was immobilised in extension in a range of motion knee brace for three weeks. From 4th week onwards range of motion exercises started and partial weightbearing was allowed from 7th week. At the end of 12 weeks patient was able to fold the knee completely and was able

Fig 11



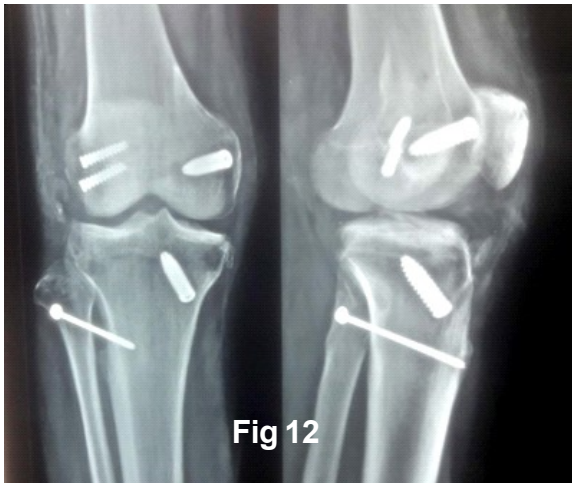


Fig 12

Fig 13

to walk with full weightbearing [Fig 13]. The foot drop is partially recovered.

Discussion :

The proximal tibiofibular joint is a synovial membrane–lined, hyaline cartilage articulation that, in 10% to 12% of people, communicates with the knee joint. The joint capsule is thicker anteriorly than posteriorly, and there are anterior and posterior ligamentous attachments. The anterior portion of the proximal anterior tibiofibular joint is stabilized by three broad ligamentous bands that pass obliquely upward and attach to the anterior aspect of the lateral tibial condyle. The posterior proximal tibiofibular ligament, composed of two thick ligamentous bands, passes obliquely from the fibular head to the posterior aspect of the lateral tibial condyle. Additional support is provided anteriorly by the biceps femoris tendon insertion onto the fibular head, posteriorly by the popliteus tendon, superiorly by the fibular collateral ligament, and inferiorly by the interosseous membrane [Fig 14].

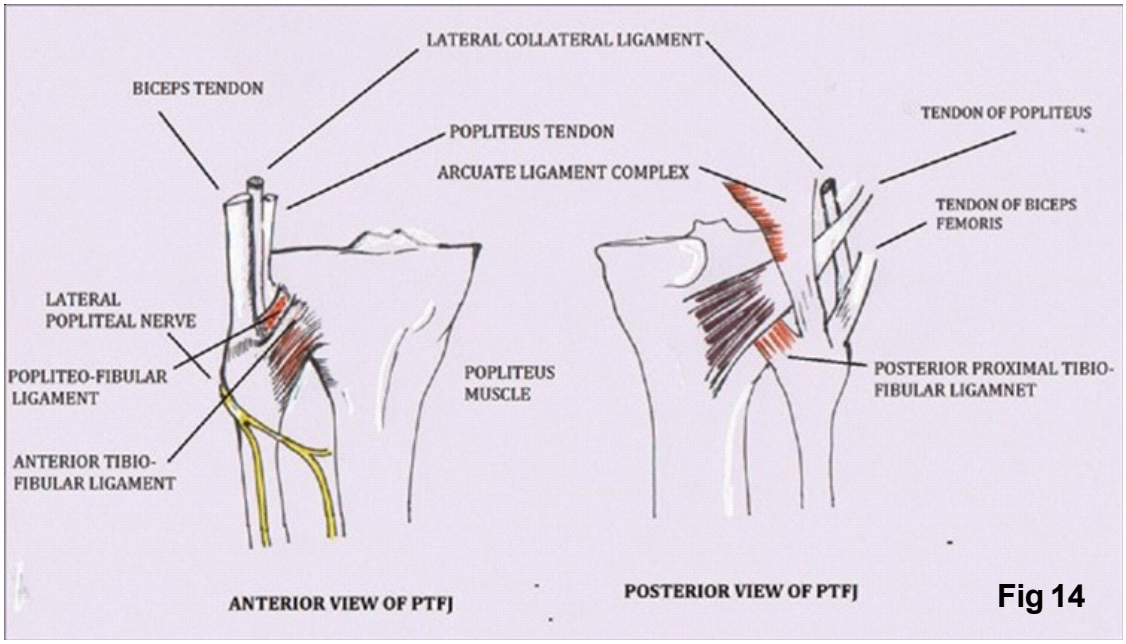


Fig 14

The lateral collateral ligament is tight from 0° to about 30° of flexion. With knee flexion, the proximal fibula moves anteriorly with relaxation of the lateral collateral ligament and biceps femoris tendon. With knee extension, the proximal fibula is pulled posteriorly because these same structures are

tightened. As a result of the laxity in the joint capsule with flexion, injuries to this joint generally occur with the knee in a flexed position.

Isolated instability of the proximal tibiofibular joint is a relatively rare. However, the injury is more commonly seen when in combination with other osseous or ligamentous pathological conditions.

Ogden divided the normal proximal tibiofibular joint into one of two types: an oblique type (greater than 20 ° horizontal joint inclination relative to the horizontal plane) and a horizontal type (less than 20 ° horizontal joint inclination relative to the horizontal plane) type [Fig 15]. Ogden reported that the horizontal type has inherently more rotational mobility with a larger surface area than its oblique

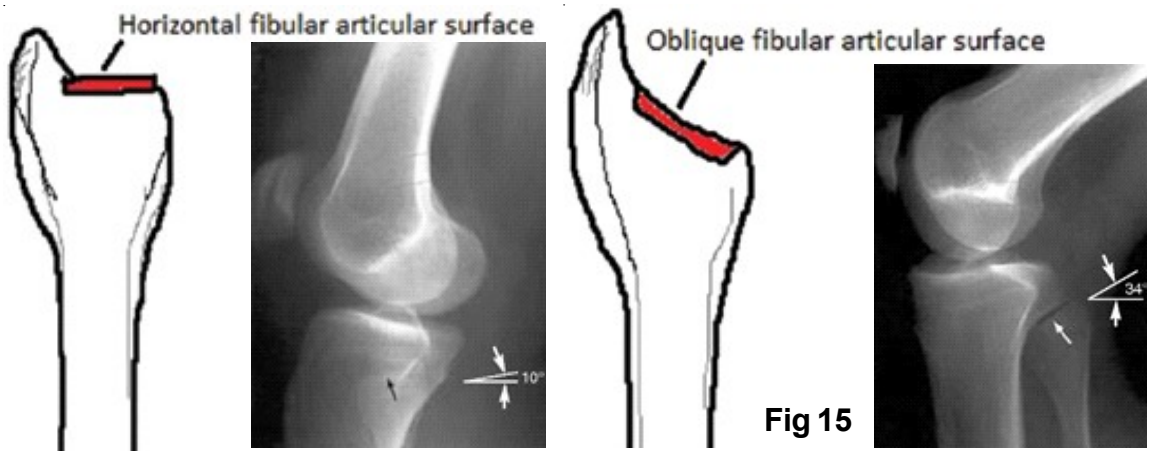


Fig 15

counterpart, and therefore increased resistance against rotational forces.

Ogden described four types of instability of the proximal tibiofibular joint: atraumatic subluxation, anterolateral dislocation, posteromedial dislocation, and the rare superior dislocation. Anterolateral dislocation is the most common dislocation which involves injury to the anterior and posterior capsular ligaments. This dislocation frequently is associated with injury to the lateral collateral ligament. Usually this injury results from a fall on a hyperflexed knee with the foot inverted and plantarflexed, such as landing with a flexed knee caught under the body. Posteromedial dislocations, often associated with peroneal nerve injuries, usually involve either a direct blow or a twisting injury that

tears the capsule and surrounding ligaments, including the lateral collateral ligament. Superior dislocations are classically associated with a concomitant highenergy ankle injury and superior migration of the entire fibula. The result is an injury to the interosseous membrane between the tibia and fibula [Fig 16,17,18].

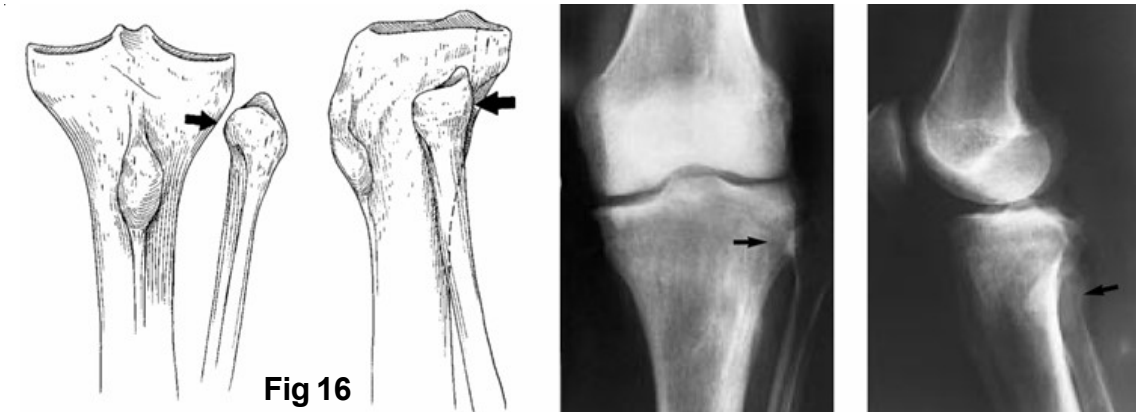


Fig 16

Patients with acute isolated proximal tibiofibular joint dislocation may present with pain and swelling or prominence in the lateral aspect of knee which is aggravated by ankle movements. Knee motion may also be painful and patient may not be able to completely extend the knee. Transient peroneal nerve symptoms may be present especially with posteromedial dislocations. But in a patient in whom dislocation of proximal tibiofibular joint is associated with multi ligamentous injury of knee, the clear-cut clinical symptoms may not be there and clinician must have a high degree of suspicion to diagnose.

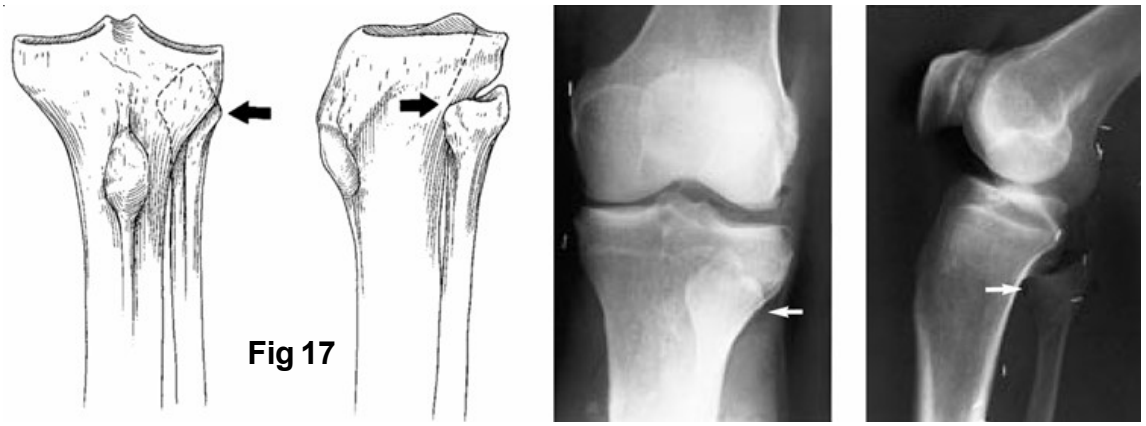


Fig 17

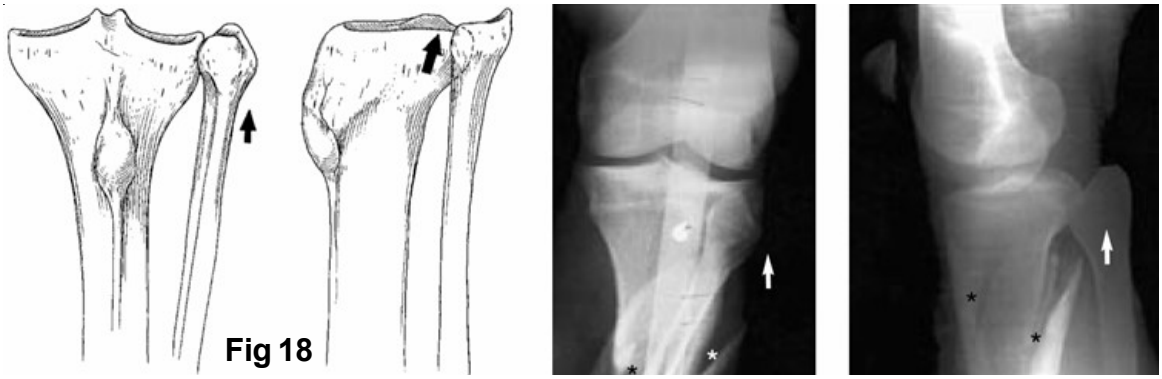


Fig 18

In a patient presenting with chronic dislocation of proximal tibiofibular joint, instability can be assessed by translating the fibular head anteriorly and posteriorly by grasping it between thumb and index finger with knee in 90 degrees of flexion.

Examination in all patients with suspected proximal tibiofibular injuries should include an assessment of the integrity of the lateral collateral ligament and posterolateral structures of the knee. Function of common peroneal nerve must also be evaluated in all these cases. In case of a multi ligamentous injury distal vascularity must also be checked.

Plain anteroposterior and lateral radiographs may show the dislocation but comparing with contralateral knee radiographs can substantially improve the ability to diagnose the instability of proximal tibiofibular joint. On the lateral view, the fibular head overlies the posterior border of the tibia. Resnick et al described a line on lateral radiographs that follows the lateral tibial spine distally along the posterior aspect of the tibia and defines the most posteromedial portion of the lateral tibial condyle. In a normal knee, this line is found over the midpoint of the fibular head [Fig 19]. In anterolateral dislocations, the fibular head

will be anterior to this line on the lateral view. In posteromedial dislocations, all or most of the fibular head is posterior to this line on the lateral view. Oblique views of the knee may be helpful, although this is controversial. Axial computed tomography has been found to be the most accurate imaging modality to detect injury of the proximal tibiofibular joint and is recommended if the diagnosis is suspected but not clearly established based on plain radiographs.

Nonsurgical management is usually successful for symptomatic atraumatic subluxation of the proximal tibiofibular joint. The initial management of acute proximal tibiofibular joint dislocation involves closed reduction, which can be done with either local anesthesia or intravenous sedation. Closed reduction is done by placing an appropriately directed force to the fibular head with the knee flexed between 80° and 110°. Whether to immobilize the patient after successful closed reduction is controversial. The indications for open reduction include failed closed reduction, acute posteromedial dislocation which have been associated with poor results after closed reduction, superior dislocations which are invariably associated with concomitant tibia or ankle fracture and dislocations which are associated with injuries to posterolateral corner structures which requires primary repair. Several techniques have been described for open reduction and internal fixation of proximal tibiofibular joint using Kirshner wires, cancellous screw or cortical button.

Malreductions or missed dislocations may produce degenerative changes in proximal tibiofibular joint resulting in chronic pain. In such cases either arthrodesis of proximal tibiofibular joint or resection of fibular head can be done. For patients with symptoms of recurrent instability, reconstruction of the supporting structures of the proximal tibiofibular joint also can be done using biceps femoris tendon or iliotibial band.

Conclusion :

Dislocation of the proximal tibiobular joint is a rare diagnosis and can easily be missed. One should consider this diagnosis in every case of traumatic lateral knee pain and pay careful attention to how the patient describes the trauma. Physical examination should include addressing the bular head and proximal tibiobular joint. Careful examination of the radiographs is essential and, in case of

doubt, one should compare them with radiographs of the healthy knee. In the setting of multi-ligament knee injury, disruption of the proximal tibiofibular joint is not uncommon. Disruption of this joint is an important co-existing injury to recognize in the setting of the multi-ligament knee injury, as proximal tibiofibular joint integrity is necessary for performing a fibular head-based posterolateral corner knee reconstruction, and if left unrecognized, proximal tibiofibular joint instability may lead to failure or persistent instability of a posterolateral corner repair/ reconstruction.

Trochleoplasty and MPFL Reconstruction for Recurrent Patello Femoral Dislocation

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Introduction

Recurrent and habitual dislocation of the patella is a challenging condition of the PFJ, affecting young patients. Management of this condition has evolved over the years. Trochlear dysplasia is the most challenging cause of the instability and surgical options have been fraught with complications and poor results[1]. Dejour pioneered trochleoplasty to successfully manage dysplasia of the trochlea. His classification of the dysplasia is useful to make surgical plan and manage this condition[2]. We report a rare case of habitual lateral dislocation of the patella successfully managed by trochleoplasty and MPFL resconstruction.

Case Report :

A 21 year old female presented with instability of the right knee cap and difficulty in bending knee and abnormal mobility of the knee cap since childhood. There was no history of trauma. Although the left knee becomes occasionally unstable, she is not troubled by her left knee as much as her right knee.

Clinical and radiological findings and CT scans with relevant measurements are given in figure

Figure 1: Lateral patellar mobility increased subluxating laterally by pushing with the thumb

Figure 2: Patellar tracking indicates lateral tracking of the patella on extension of the knee "J sign".

Clinical examination showed a very mobile patella laterally with dislocation on pushing laterally with the thumb (Figure 1). Apprehension test was positive. The patella dislocates habitually every time the knee flexes more than 80 degrees.

J sign was positive on active extension (Figure 2). Beighton score was 6/9. While the right side was the worst affected, the left side was mildly affected. CT scans were done for both knees which showed the findings given in Figure 3.

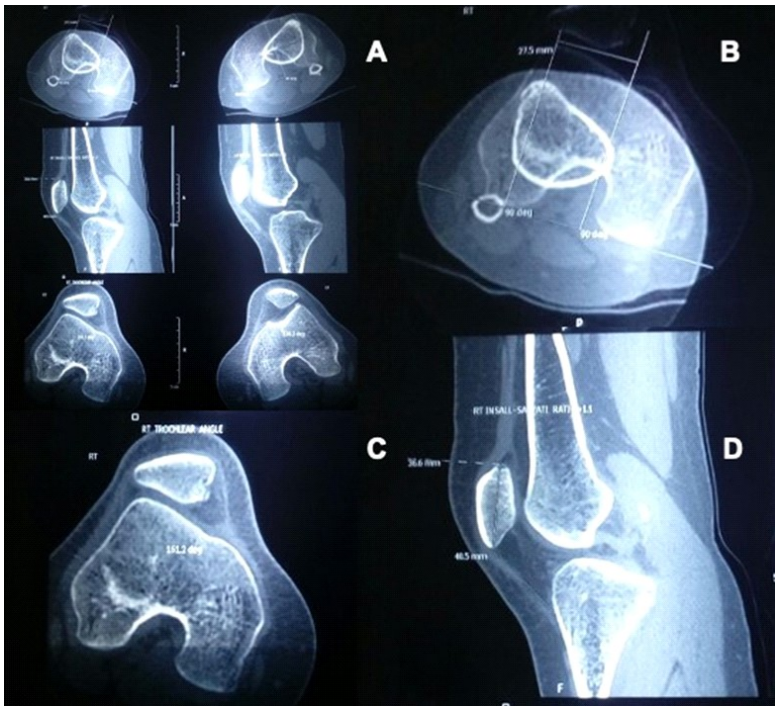

Figure 3: A: CT Scans of both knees. B-D: CT of Right knee with measurements. B: TTTG distance 22.5mm, C: Trochlear Angle 161 degrees, D: Insall - Salvati Ratio 1.1

CT scan shows a Dejour Type C Trochlear dysplasia with a shallow trochlear groove given by the trochlear angle of 161 degrees. The patella was tilted laterally with no evidence of degenerative changes.

Through a lateral parapatellar approach, a lateral retinacular lengthening, trochleoplasty were done and on the medial side, an MPFL reconstruction was done using a gracilis tendon autograft. The knee was immobilized in 30 degrees flexion for 2 weeks and the knee mobilized after that. Trochleoplasty was done using an open technique with a modification of the technique described by Dejour[3] by shaving deep to the subchondral bone and recontouring of the lateral trochlear facet to remove the bump seen in the CT scan and create a groove. The surfaces were tied down using transosseous number one vicryl suture in the sulcus[4] and on the lateral trochlear surface and

tied to reduce and fix to underlying bone. Lateral radiograph done post operatively shows evidence of recontouring. Follow up radiographs show evidence of healing subchondrally with some bone formation around trochlear facets (magnified view).

MPFL reconstruction was done in the standard fashion with one attachment of the ligament at the Schottle's point on the femoral side and two attachment on the patella. The patellar attachment were drawn through tunnels and sutured laterally taking care to maintain optimal tension.

Post operative radiographs of the knee AP and lateral views. Arrow points to the evidence of trochleaoplasty (Figure 4).

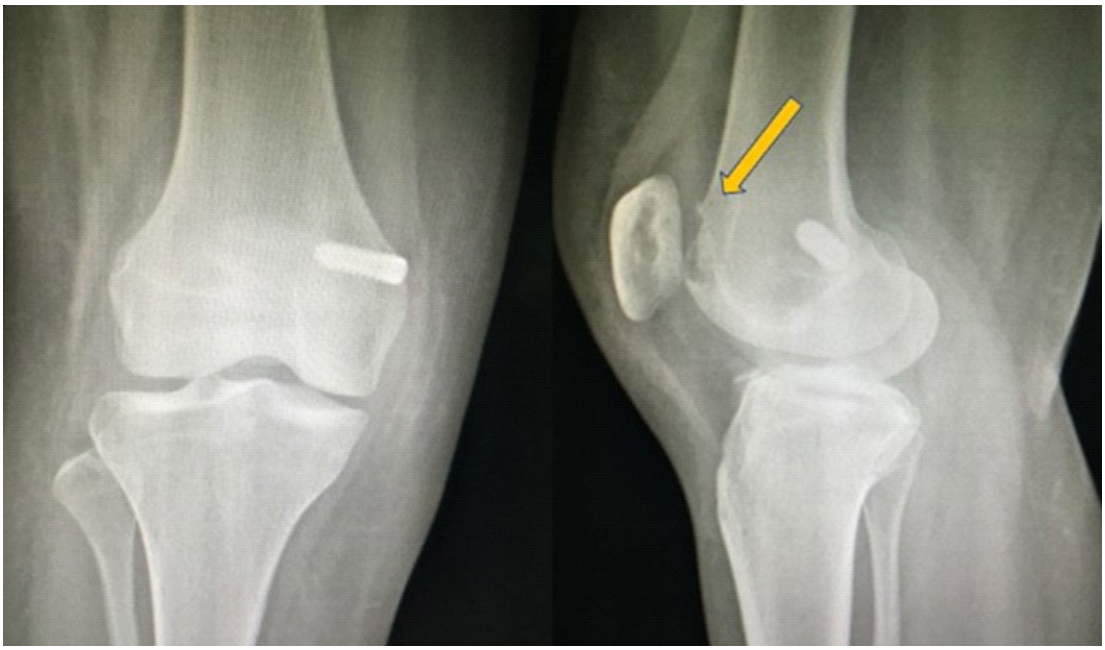

Figure 4 : Immediate post operative radiographs showing MPFL reconstruction and evidence of trochleoplasty indicated by the arrow

Post operative x rays at one year follow up (Figure 5) and four years follow up show preserved alignment. Clinically, she has good function of the knee (Figure 6) and asymptomatic. There was no history of instability of dislocation since surgery.

Figure 5 : Radiograph at 1 year follow up shows remodelled trochlea (magnified view on the right)

Figure 6 : Clinical picture 4 years post op showing full flexion at the knee

Discussion :

Recurrent dislocation of the PFJ is a difficult problem to manage and treatment strategies for this condition have been evolving. Options for management traditionally included various non anatomical soft tissue reconstruction techniqiues. Surgical options may be classified as soft tissue procedures and bony procedures to restore alignment of the PFJ. Traditionally, they were non anatomical. But recent methods have focused on anatomical reconstructions of

specific structures to restore alignment. Algorithms have been developed by experts to manage this daunting condition. The algorithm is evolving and prominent procedures in this include the following procedures alone or in combination: MPFLR, Tibial Tubercle osteotomy, MQTFLR (Medial Quadriceps Tendon Femoral Ligament Reconstruction) and reconstruction of other stabilizing ligaments. A full review of options for management have been presented in 2020[5]. We have presented a rare case requiring Trochleoplasty and MPFLR.

Conclusion :

Trochleoplasty is a useful technique to restore difficult cases of trochlear dysplasia. It is a challenging technique and combined with MPFLR and retinacular lengthening, can assist in stabilizing PFJ instability.

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Bilateral Hip Arthroscopy for femoral head AVN

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Case report :

A 25 year female patient presented with bilateral hip pain. She had a history of taking corticosteroids for Asthma in the past. She was adviced bilateral total hip replacement as per the standard practice in the region.

She then presented to me. We did updated MRI scan which showed femoral head avascular necrosis (AVN). It was grade 3 in the right hip and grade 4 in the left hip (Ficat & Arlet classification).

After informed consent, we kept the patient supine on traction table. We did both the therapeutic hip arthroscopies in the same sitting. We first did the right followed by left hip after making appropriate changes in the traction table. We used anterolateral and modified anterior portals for the procedure.

We did right hip arthroscopic assisted core decompression along with autologous stem cell implantation, synovectomy & chondroplasty.

On the left side, we did arthroscopic synovectomy, chondroplasty, anterior labral debridement, excision of small pincer lesion.

Patient recovered well post operatively and was discharged on the 2nd post operative day. She was adviced protected weightbearing with crutches for 6 weeks.

She is presently about 10 months post op and has been mobilizing independently without any significant problems.

Discussion :

On the right side, this patient had grade 3 AVN. Core decompression has been proved to effective upto grade 2 only with variable results in early grade 3. We chose to do arthroscopy because in addition to core decompression, we injected autologous stem cells which we extracted from the iliac crest (followed by its preparation in the centrifuge machine). I also did synovectomy, chondroplasty.

We did not do core decompression on the left side side as it was already grade 4. We did synovectomy, chondroplasty, anterior labral debridement, excision of small pincer lesion.

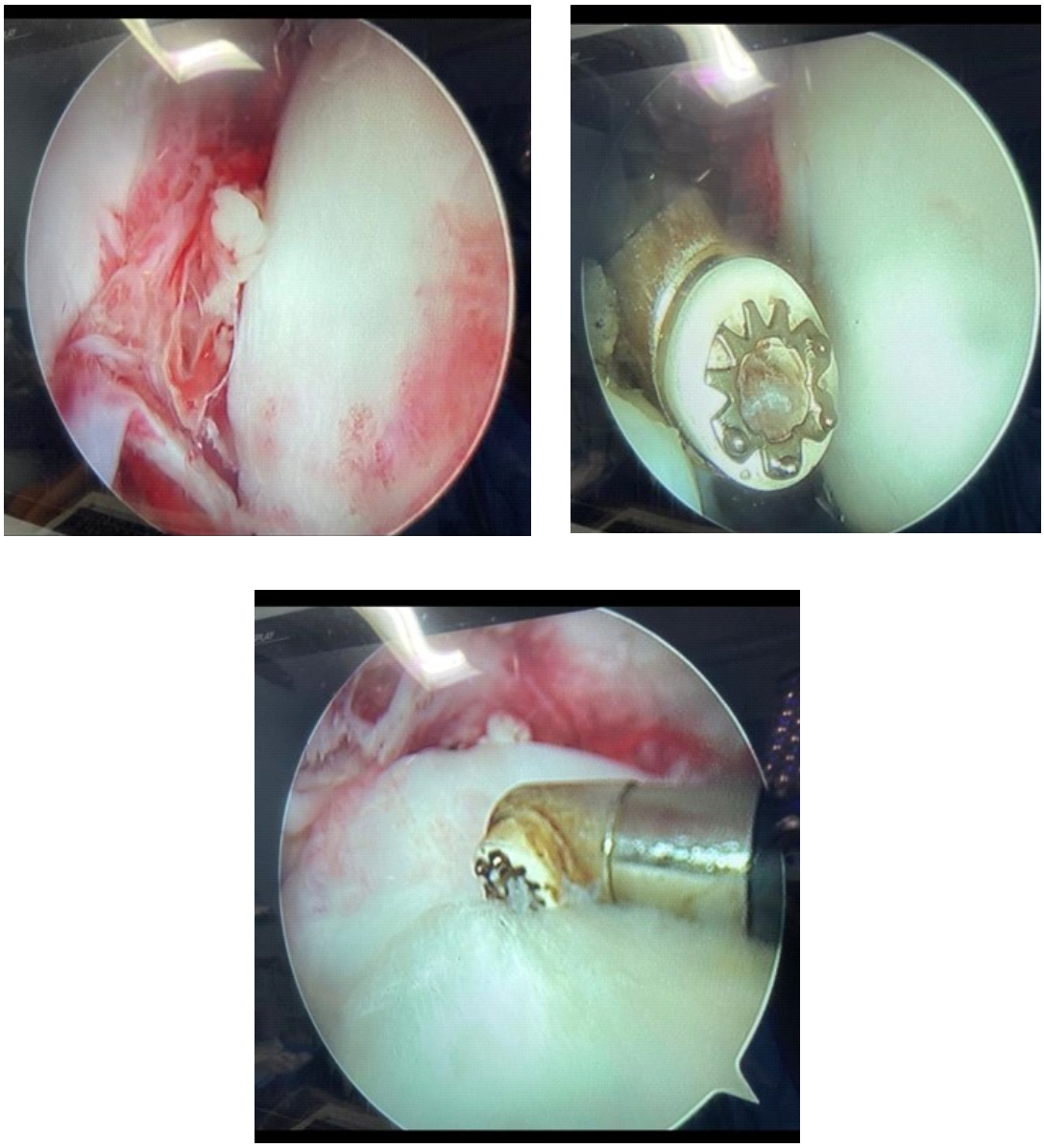
These procedures of synovectomy and chondroplasty have been proved to be effective in most of the large joint OAs.

The fact that patient is relatively pain free 10 months after the procedure shows that above treatment is effective. Otherwise, she would already have been 10 months post bilateral THR as adviced by some of my colleagues in the region.

There are a lot of tribal people in the adjoining regions of north Andhra Pradesh, Orissa and Chattisgarh who come to Vizag with Sickle cell Anemia for treatment.

Significant number of these people develop avascular necrosis of the femoral heads as a sequelae. With this innovative approach, we potentially could reduce the number of major surgeries they undergo in the hips in their lifetime. Thereby, reducing both the financial and psychological burden on the patient and family. Further high quality studies are required to establish its role.

Patient positioning for Hip Arthroscopy



Intra operative images of the Hip

Conclusion: Bilateral therapeutic hip arthroscopy may have a role even in grade 3 and grade 4 AVN by prolonging the native hip and thereby delaying the inevitable THR

Deltoid Muscle Fibrosis following Injection - A Case Report and Review of Literature

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Introduction :

Deltoid fibrosis is a disorder of chronic inflammation marked by intramuscular fibrous bands within the substance of the deltoid muscle, which leads to secondary contractures and affects the function of the shoulder joint(1). It commonly occurs in children after intramuscular injection, especially with antibiotics and antipyretics, which seem to affect the fibrosis(2). Patients who develop contractures following injection are likely to have an inherent genetic predisposition for the development of fibrosis. In adults, contractures seem to be related to injection frequency. However, it is also seen in patients without a significant history of intramuscular injections, in whom it may be attributed to trauma, congenital factors, developmental defect, localised arthrogryposis or progressive idiopathic factors(3). This could be caused by an enzyme deficiency in collagen degradation, an increased rate of collagen synthesis, genetic defects in the regulation of collagen biosynthesis, or an enzymatic defect in fibroblasts(4). We present a case report of a 50y old lady,

who developed deltoid fibrosis following injection and was successfully treated with distal release of the contracture.

Case report :

A 50-year-old lady presented to the clinic with a history of pain in the right shoulder of two years duration. She complained of difficulty in adducting her arm and limitations of activities of daily living. The shoulder pain was not radicular and was not affected by the movements of the neck. On detailed questioning, the patient gave a history of receiving an injection to the right upper arm after which, she started noticing the symptoms. There was no history of muscle weakness, sensory symptoms, contractures elsewhere in the body or family history of similar contractures.

On clinical examination, there was a dimple on the skin over the deltoid, a palpable fibrous cord over the muscle, and medial scapular winging, which became more prominent on passive adduction of the arm as shown in figure 1. There was a fixed abduction deformity of 20 degrees, and the other shoulder movements were normal. She did not have any spine or chest deformities. There were no signs of glenohumeral instability, and the power of the muscles was normal.

Figure 1: Clinical image showing
(a) dimpling of the skin over the deltoid,
(b) medial winging of the scapula

MRI of the right shoulder showed hypointense cords in the substance of the muscle involving the central and posterior fibres as shown in Figure 2.

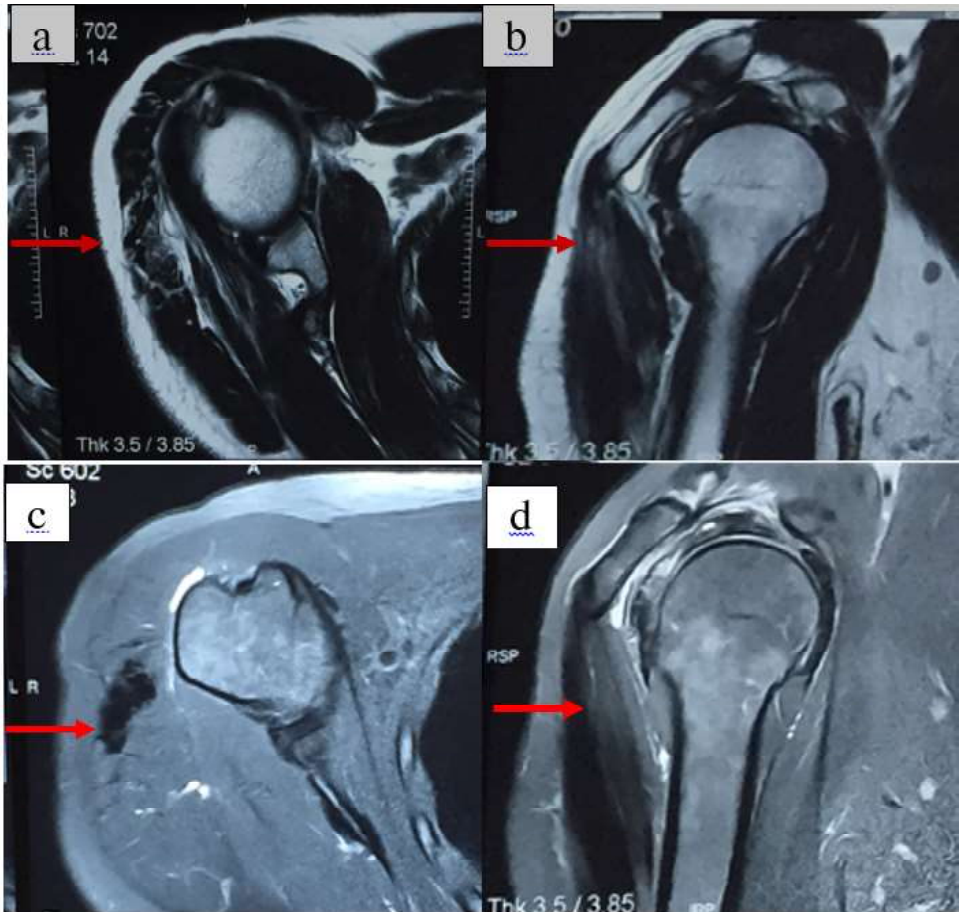

Figure 2: Axial and Coronal MRI sections of the right shoulder showing fibrosis in the deltoid. Note the dimpling of the skin over the fibrosis.

Surgical treatment was planned, taking her symptoms into consideration. Under regional anaesthesia, and patient in lateral decubitus position, the shoulder was draped freely. A 5cm longitudinal incision was made over the contracted band. The muscle insertion and the contracted bands were identified. Distal release, i.e., release and excision of about 1cm of the band was done, preserving as much normal tissue as possible as shown in Figure 3.

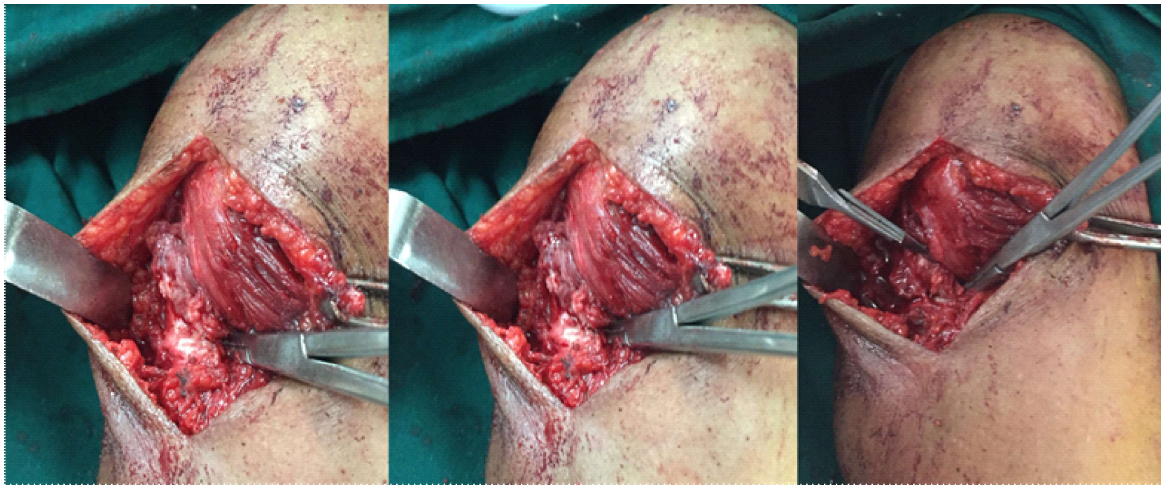

Figure 3 : Intraoperative images showing distal release and excision of the fibrotic band.

The arm was manipulated until full adduction was achieved without any taut palpable bands. Haemostasis achieved, and the wound was closed in layers. Postoperatively, the arm was rested in a sling pouch. She was permitted passive movements of shoulder immediately. Active mobilisation was started as pain allows. Forced adduction of the arm was encouraged. She was followed up regularly. At 3 months follow-up, there was no evidence of weakness of deltoid, abduction deformity and winging of the scapula had disappeared and she had normal functioning of the shoulder.

Discussion :

Deltoid fibrosis is part of a spectrum of fibrotic conditions that affect both upper and lower extremities. Similar contractures have also been seen in the quadriceps and gluteal muscles(5). It is seen in people of all ages, but it has been reported primarily in children. Contractures of the deltoid frequently involve the central and/or posterior fibres (usual site for administration of injection to avoid cephalic vein anteriorly), and anterior fibres are spared(6). Cases where all the three portions of the deltoid have also been reported. Most contractures are full thickness. However,

partial thickness contractures have also been reported.

Most frequently, the affected individuals cannot adduct the arm (abduction contracture) and may have scapular winging and secondary scoliosis(7). As the abduction contracture increases, the weight of the arm causes medial rotation of the inferior border of the scapula, resulting in winging of the scapula. This alters the biomechanics of the glenohumeral and scapulothoracic rhythm, leading to impingement, rotator cuff tendinopathy and tears. Long standing cases can cause labral injury, and glenohumeral instability (7,8).

Diagnosis by X-ray alone may be difficult due to abnormal scapular position. Changes seen on X-ray include flattening of the humeral head, bony projection in the superolateral acromion, hypertrophy of the deltoid tuberosity with medial convexity of the shaft of the humerus(5). CT and MRI are needed to assess the status of the joint, deformity and the muscular architecture. MRI shows fibrous cords in the muscle. Electromyography (EMG) has demonstrated decreased-to-absent activity in the involved muscle, but nerve conduction studies have been normal(2).

Chen et al proposed the following possible mechanisms for the development of deltoid contractures(2).

- Direct disruption of the muscle fibres by needle injection
- Myotoxicity related to the injected drugs.
- Myoischemia due to the volume of the injection, with local oedema, fibrotic compression, and vascular damage

All these factors cause focal myositis, promote fibroblast activity, collagen production, and subsequent myopathic degeneration. In some patients, distal nerve fibres or motor endplates may get damaged due to fibrosis or ischaemia leading to entrapment neuropathy. Histopathological examination reveals evidence of chronic inflammation, atrophied muscle and marked proliferation of fibrous tissue in the perimysium and endomysium. Phagocytosis with focal necrosis may be seen.

Surgical treatment is the mainstay of treatment. Release of the contractures restores the natural kinematics. It is

indicated in patients above 5years of age, abduction contracture >25 degrees, neck or shoulder girdle pain, and limitations in activities of daily living(9). Patients should be at least 5 years old and should show evidence of progressive deformity during growth. The humeral head deformity may remain even after surgical correction(7). Hence surgical correction at the earliest may allow spontaneous correction of the bony deformity with growth. Huang et al. suggested that early surgery is necessary in older patients and in patients with an increased winging angle to avoid rotator cuff injury or worsening of rotator cuff pathology, impingement, and late arthritic changes(8).

Surgical release can be done either proximally or distally. Banerje et al. opined that proximal release was not adequate to release all the fibrotic bands(10). Proximal releases have higher rate of complications such as failure to release the deltoid contracture completely, keloid formation, and may leave large defect in the muscle leading to a stair-step like deformity. Distal release is popular as it can be done when more than one portion of the muscle is involved, has fewer complications and provides excellent release as shown by various studies(6,9). Shanmugasundaram initially used proximal release through a 5-cm vertical incision starting from the tip of the acromion process. However, later they switched to distal release as it is associated with lesser complications(5).

Postoperatively, the arm can be immobilized for a short duration with a sling or mobilized immediately. Review of literature shows that there is no difference between the two in the long-term functional outcomes (6,9,11,12).

Conclusion :

Deltoid fibrosis is an uncommon clinical entity which alters the normal functioning of the shoulder joint. Clinical examination and radiology aid to confirm the diagnosis and surgical treatment by distal excision is the treatment of choice. Early diagnosis and treatment is the key to prevent secondary complications in the joint.

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Ankle Arthroscopic Autologous Collagen Induced Chondrogenesis (ACIC) by modified Shetty - Kim technique

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Case Report :

A 37 year old male presented with severe ankle pain since the last 2 years not responding to conservative treatment.He was treated with rest, analgesics, physiotherapy and brace with little relief.

He had MRI scan which showed an osteochondral lesion in the medial talar dome.

After informed consent, we did anterior ankle arthroscopic debridement, synovectomy, excision of small distal distal osteophyte, microfracture, filled the defect with Collagen graft mixed with PRP covered by Tisseel(ACIC) – modified Shetty-Kim technique.

We did the procedure in supine position with 2 anterior portals with manual traction.

He has been kept in a below knee back slab. He is presently 3 days post op. He was discharged on the 1st post op day. He is mobilising non weight bearing with a walker frame. He will reviewed in 2 weeks for removal of sutures. He will be kept non weightbearing in a below knee back slab for a total period of 6 weeks. Then he will be allowed partial weight bearing in a SP walker boot for further 6 weeks.

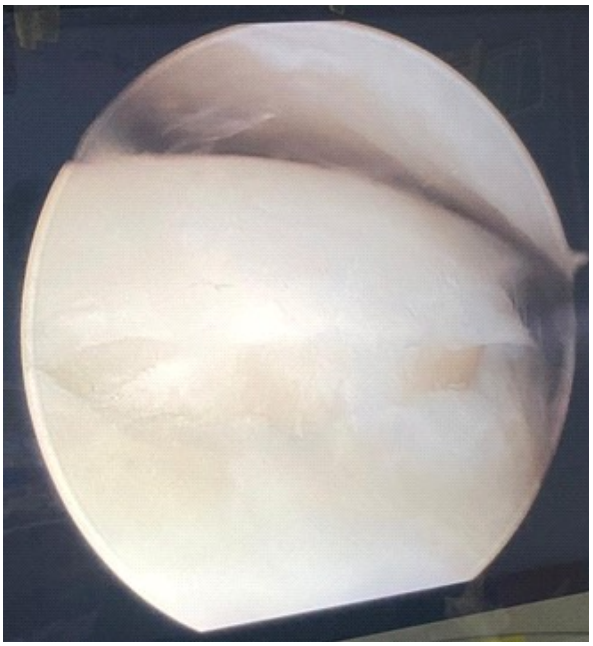
Discussion :

OsteochondralAutograft transfer system (OATS) can also be done but it is an open procedure requiring medial malleolar osteotomy which can lead to neurovascular and ligament injury, fracture non union, metal work irritation and may require second procedure to remove the metal work.

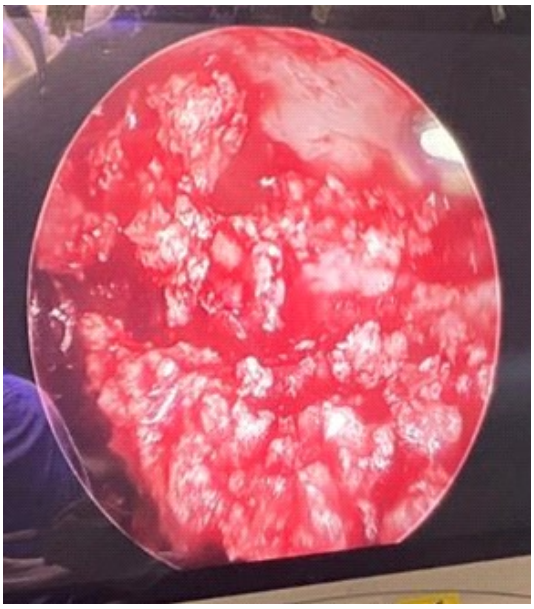
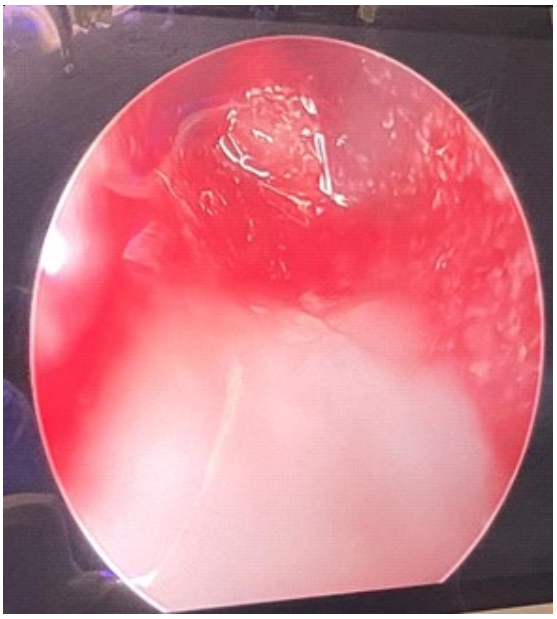
Autologous Chondrocyte implantation (ACI) can also be done but is a two stage arthroscopic procedure and also very expensive.









Conclusion: Autologous Collagen induced Chondrogenesis (ACIC) using the modified Shetty-Kim technique is a cost effective one stage arthroscopic procedure for the treatment of osteochondral lesions of the talus.

Extensive Fixed Multiple Synovial Chondromatosis – A Case Report –

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Introduction :

Synovial chondromatosis is a rare condition characterised by foci of cartilage in the synovial tissue of joints, which is due to metaplasia of intimal layer of synovium[1]. Synovial chondromatosis is known as articular chondrosis and synovial chondrosis. Knee joint is the most commonly affected joint [2] . Although described as a benign disease, it can be very destructive and can cause severe osteoarthritis and pain. Synovial chondromatosis can be classified as primary or secondary forms. Primary synovial chondromatosis, which is rare, occurs spontaneously and is not related to any pre-existing conditions. Secondary synovial chondromatosis is the more common and often associated with preexisting osteoarthritis, rheumatoid arthritis, osteonecrosis, osteochondritis dissecans, neuropathic osteoarthropathy tuberculosis, or osteochondral fractures in the affected individual [3.] The purpose of this case report is to document a rare presentation of primary synovial chondromatatosis of knee joint, insidious onset without much calcifications seen on the radiograph, but when patient underwent arthroscopic joint debridement ,there were numerous cartilaginous loose bodies all over the joint .

Case Report :

24 year old gentleman presented with pain in the knee for 2 years with difficulty in training for the police academy due to his knee. No history of trauma in the past and no family history of joint problems. c/o pain on flexion of the knee on the sides and extreme flexion of the knee deep inside the knee. On examination, there was palpable grating in the knee while flexing more than 90 degrees especially on the medial and lateral supra patellar regions with thickened synovium and fine nodular appearance. Lachman was positive. No evidence of ACL/ PCL/ MCL/ LCL/ PLC laxity of the knee. Pivot shift was negative. There mild effusion grade 1. He had full range of movement from 0-140 degrees. Final 10 degrees flexion caused deep pain in the knee. No other joint involvement was noted.

Radiograph showed nodular chondral appearing lesions in the suprapatellar region which were soft tissue lesions. There was no evidence of ossification within the lesions. (Figure 1)

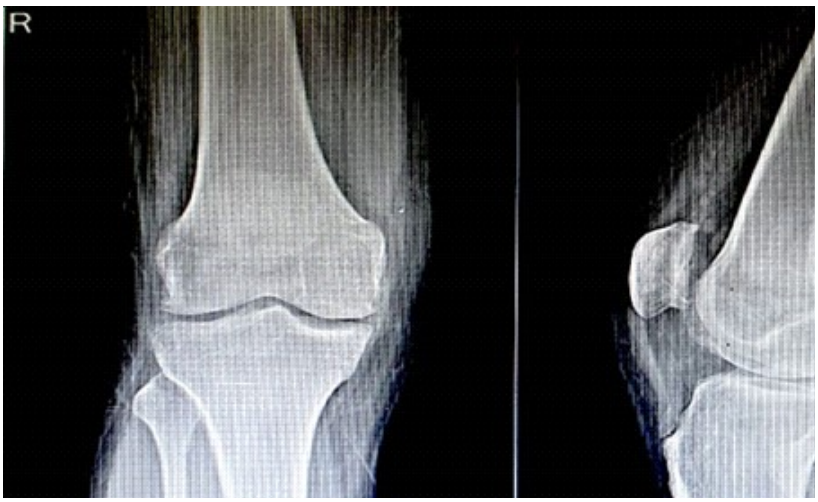


Figure 1: AP and Lateral view of Right knee joint showing nodular chondral lesions in the suprapatellar region with no evidence of ossification.

MRI however, revealed more involvement of the joint including suprapatellar areas and the gutter (Figure 2,3).

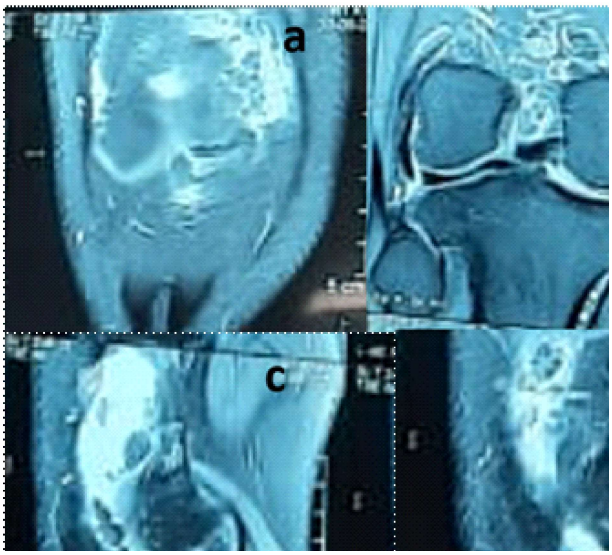
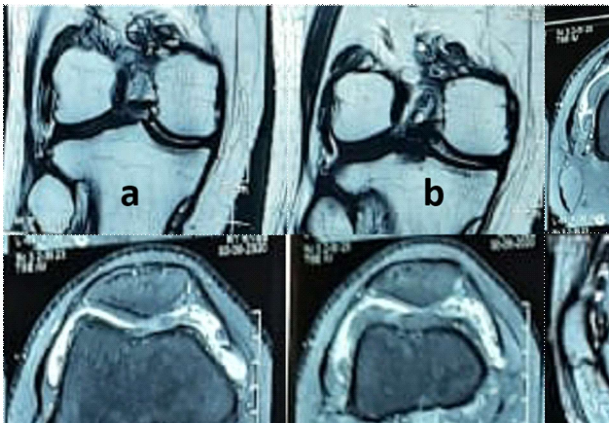


Figure2: MRI images showing the effusion of knee joint and nodules involving the knee joint. a and b: coronal section images showing nodules and effusion, c and d: Sagittal section images showing nodules in suprapatellar region.

Figure 3: MRI images of different sections of the knee joint showing nodules extensively involving the joint



The true extent of the disease was not evident until an arthroscopy of the knee was done. It showed extensive seeding of the synovium in most compartments of the knee and few loose bodies. The most notable aspect of this case was that there were a range of lesions starting from a few millimeters to upto 3-4 cms lesions seeding the synovium throughout the knee. Suprapatellar pouch appeared to be the most affected followed by the gutters and the anterior compartment. Majority of the lesions were buried in or attached to the synovium. Only few lesions were free. (Figures 4,5,6).

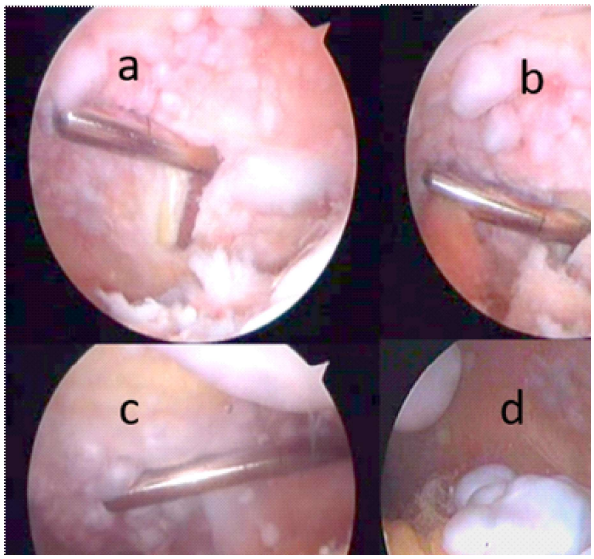
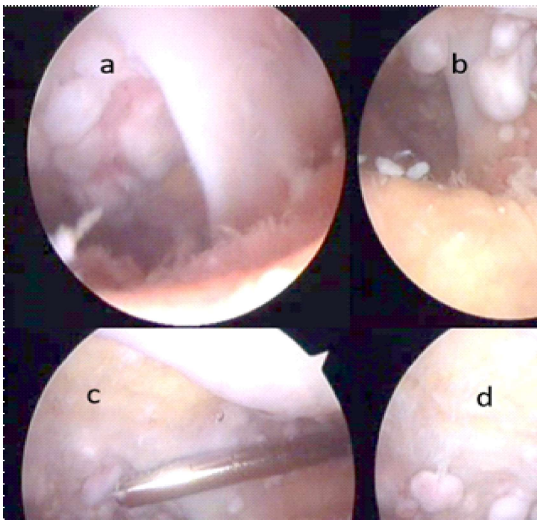


Figure 4: Intra operative pictures showing nodules of various sizes attaches to the synovium in suprapatellar pouch

Figure 5: Intraoperative images of suprapatellar pouch showing multiple nodules protruding and embedded in synovium.



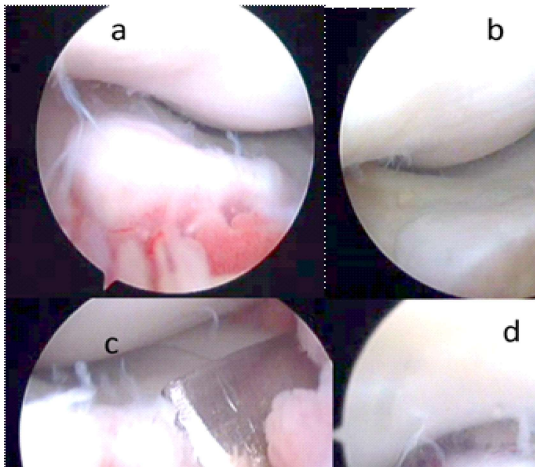


Figure 6: a,b,d: Nodules in intercondylar notch area, C : picture of the nodule in anterior compartment with the osteotome excising it .

All the visible lesions were successfully removed using graspers, artery forceps or the shaver. Rarely, in the gutters, by directly using a 11-scalpel blade to detach from the synovium, and anteriorly, near the infrapatellar fat pad, where it was attached to the bone, an osteotome was used to detach and excise it (Figure 7).

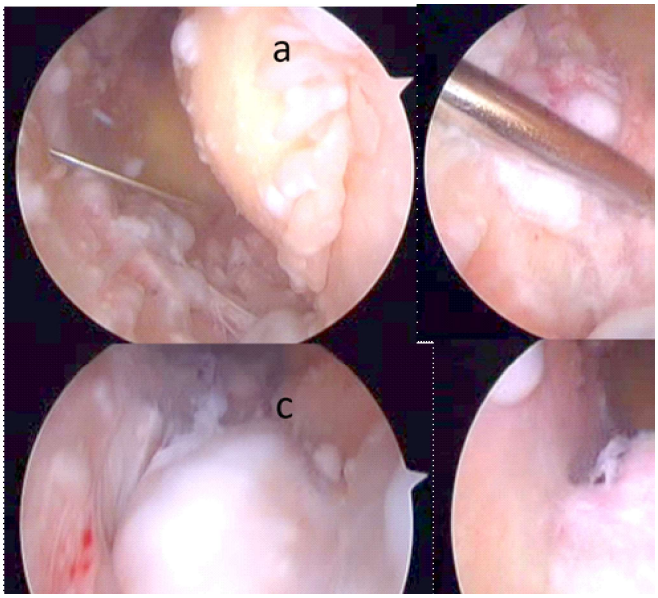


Figure 7: Nodules in medial gutter, a, b: Multiple small nodules in the medial gutter. c, d: Large pedunculated nodule arising from synovium in medial gutter

All the compartments appeared free of the lesions at the end of the procedure (Figure 8)

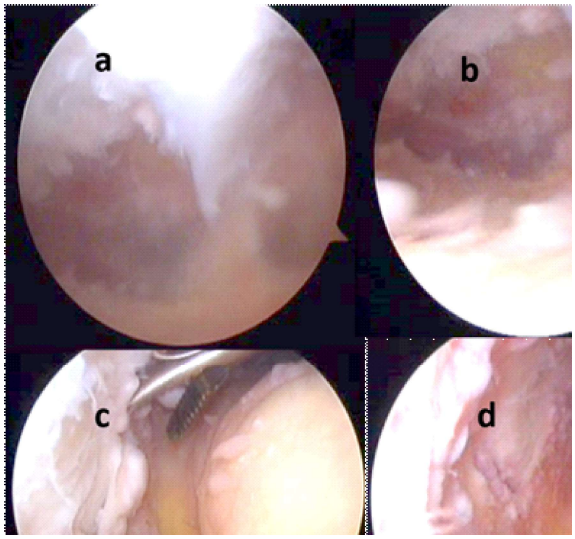


Figure 8: Images after complete removal of all the nodules from the joint

He had an uneventful recovery post operatively. Aggressive physiotherapy was initiated from post-operative day one. By 2 weeks, he had upto 90 degrees of flexion and by 4 weeks, he regained most of the function of the knee. His preoperative symptoms were not present at the last follow up of 2 months.

Discussion :

As cartilage cells are absent inside the synovial membrane, the development of synovial chondromatosis depends on metaplastic transformation of the synovial cells into chondrocytes via an unknown stimulus [1]. These chondrocytes become pedunculated and encrusted inside the synovium and eventually expelled into the joint as loose bodies.[4]

Milligram classified the disease into three phases: Early (active intrasynovial disease but no loose bodies), transitional disease (active disease and loose bodies), and late (multiple loose bodies but no intrasynovial disease) [2] Patient commonly presents with swelling, pain and restriction of movements. It is common from 3rd to 5th decade.[5] Synovial wchondromatosis is twice more common in males [6] than in females. Presentation is mostly unilateral, but bilateral involvement has also been seen [7,8]. Plain radiograph, ultrasound, CT and MRI are the imaging modalities which can be used to assist in diagnosing this condition. MRI is the modality of choice because of its superior soft tissue contrast [9].

In our patient, radiograph did not show any extensive involvement of the joint, but as the patient had persistent pain and limitation of movements, we decided to arthroscopically debride the joint. But to our surprise when we viewed the joint, we could see that joint is extensively embedded with cartilaginous bodies which are source of his pain and limitation of movements.

Complications of synovial chondromatosis can be secondary osteoarthritis, malignant transformation, and recurrence. Pigmented villonodular synovitis, synovial hemangioma, and lipoma arborescens are few conditions which can mimic synovial chondromatosis. Radiography, MRI and histology may help in accurately differentiating them.

Conclusion :

Synovial chondromatosis is a rare benign condition which can become highly aggressive and destructive. Extent of disease may be misleading in preoperative investigations in case of chondral lesions. Excision of all lesions may be done but is challenging and leads to good outcome

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Rare Presentation of Lunate Dislocation: Trans-styloid Dorsal Dislocation of the Lunate

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Introduction :

Perilunate fracture dislocation and lunate dislocation are rare carpal injuries accounting for 10% of all wrist injuries, of these trans-scaphoid Perilunate dislocation appears more frequently. These lesions represent broad spectrum of traumatic lesions usually resulting from high energy RTA or a significant fall on out stretched hand. The classical description of trans-scaphoid Perilunate dislocation or an isolated lunate dislocation occurs towards volar distal forearm [1]. These dislocations happen secondary to the failure of restraining ligaments and structures resulting in first dorsal dislocation of carpals and then reduction back on to the radius, leading to the volar subluxation of lunate in the volar direction. Early recognition and prompt management is very important to avoid morbid complications which include median nerve injury, Complex regional pain syndrome avascular necrosis of lunate, poor functional outcome and post traumatic arthritis. Dorsal dislocation of lunate is extremely rare with only few worldwide scattered reports.

We are reporting a case of trans-radial isolated lunate dorsal dislocation secondary to high energy road traffic accident associated with head and chest injury. He was treated with open reduction, dorsal scapholunate ligament repair and K- wire stabilization of styloid, and lunate. The patient had uneventful recovery.

Patient History :

A 40 years old poly traumapatient was transferred from another medical centre to our department 24 hours after a high speed caraccident. He blunt abdominal injury with Stable head injury component. The right wrist had boggy swelling, tenderness over dorsal aspect of wrist and restricted range of movements. The neurovascular evaluation was

Fig. 1 showing signet ring sing of scaphoid, styloid fracture, dislocated lunate

Fig. 2 shows poor lateral view and inconclusive

unremarkable.Initial radiographs (Fig-1,2) of the right wrist were inconclusive and showed fracture of base of 2nd metacarpal, complex wrist fracture with lose of gilula's lines as it were bed side and not be taken in true plane. Further evaluation was performed using CT scan with 3-D reconstruction [fig2]. Computer tomography examination revealed a dorsal dislocated lunate with styloid fracture.

Figure 2A C-Arm image showing dorsal dislocated lunate

Figure 3 : CT scan with 3-D reconstruction shows styloid fracture and dorsally dislocated scaphoid

Figure 4: Dorsal dislocated lunate well seen on 3-D reconstruction

After initial stabilization the patient was taken to the operating table where, under subclavian perivascular block and tourniquet. After initial failed attempts of closed reduction, an open extended dorsal approach was performed [fig3] .The skin and subcutaneous tissue was divided in line with the skin incision over the lister's tubercle. The extensor retinaculum was divided in z fashion for ease of closure. EPL was elevated from 3rd compartment and retracted laterally. Wrist denervation was performed by identifying and dividing the Posterior introsseous nerve on the floor of 4th compartment. The dorsally dislocated lunate was found lying over the rent in the dorsal capsule [fig5].

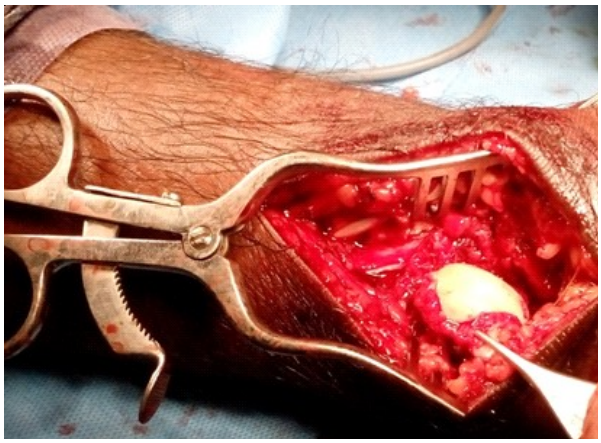

Figure 5 : The lunate was found lying just beneath the extensor tendons out of the dorsal capsular rent.

The Identification of articular surfaces of lunate was done by identifying the trapezoidal volar aspect, pointing dorsal aspect and flat medial and lateral surfaces. After giving a through wash and extending the capsular rent to elevate a distally based capsular flap the lunate was replaced back into lunate fossa after checking the articular surfaces of capitates, scaphoid, and triquetral bones. The reduction was achieved under image guidance (fig 6).

The reduction was stabilized with 1.2mm smooth K-wires across Lunatotriquetral joint and scapholunate joint. The radial styloid was stabilized with two 1.2mm K-wires under image intensifier [fig 6,7].

Figure 6 : Radial styloid fixed with two k-wires and the lunate is fixed inplace with scapholunate and lunotriquetral k-wires

Figure 7: lateral view shows reduced lunate, extended scaphoid with well-maintained SL angle and CL angle

The remnants of dorsal scapholunate ligament were repaired in double breast method and augmented with radially based dorsal capsular flap with nonabsorbable sutures. The capsule was repaired with absorbable sutures. The extensor tendons were replaced back into compartments and the extensor retinaculum repair was performed by loosely repairing the z lengthened flaps. The wound was closed under drain and protected for 4 weeks with a below elbow slab.

Limb elevation and Aggressive active finger movements were initiated on day 1 post op.K-wires were removed after 4 weeks and Wrist tenodesis movements were initiated with removable thermoplastic splint for 8 weeks. Gradual strengthening and training was done till 12 weeks post op.

Patient atthe end of 3 moths post op had minimal pain with restricted range of movements as compared to the opposite as compared to opposite side with restriction of 20 degrees of flexion and 30 degrees of extension. The pronation was full but there was 10 degrees restriction of supination. The radial and ulnar deviations were full and free. At the

end of 3 months he was able to perform all his duties and activities of daily living with minimal difficulty.

Discussion :

Estimate 2.5% emergency department visits are of wrist fractures, of these about 10% are Perilunate dislocations and fracture dislocations [2]. The diagnosis of Perilunate and lunate dislocations is missed initially in up to 25% cases and the resultant delay of treatment adversely affects the final clinical outcome [8]. The long term outcome can be poor because of damage to the ligaments and architecture of the carpus. With prompt recognition and intervention, however the incidence of permanent disability may be reduced and patient may attain near normal hand functions.

Attentive physical examination of wrist joints especially of unconscious and polytrauma patients is the key to avoid missing such a grave but often missed injuries. Mere x-rays may not yield the diagnosis. Getting true PA view, ulnar deviation view, true lateral view and pronated and supinated views is at most important. When in doubt it is often preferable to get CT scan of wrist joint with 3-D reconstruction helps in planning of the intervention. Subtle scaphoid fractures or ligament injuries are better reported in a MRI scan

On a plain PA radiograph marking of gilula's lines, subtle overlap of carpals,signet ring sign of flexed scaphoid, and shape of lunate may guide in looking for subluxation[5]. The lateral view will show dislocation of capitate of the lunate distal articular surface, the capitate sitting in the cup of lunate fossa of radius, marking of scapholunate and lunotriquetral angles are very helpful to define the deformity.

The wrist is an inherently stable joint and rarely dislocates. The stability is provided by several ligaments, carpal contour, and the musculotendenous units surrounding the wrist joint.

Perilunate fracture dislocations and lunate dislocations are rare carpal injuries of which trans-scaphoid fracture dislocation is the commonest [3]. Rare injury patterns have been reported but the least common appear to be dorsal dislocation of lunate with palmar dislocation of rest of the carpals. To our knowledge till date there are 6 reports of such injuries with only one report of trans-styloid dorsal dislocation of lunate.

The lunate dislocation has been well described in the volar direction as a part of Perilunate dislocation and Perilunate fracture dislocation. This set pattern of dislocation happens as described by Mayfield in his classical work on sequential failure of ligaments stabilizing the lunate. This pattern happens because the entire distal carpal row biomechanically acts a single unit and has minimal intercarpal movement. The distal scaphoid is tightly attached to this distal row through STT ligament and thus moving with distal carpal row, while on ulnar of scaphoid the lunate is tightly attached to the volar rim of distal radius through short radio lunate ligament which is the strongest ligament of the wrist and the last one to fail, resulting in volar subluxation of lunate.

The classical Mayfield's [1] description of sequential failure of ligaments around the lunate has been over simplified into four stages of increasing ligament injury. The sequence starts with abnormal hyperextension forces acting on the wrist joint. As already described the distal carpal row which has minimal intercarpal movement moves as a single unit and tightly attached to the distal scaphoid with STT ligament leading to abnormal strain on the SL introsseous ligament as the lunate is tightly attached to the volar rim of distal radius. The SL Ligament starts to fail from volar to dorsal direction in stage 1. Stage 2 involves injury to the capitoluante ligament leading to dorsal displacement of entire distal carpal row also known as the classical Perilunate dislocation. The 3rd stage happens with increasing forces leading to further failure of lunotriquetral ligament. Last but not the least the dorsal flimsy radiolunate ligament fails leading to almost free to move lunate except theshort radiolunate ligament remaining attached to the lunate. The push from dorsally dislocated distal carpal row which tries to occupy the lunate fossa leads to the final 4th stage of lunate dislocation through the volar "space of Poirier" to lie in the distal forearm which may cause median nerve compression.

Lunate to dislocate dorsally cannot be explained by this said pattern of sequential injury of ligaments as we know the robust ligaments and the bone contour of carpal bones leads to either dislocation of lunate volarly or fracture the scaphoid depending on the integrity of scapholunate ligament.

There is only one other report in

English literature of isolated dorsal dislocation of lunate with trans-styloid fracture radius. Bjerregaard et al describe a case of radial styloid fracture with associated dorsal dislocation of the lunate in a lorry driver who collided with a train[7]. Seidenstein reported a patient who fell from a truck with a forced hyper flexion injury as he fell, resulting in 75% subluxation of the lunate; a delay in diagnosis necessitated excision of the lunate [6]. Sarkar and Siddiqui reported a single case of isolated dorsal dislocation of lunate without any other carpal injury, due to low energy trauma which was reduced closed and stabilized with single k- wire placed dorsally. They achieved good results with closed reduction and early mobilization [4].

Perilunate dislocations are treated closed in emergency if there is no other associated life threatening conditions. Under anesthesia closed reduction is attempted to decompress the median nerve at earliest using “Travernier’s method”. A failed closed reduction warrants an open reduction, K-wire stabilization, and repair of the disrupted scapholunate ligament. Closed reduction and immobilization for 12 weeks should be continued only when medical reasons contraindicate surgical intervention. Post reduction radiographs are imperative to see the very “critical relationship” between capitate and lunate and the position of scaphoid. The scapholunate angle greater than 80 degrees and SL gap greater than 3mm have been shown to indicate a poor prognosis if not corrected. Once confirmed then percutaneous divergent k-wires are placed across Scapholunate and lunotriquetral joints. Cast and k-wires and cast are retained for a period of 8 weeks.

Herzberg and colleagues in their multi-centric study showed significant better results of open reduction, ligament repair, and k- wire fixation than other alternative methods of treatment[7]. Generally, open reduction of carpal dislocation achieves better results than closed treatment because it allows (a)complete recognition of all bone and soft tissue injury(b)removal of interposed soft tissue(c)assessment of chondral fractures and its management(d)an accurate reduction can be achieved (e)suture repair of repairable ligaments. More and more surgeons prefer open dual volar and dorsal approach to repair the dorsal scapholunate ligament and palmar lunotriquetral ligament [9].

Most patients have some permanent limitation of motion, and several months of rehabilitation are required to regain function. Return to heavy labour is rarely possible before 6 months more commonly up to 12 months.

Conclusion:

Lunate dislocation and Perilunate dislocation are very rare and high-energy injury. A large percentage of this carpal lesion is often missed out at the initial evaluation of the patient. Missing or improperly treating these injuries leads to serious morbidity and loss of function. Therefore, good functional outcomes can be achieved following early recognition of injury, repair of ligaments and capsule, and restoration of carpal alignment.

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Hand injury : Radial Collateral ligament avulsion fracture at proximal phalanx base fixed with ethibond and endobutton with metacarpal fracture fixed with k wire

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Abstract :

We report a 25 year old female housekeeping staff who presented to us with pain, swelling and deformity left middle finger following fall. She was found to have RCL avulsion fracture of proximal phalanx along with a 4th metacarpal fracture. Avulsion fracture was fixed with ethibond and endobutton on skin . Metacarpal fracture fixed with k wire. She revovered completely with full function at 2 months and resumed to work at 3 months.

Case Report :

A 25 year old female who is a housekeeping staff at our hospital presented to the ER with pain , swelling and deformity of left middle finger following a fall. She sustained the fall on outstretched hand due to slip on floor and had impact on the middle finger too. On presentation we noted diffuse swelling of the entire hand and ulnar deviation of the middle finger. Xrays of the hand were ordered and an avulsion fragment at the base of proximal phalanx of the middle finger noted along with ulnar subluxation of proximal phalanx over metacarpal head and also a spiral fracture 4th metatarsal.

A diagnosis of LCL avulsion was made. Patient was counselled for the attempt at closed manipulation and if failed an open reduction procedure. An attempt at manipulation was done. Neither reduction nor a stable joint could be achieved and hence decision to do an open reduction made.

Patient was taken up for surgery the immediate following day. Initially we fixed the 4th metacarpal fracture with k wire as we thought this would allow us to freely

manipulate the 4th digit during fixation of LCL avulsion of 3rd finger. A dorsoradial approach was used and extensor hood was split. Capsule was found torn and avulsion fragment was identified. The fragment was rotated. Fracture site irrigated . No 2 ethibond bites were taken on the fragment at osseoligamentous junction. Traversing holes for the sutures were made with k wires and exited from the skin on ulnar side. Sutures brought out onto the ulnar side and tied over an endobutton over the skin. Checked for alignment, stability and block. The joint was congruent, stable and no block noted. Capsule and tendon repaired . Skin sutured with 3-0 ethilon. Immobilisation done with a volar slab in 30 degrees flexion for MCP joints. Buddy strapping was done . IP joint movements were initiated. Immobilisation continued for 4 weeks . ROM exercises started after 4 weeks. Strengthening exercises started after 8 weeks. At the end of 3 months patient was able to resume her normal duties and was absolutely pain free and had no instability .

Pre and post operative radiographs

Per Operative Image

3 months follow up

Discussion :

The ultimate aim in treating any fracture in the hand is to restore full function. To achieve this we need good healing, neutralisation of deforming forces with proper fixation and timely rehabilitation. The difficulty however for some injuries lies in the fact that no single method yields consistent results in different set ups, and, the methods are not without complications. However, a thorough knowledge of Anatomy, biomechanics, concepts on treatment of hand injuries and basic orthopaedic surgical principles should help us achieve the aim without having serious complications.

Collateral ligament injuries are common in the thumb. The incidence of finger Collateral ligament injuries is approximately 1 in 1000 hand injuries. When they occur these injuries cause significant clinical and functional disability and hence warrant prompt treatment. Radial sided injuries are common in ring and little finger whereas ulnar sided injuries are common in index finger. In middle finger incidence is almost equal.

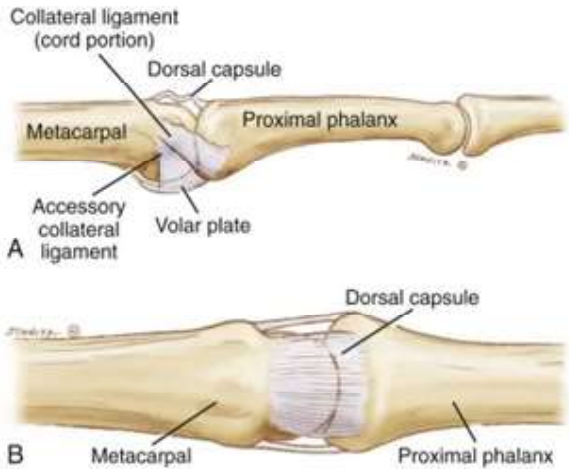
Anatomy :

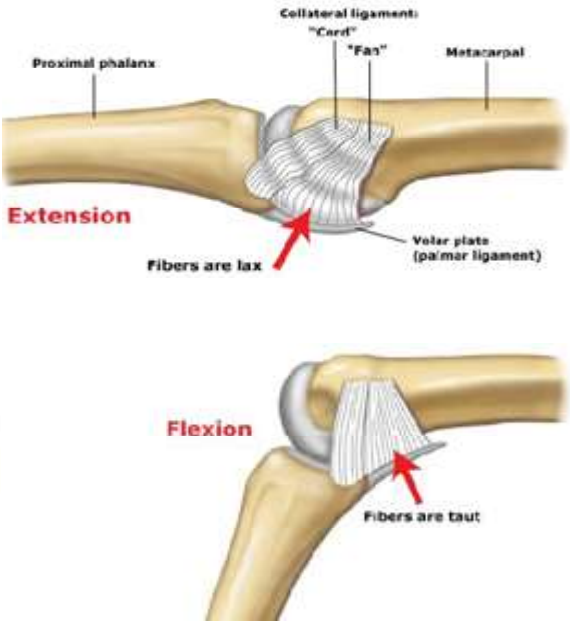
The finger MCP joints are complex condylar joints with motion in multiple

planes. Stability is conferred by the articulating surfaces, ligaments, the capsule (Static Stabilisers), the intrinsic and extrinsic muscles (dynamic stabilisers) . The Normal ROM at MCP joins is flexion around 90deg; Extension of 20-30 deg; Abduction and Adduction of 10-40 deg(Depending on the finger). Rotation also occurs during flexion .

The articular surface of metacarpal head is convex and elliptical with a variable radius of curvature in the midsagittal plane . The base of phalanx is concave, shallow and round to conform to the various segments of articulation. The glenoid cavity is oblong with the lowest diameter in transverse plane. The geometric centre of rotation of MCP joint is multiaxial and becomes more palmar with flexion. The phalanx base cover the metacarpal head in transverse plane but only a third in the sagittal plane at any point during flexion and extension. Volar plate augments this coverage during flexion.

There are two collateral ligaments proper(pCL) and accessory(aCL) collateral ligaments . Together they are fan shaped . The pCL originate from the radial and ulnar tuberosities of the metacarpal head and insert to the palmar proximal base of proximal phalanx. The aCl originate just solar to pCl and insert onto the lateral side of Volar plate. The pCL is taunt in flexion and lax in extension and the aCl behaves in reciprocating fashion.





Injury :

The Mechanism is usually a sideways directing force with finger in flexion . Depending on the direction either the ulnar or radial ligaments are torn. They can be classified in lines with other ligament injuries :

Grade 1- sprain

Grade 2- partial rupture with a firm end feel

Grade 3 - total rupture with an avulsed fragment

The classical symptoms include Pain, swelling, ecchymosis and an obvious deformity (in total ruptures). A displaced avulsed bony fragment on the X-rays may act as a sentinel to the lesion. Radiographic views of routine AP and lateral may sometimes not show the avulsed fragment, and in such cases a Brewerton oblique view may help.. Clinical stress testing may be done under local anaesthesia with MCP joint in flexion and extension which would reveal the instability. Investigations like orthography and MRI are not indicated for fresh cases.

Treatment :

Partial ruptures usually can be managed conservatively by buddy strapping and volar splint for 2 weeks as the joint is stable. This followed by progressive rehabilitation is all that is necessary for a normal outcome in most of these cases.

Total ruptures with avulsed fractures have been treated with multiple methods like : K wires, Suture anchors, TBW, screw fixation, wire suture technique and few others. Every method has pros and cons. While using k wires which is a simpler tool , we need fine wires or else there is a risk of total separation of fragment from the ligament or fragmentation . Also when used alone, there is possibility of loosening ,migration and inadequate compression. Another technique, the wire suture technique popularised by Lister has the advantage of a much secure fixation whereas it runs

the risk of untying of the knot or breakage. Mini screws are being widely used by hand surgeons but require more expertise and also has the risk of fragmentation if fracture is a small fragment or multiple attempts are made.

Halil Bekler et.al used a modification of wire suture technique where k wire is used to fix the fragment and an SS wire is brought out onto the skin under tension and tied over an endobutton on the skin. The disadvantages being an implant continuing outside the skin and pressure problems of skin because of the endobutton and knot.

After going through all the above methods and considering our logistics we have used fixation similar in concept to Halil Beker et.al technique , but, we have avoided k wire and also used ethibond in place of SS wire. We wanted to avoid any further fragmentation as we noticed undisplaced fragmentation per operatively. We secured the fragment with ethibond from collateral ligament and made portals from distal fragment to outside the skin. We used a needle to bring out the ethibond and tied it over an endobutton. Stress testing showed a stable joint. We could achieve a normal function by 3 months and we did not encounter any complication.

We consider this to be a reproducible technique even by any general orthopaedic surgeon.

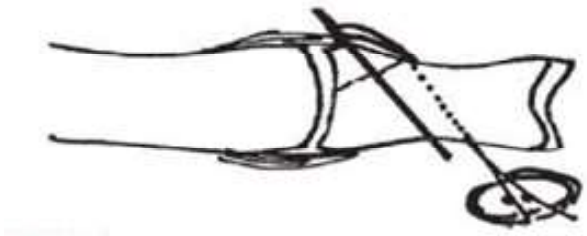


Fig.technique as suggested by Halil Bekler et.al

Conclusion :

Collateral ligament ruptures especially the total ruptures with avulsed fragments need operative repair for achieving a good functional outcome. Combination with a metacarpal fracture is somewhat rare. Our technique was easy and we did not face any per operative difficulties. Rehabilitation is a key factor too. By the end of 3 months with progressive rehabilitation we could achieve a full normal function

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Abbreviations :

1. LCL - Lateral collateral ligament

2. pCL - Proper collateral ligament

3. aCL - Accessory collateral ligament

UCL Repair by Internal brace/ Ligament Augmentation

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Case report :

A 30 year old patient presented with persistent left elbow pain since the last 1 year. He injured his elbow in the gym. He was diagnosed as golfers elbow and treated with rest, analgesics, activity modification, brace and local steroid injection with little relief.

He had MRI scan done which showed high grade rupture of the anterior band of his Ulnar collateral ligament in the left elbow.

Clinically, he had minimal tenderness over the common flexor origin. Milking maneuver test was positive for Anterior band of UCL injury.

As the patient was young, active and quite keen to go back to his activities in the gym, we opted for Ulnar collateral ligament repair.

After informed consent, we did the surgery in supine position and arm support under tourniquet control. We used a medial incision and gentle dissection upto the UCL by elevating the common flexor origin. We preserved both the ulnar and medial antebrachial cutaneous nerves. We found a high grade near complete rupture of the anterior band of UCL.

We used 2 Swive Lock anchors (one inserted in the medial epicondyle and other in the sublime tubercle) with a Fibertape acting as an internal brace/ ligament augmentation. We a used Fiberwire to repair the remaining ligament.

We also debrided and excised some of the inflamed tissue in his common flexor/ pronator group attachment near the medial epicondyle.

Discussion :

Normally, for UCL reconstruction, Palmaris longus autograft is taken. But that involves 2 more incisions in the forearm and associated morbidity.

We opted for the new Internal brace/ ligament augmentation system so that we can repair the remaining ligament and also use the Fibertape as an internal brace.

Patient is presently 5 weeks post op.

Patient was kept in above elbow back slab for the first 2 weeks. His sutures were removed at that stage. He was allowed ROM from 30-90 degrees in the next 2 weeks. Since 1 week, he has been unlocked for full ROM in the brace. After 1 week, his brace will removed and he will be gradually mobilised under physio supervision.

Conclusion:

With this innovative approach of internal brace/ ligament reconstruction, we can improve both his pain and elbow function significantly which is unlikely to happen with continued conservative treatment. It also avoids the need of autograft and associated comorbidity.

OPEN INJURIES WITH BONE LOSS- MASQUELET TECHNIQUE

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NRI Medical College

Compound injuries with bone loss are more challenging to the surgeon as they are prone for infection due to poor vascularity and soft tissue cover. Different methods of management have been like autologous vascularized fibular graft, bone lengthening with ilizarov or limb reconstructive system and osteomyocutenous flap. All the above mentioned techniques require high learning skill or specialized training. A simple alternative is masquelet technique based on principle of tissue memory producing periosteium like membrane which is highly vascular and has osteogenic potential. Masquelet technique is two staged procedure.

Stage 1 :

Thorough debridement and antibiotic cement spacer (2gmvancomycin+500mg gentamycin in 40 grams bone cement) placed in the gap. Soft tissue cover as required (flap/split skin grafting) and Temporary fixation of the bone (either external fixator/plate or nail).

After four to six weeks

Stage 2 :

Antibiotic spacer removal followed by debridement of bony edges without much disturbance to induced membrane .Harvested morcillized bone grafting either from iliac crest or reamer-irrigator-aspirator is placed in the biological chamber. Definitive fixation is done with either plate/nail/ external fixator.

Case report :

55 years old farmer presented with alleged history of farm yard injury with a diagnosis of compound

grade IIIb fracture of left distal femur with bone loss and contamination (figure 1 and 2). Patient presented to emergency department within an hour. After initial hematological, radiological investigations,

Figure 1:
Clinical Photograph of wound

Figure 2:
Pre Operative X-ray

Figure 3 :
Clinical Photograph after debridement

and culture sensitivity swabs were taken through before wound lavage with normal saline was given (figure3). Initial debridement and antibiotic

coated cement spacer (3grams vancomycyin in 500milligrams gentamycin in 40 grams poly methyl methacrylate ,bone fixation with distal femur locking compression plate and quadriceps tendon repair was done within six hours (figure 4).Regular wound care with physiotherapy was started from first post-operative day with strict non-weight bearing on operated limb. Later culture-sensitivity report

revealed no organism. Patient was discharged on the 10th post-operative day after suture removal.

After six weeks antibiotic spacer was removed without disturbing the induced membrane (figure5).

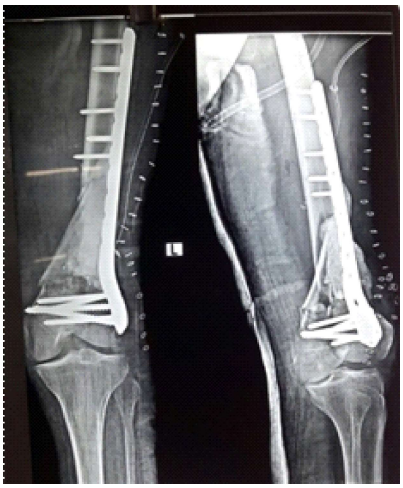

Figure 4: post operative x-ray with cement spacer

Figure5 : Clinical Photograph with spacer removed showing induced membrane

Figure 6: clinical photograph with spacer removed showing induced membrane long with morcilized graft

Debridement of bony edges was done till fresh bleeding and morcellised bone graft harvested from iliac crest placed in the defect (figure6). Tight seal closure of membrane was done and wound closure was done in layers.

Regular wound care with physiotherapy started from first post-operative day with strict non-weight bearing on operated limb. Later culture-sensitivity report revealed no

organism. Patient was discharged on the 10th post-operative day after suture removal. Partial weight bearing was started at 6weeks (figure7) and complete weight bearing was done after

Figure 7: post op x-ray showing graft

confirmation of both clinical and radiological union at 4 months. Patient obtained complete range of motion with five degrees extension lag due to quadriceps injury (figure9 and10). Patient started his farming activity after 6months. At two years follow up he did not have any complaints or signs of infection.

Figure 8: Range of movements

Discussion :

Masquelet technique is usually used in segmental bone defects, infected non-unions and tumour excision.. It has the advantage of being simple, but requires careful execution. The two-stage procedure is done with a first step of control of infection and soft tissue support and at a second stage, reconstructive procedures are done to achieve union. Literature supports treating defect of 15-20 cm using this technique.. In present case defect is 9cm. Choice of graft are from iliac crest In this case morselized cancellous autograft was taken from iliac crest. Addition of an allograft or xenograft

Figure 9 : showing fracture consolidation

does not affect the delay to or the mechanical quality of union, as long as the ratio is not greater than The ideal ratio of grafts is 1:1.. Graft used in our case is allograft and we didn't add any allo or xenograft or bone substituting substances in our case. Choice of implant is external fixator and in second stage is intra or extra medullary device. In our case we used plate since the wound was clean after wound debridement and it would aid in alignment and stability.

Induced membrane produced by acrylic cement has unique properties compared to other methods,

It is rich in osteoinductive factors like BMP2 with highly vascular qualities. We have used dual antibiotics (vancomycin and gentamycin) in our case because of their synergistic effect.

Most common complication in literature is recurrence of infection, implant failure and stress fracture. In our case there was no complication until 3years follow up. Patient was able to attend to is regular activities within 6 months.

Conclusion :

The induced membrane technique is a valid option for the management of bone defects after debridement. It is a simple and straightforward procedure. Careful and regular follow up required.

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Reconstruction of Proximal Femur GCT with THR and Ilizarov

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This case was performed at JIPMER, Puducherry during post graduate training of Dr Srinivas B S Kambhampati & Dr Jagdish Menon and discusses options at that time due to constraints in implant availability and is presented here mainly for the principles involved in the treatment.

Abstract :

35 year old lady with a Giant Cell Tumour (GCT) of the greater trochanter extending into the femoral neck complicated by a pathological fracture of the neck of the femur was treated by wide excision of the tumour and Total Hip Replacement (THR) with a Charnley CDH prosthesis followed by Ilizarov fixation of the lower femur to correct the resulting deformities. Follow up after 4 years showed no evidence of recurrence of tumour, a stable hip joint and good range of movement of the hip. With the advent and easy availability of custom-made prosthesis, this technique may rarely be required now. It was done at a time when custom implants were not readily available and were very expensive.

Keywords: Giant Cell Tumour, Osteoclastoma, Greater trochanter, pathological fracture,joint salvage, hip replacement, Ilizarov fixation

Introduction :

The incidence of proximal femoral GCT is reportedly 3-4%[1–3]. More than half

will affect the bones around the knee joint and 56-80% occur in those aged 20-40years[4]. The treatment of giant cell tumour traditionally has been intralesional excision, curettage and autograft reconstruction by packing the cavity after excision with morcellised iliac cortical and cancellous bone grafts. This type of excision however will leave behind microscopic disease leading to high rates of recurrences. Recurrence rates vary from 27%[5] to 50%[5]with only simple curettage. Removal of this microscopic disease by wider excision poses considerable challenges in the reconstruction of the adjacent joint. We report a rare case of GCT of proximal femur treated by THR followed by Ilizarov fixation to correct resulting deformities.

Case Report :

A 35 year old lady presented in our outpatient department with a tender expansile swelling over the greater trochanteric region of L thigh of 3 months duration and inability to walk following an insignificant fall prior to presentation. A plain x ray of pelvis with both hips revealed an expansile lytic lesion in greater trochanter of L femur with a pathological fracture of the neck of femur. It shows a classical soap bubble appearance suggestive of Giant Cell Tumour of Campanacci grade III (Fig1).

Fig. 1: AP radiograph of pelvis shows expansile lytic lesion of greater trochanter with pathological fracture of neck of femur

The most suitable procedure for this case would be resection of the tumour and replacement with an endoprosthesis. But due to economic constraints and non availability of funds, it could not be carried out. So we planned to do a wide resection of the tumour and replace the proximal femur with a Charnley type Total Hip Replacement. We planned to correct the resulting shortening after resection by lengthening the femur. After resection and Total Hip Replacement, it was found that the hip joint was unstable and dislocated due to bulky soft tissues (Fig2) and the femur was short by 11 cms.

Fig2 : Post THR radiograph shows a dislocated THR due to bulky soft tissues

The problems after the first procedure were 1.The limb was externally rotated 2.dislocated hip joint 3.shortening of 11 cms. The hip joint was found to be reduced and stable in a position 30° abduction and 20° internal rotation.

We addressed these problems in a second sitting after the soft tissues healed by applying an Ilizarov fixator to the distal femur. An osteotomy was performed at the distal femoral metaphysis, the distal fragment was derotated 20° externally to correct rotation deformity and fixed to the proximal fragment in the fixator. Distraction at the osteotomy site was initiated from 9th postoperative day at a rate of 1mm/day in 4 divided intervals.

By the end of 2 weeks of distraction, the head of femur was reduced into the acetabular socket and stable in all directions except abduction. So a varus angulation was created during distraction at the distal femur.

At 3 months following fixator, varus angulation can be seen and the regenerate forming with final length almost achieved (Fig. 3a,b,c). Distraction was stopped at 4 months. Radiograph at 6 months showed good regenerate in consolidation phase and knee joint line parallel to ground.

At 1 year 3 months following THR, fixator was removed. Regenerate had consolidated and a varus angulation of 20° achieved. Final follow up x ray at 4 years (Fig.4) showed stable and reduced hip joint, with a stable prosthesis and no evidence of recurrence. She was full weight bearing without any aids. All her deformities were fully corrected except the shortening. She had a limb length discrepancy of 2 cms (a total of 9cms lengthening was achieved) for which a shoe raise was given (Fig 5).

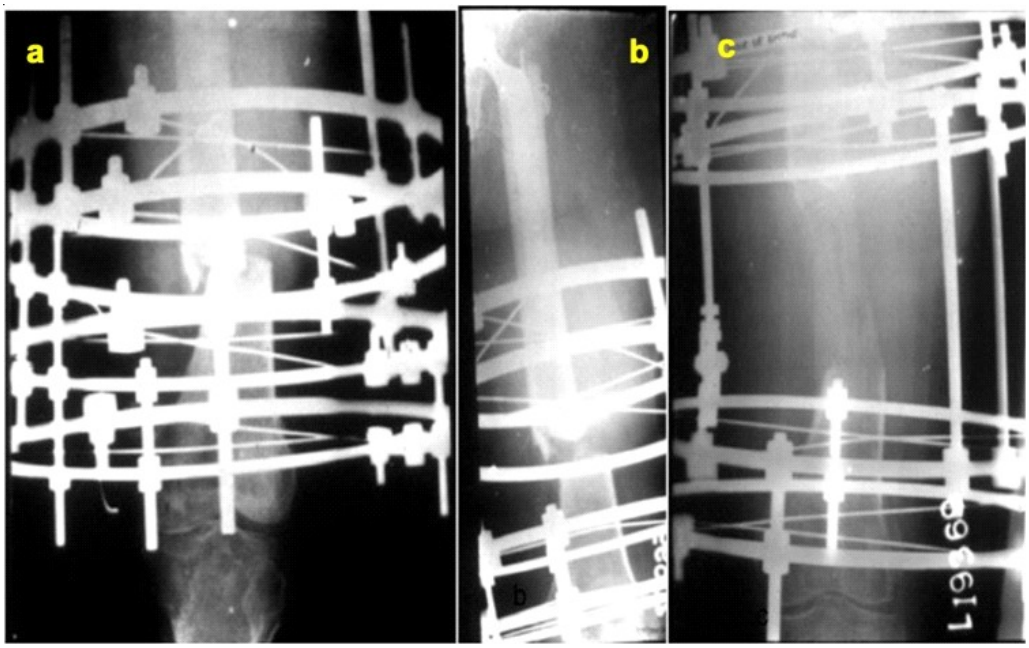

Fig3 : Radiograph of distal femur after Ilizarov Fixation and osteotomy
a) at osteotomy and rotatory correction, b) partial lengthening done
c) after full lengthening and varus correction 6 months after procedure

Fig4: Radiographs after removal of fixator. a: Hip stabilized b: AP radiograph of distal femur shows consolidated regenerate c: lateral radiograph of distal femur

Fig 5 : Final clinical picture showing oblique pin scars of lengthening and rotation and a shoe raise. She was independently mobile.

Discussion :

Surgical excision is the treatment of choice for GCT. There has been a lot of research in extending the margin of excision of GCT by physical or chemical agents in order to preserve the adjacent joint. Physical agents are wider excision, cold or heat application with liquid nitrogen, methylmethacrylate (bone cement) or carbon dioxide laser. Chemical agents include weak solution of phenol.

Marginal and wide excisions are associated with reconstructive and disability challenges since the tumour is located in the epiphyses.

The main considerations for reconstruction are: 1. Resection of tumour with a margin sufficient to prevent recurrence. 2. Maintaining stability of the hip joint to preserve useful function. The different options for hip reconstruction are: 1.Endoprosthetic replacement, 2.Osteoarticular allografts, 3. Alloprosthetic composites, (Fig 6) 4.Resection arthroplasty, 5.Arthrodesis and 6.Rotationplasty.[6] Hip arthrodesis and rotationplasty are too radical for GCT and are reserved for more malignant types and troublesome recurrences.

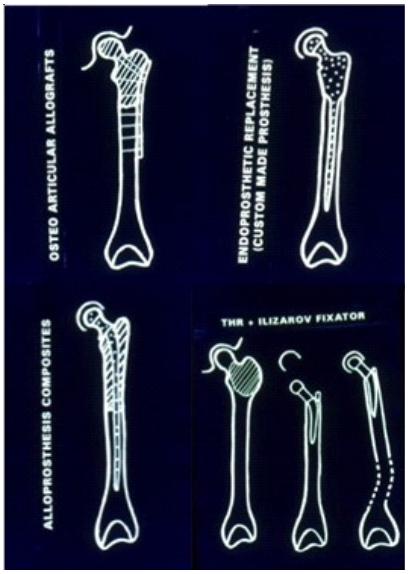

Fig 6: Options for treating GCT of proximal femur and outline of our treatment. Other procedures are expensive or unavailable.

Endoprosthetic replacement with or without CAD/ CAM prosthesis is the most widely practised. It allows rapid return to maximal function, provides immediate stability and tumour can be excised with a wide margin. A modular prosthesis can be used to reduce inventory.

Other methods used to treat in literature are excision and reconstruction with DHS and valgus osteotomy[7], Total Hip Replacement[8], custom made prosthesis, allograft reconstruction and alloprosthesis composites. There were no reports of management of proximal femoral tumours using distraction osteosynthesis. Systemic therapy using Denosumab, Bisphosphonates and TNF-a inhibitors have also been employed.

The principles of distraction osteosynthesis were laid down by Gavril Abramovich Ilizarov[9]. The advantages of this technique are:

o It is relatively semi invasive technique compared to custom made prosthetic replacement.

● All deformities of the lower limb can be corrected simultaneously.

● The Ilizarov fixator is versatile, can be constructed from pre-existing components and can be changed during correction according to the existing needs.

Pitfalls with the use of Ilizarov fixator are:

● Neurovascular injury

● Adjacent joint contractures due to stretching of the muscles.

● Use of the fixator time consuming and needs skill and experience.

● Compliant patient who needs to tolerate the fixator for prolonged periods of time and associated fixator care.

Conclusion :

Our procedure is a viable alternative to expensive treatment methods like custom made prosthetic replacements and offers a chance for further correction of deformities following these procedures should the necessity arise after such procedures.

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Limb Salvage after complete loss of distal femur following an infected fracture using the Ilizarov principles

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Introduction :

Open distal femur fractures are among the dreaded injuries we encounter in our trauma practice. Despite the advanced implants and techniques that we may have used, we sometimes end up in a situation where an amputation would seem imminent. We wish to share our experience in treating one of these fractures where we were able to salvage the limb from a situation where there was complete loss of the distal femur.

Case Report :

A 32 year old man was injured in a road traffic accident, while he was travelling on a two wheeler. He sustained fractures of the distal femur - AO 33-C3, the ankle, and of both the bones of the forearm all on the right side. (Figure1) His blood sugars were found to be higher during the pre-operative check. An initial plan was made to internally fix all the fractures in the same operative sitting. The forearm bones and the ankle were fixed internally. The distal femur was exposed and a failed attempt was made to fix the fracture with internal fixation, following which, articular fixation was done with K wires and a joint spanning

Fig. 1

external fixator was applied as a temporary measure (Figure 2). However the wound healing did not progress as expected and there was purulent


Fig. 2

discharge by the 9th day, despite administration of IV antibiotics. The wound was debrided twice and the necrotic free bone fragments were removed in order not to leave any avascular bone. Despite these attempts, the infection did not settle and only a small articular piece of the distal femur was left with. At that stage the entire distal femur was removed and an antibiotic cement spacer was placed with the hope that this would eradicate the infection and pave the way for later reconstruction with some sort of tumour prosthesis. However the infection continued unabated (Figure 3A - 3C).

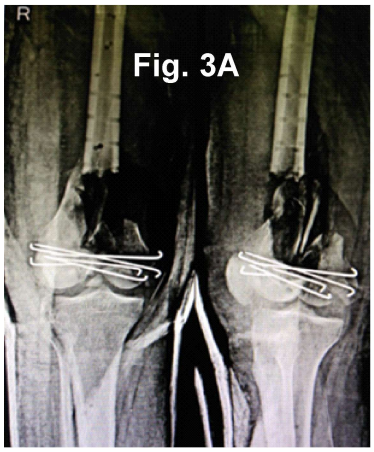
Fig. 3A

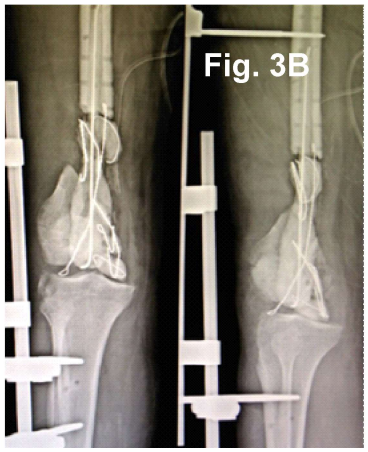
Fig. 3B

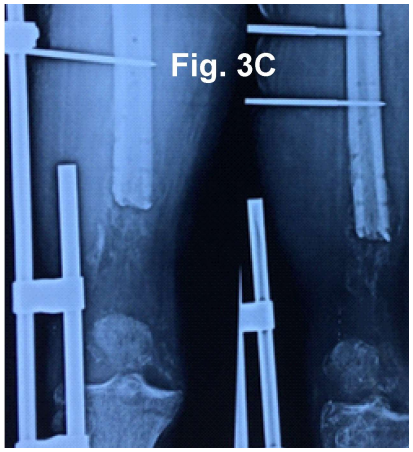
Fig. 3C

Left with complete loss of the distal femur, in a compromised soft tissue and with glaring infection we seemed to run out of options to provide a functional limb with knee movement, to this patient. We did search for and discussed the options available with multiple colleagues. Complete distal femoral prosthetic replacement was considered but the idea was dropped due to the obvious infection. An above the knee amputation was suggested as an option for the patient at this stage. This would entail a single procedure and a foreseeable path to

regain mobility with a good prosthesis. The dwindling financial and family support, and the psychological condition of the patient who was bed ridden for a long time were also taken into consideration. However the patient was reluctant to accept the prospect of being with a single leg for the rest of his life. So a decision was made to salvage the limb, by fusing the remaining distal femur to the proximal tibia to get stability and to lengthen the remaining bones to correct the shortening.

The patient was operated under combined spinal and epidural anaesthesia, on a radiolucent table in supine position with a rolled sheet under the ipsilateral greater trochanter, with image intensifier guidance. The wound at the distal femur was debrided, the distal femur shaft was freshened, and the

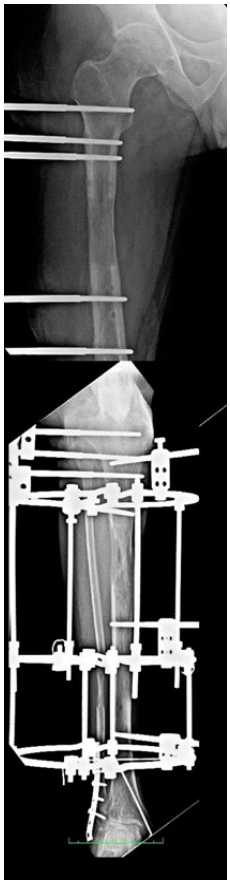

Figure 4
(Immediate Post Op)

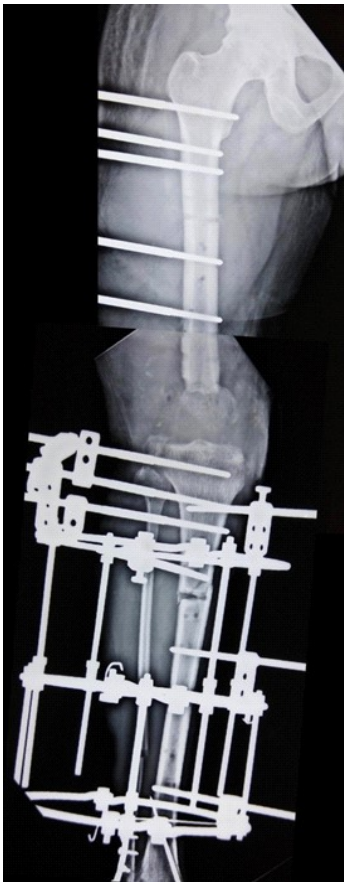

Figure 5
(During Consolidation)

Figure 6

remaining articular cartilage on the proximal tibia was excised. A rail fixator (Pitkar) was used to fix the femur and the proximal tibia using threaded half pins with tapered ends. Three pins were used in the proximal femur starting from the lesser trochanter downwards, but proximal to the intended level of the subtrochanteric osteotomy for lengthening. Two pins were used for fixation in the shaft of the femur. Three pions were used in the proximal tibia, taking care to maintain about 10 degree of flexion at the arthrodesis site.Care was taken while applying the pins so that the rail will be parallel to the mechanical axis of the femur to ensure that the lengthening would occur along the mechanical axis. All the above three pin clusters were attached to a rail with three carriers and compression distraction units mounted in between each of them. A percutaneous corticotomy was done in the sub trochanteric area in between the proximal two pin clusters, using the multiple drill hole technique. The gap of about 14 cm in between the remaining femur shaft and the proximal tibia was shortened only partially for fear of nerve palsy and wound dehiscence.

A three ringed Ilizarov frame was applied to the tibia with the proximal ring attached to the already placed half pins in the proximal tibia. A percutaneous corticitomy was performed in the proximal tibia using the multiple drill hole technique. (Figure 4 and 6)

Post- operatively, the wound on the distal femur healed well, and bone was moved as follows- the gap between the distal femur and the proximal end of tibia was compressed at the rate of about 5 to 10 mm per day depending on the soft tissue condition, the proximal femur corticotomy was distracted at the rate of 1 mm per day, the proximal tibia corticotomy was distracted at the rate of 0.75 mm per day. Both the distractions were started after the fifth post operative day and the compression was started immediately after the surgery, and all of these progressed simultaneously.

The docking of the femur shaft and the proximal tibia was uneventful, and once docked, this site was maintained under compression to allow for bony fusion. The whole limb was thus shortened as the distraction in the femur and the tibia continued at a slower pace. The patient was mobilised with a walker to walk and was discharged home, with instructions to continue the distraction.

The wound in the distal thigh and the pin sites healed well and the patient was encouraged to take bath with soap and water regularly and to clean the pin sites by himself. He was given daily calcium and vitamin D supplements, antibiotics were used in short courses only when there was pin site pain and discharge, and pain medication (Tramadol and Paracetamol) was used as and when required. NSAIDS were avoided for fear of delayed ossification of the regenerate.

Signs of healing at the site of arthrodesis were seen on serial imaging, while lengthening was progressing well and calcification noted in both the sites of the regenerate. However the patient has turned hostile in the mean time and was demanding removal of the fixator and amputation. In view of the proximal femur corticotomy an amputation at this stage would he a high above knee and that would be a dicult proposition from a rehabilitation perspective. The patient was counselled for the same, and was encouraged to continue with the ongoing treatment. However to reduce the time of fixator use, further lengthening was stopped leaving the limb short by about 5 cm. The regenerate was about 5 cm in the femur and about 4 cm in the tibia at that stage. (Figure 5)

Further consolidation at the regenerate occurred slower due to the reluctance of the patient to walk which would load and stimulate faster ossification. At about 18 months time, the fixator was removed, after attaining a good consolidation of the bone at both the lengthened sites and the arthrodesis site. A knee ankle foot orthosis (KAFO- with limited ankle, fixed knee, ischial seat and shoe rise) was given to further protect the bone while the patient is walking. The patient has since returned albeit partially to his pre injury occupational status as a home tutor. He has also returned to community ambulation with the use of orthosis. (Figure 7)

Discussion :

Comminuted intra articular fractures are one of the most dicult to treat fractures. A complete work up which may include a CT scan can help understand the fracture pattern well and help in planning the approach, the implants to be kept ready and anticipate the intra op challenges. In a situation like this where there are multiple fractures, it may be a wise strategy to fix the fractures in separate sittings, so that enough time and concentration can be devoted for the dicult fractures. Good pre-operative planning will help reduce the time the wound is kept open during surgery, this in-tern reduces the risk of intra operative contamination, and subsequent wound infection.

Principles and techniques of Ilizarov using external fixation can come in as a handy tool to bail us out of dicult complicated trauma. In this present case, persistent Infection, loss of entire distal femur, poor soft tissue and host condition were the factors that were dicult to address. Amputation and prosthetic replacement seemed to be the only option to get the patient backs on his feet, but alike most of our patients, this was not accepted.

We have planned a two level lengthening in order to gain the large length of bone loss, and to reduce the amount of time spent in the fixator. A robust mono lateral rail type fixator was chosen for the femur to make it easier for the patient, while a regular Ilizarov ring fixator was chosen for the tibia. This also ensured a stable construct while allowing the arthrodesis to be achieved with about 10 degrees of flexion, and also ensured that the compression at the arthrodesis and the lengthening at the two corticotomies can be done independent of each other. We did the docking at the arthrodesis site at a faster pace- we call this sub-acute docking and it has the following advantages: 1. the dead space is obliterated sooner thus reducing the chance for infection, 2. the stability of the construct is enhanced when the bones are docked and in compression, this in turn reduces the stress on the construct and enhances the life of the pin bone interface, 3. the healing at the docking site can start as soon as the docking is complete thus reducing the overall time in fixator, 4. reduce the need for secondary procedures-the dead space that is left longer will get filled with fibrous tissue and this may entail a second

procedure to freshen the docking site and add bone graft, 5. Less risk of Neuro vascular and soft tissue problems as compared with acute docking.

In spite of the tri-focal osteosynthesis involving initial shortening and subsequent long lengthening- there were no neuro-vascular complications,, there were no wound healing issues, there was no long term requirement for IV antibiotics, and there was no need for any secondary procedures like bone grafting. However we have had issues with patient compliance in spite of the presumably exhaustive pre-op counselling, and we had to stop short of achieving the target of complete limb length equalisation. Even with this shortening, we consider the end result as acceptable given the fact that the patient is able to walk with a sensate and vascular lower limb with a shoe rise.

A Brain teasing deformity, How we got out of it?

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Introduction :

Rare problems needs high level of clinical skills for its evaluation and correction, one such problem is presented for its rarity and still more rarer correction strategies.

Case presentation :

In September 2006 a 13yr old girl was referred to us with the following description “having a very complicated deformity of left hip, left knee and left ankle along with severe shortening and a very interesting 180^0s torsional deformity just above her left knee”.

Available X ray was very deceptive, in AP view hip was looking like lateral, no knee joint line, fibula on medial side.

Clinical photos & x ray

There was no significant history of infection or trauma. No scars of healed sinuses. Fungal infection in the deep crease on lateral side of left thigh.

For evaluation of any lower limb deformity, it is customary to take full length standing X rays of both lower limbs from hip to heel in one shot centering on the knee. It was impossible in this case as

she could not stand on both limbs with patella forward.

As our conventional tools of investigations were of no help in deciphering the condition we had to fall back on our clinical skill and common sense to sort out the problem.

On detailed clinical evaluation we could locate the tiny patella, and attempted derotating the limb so as to get the patella facing the roof ie forward and knee axis parallel to the floor. It was amazing the whole deformity was transformed into pure genu valgus- Distal femoral valgus- of unusual magnitude.

We took X ray of the limb in that lying position and the deformity was calculated, Now we got her hip AP and knee AP in a single film. It was found to be having extreme distal femoral valgus.

It was interesting to note the natural compensation of this severe lower femoral valgus; she flexed her knee, to bring her foot on floor, this brought her heel forward. Combination of this severe valgus and flexion at knee mimicked like '180^0s torsion'. Residual apparent flexion deformity at the knee was compensated by hip flexion and overall shortening was compensated by the equinus at the ankle.

Planning :

Proximal and **distal** anatomical axes of the femur were drawn on the X ray. They were not meeting in the bone but at a point far lower down, off the limb. As we could not locate direct CORA, a middle line was drawn between these axes over the middle segment. Thus we got two resolution CORAs of Magnitude 65^0s and 105^0s, totaling 170^0s. And we planned two level corrections on this tiny femur. **As far as we know there is no report of such severe genu valgus deformity in the literature or its correction.**

Expected problems :

Soft tissues. IT band tightness, Vastus lateralis contractures, Chances of peroneal nerve palsy, vascular problems.

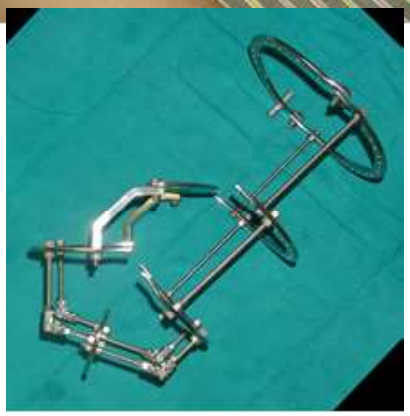
Hardware :

How to make preassembly for this deformity? How to control the three fragments by frames, Placement of hinges & placement of distracters?

Per operative :

How to place wires parallel to the knee in distal femur? How to do corticotomy at 2 levels, when we have no space on lateral side? Where will be position of neuro-vascular bundles in this deformed limb?

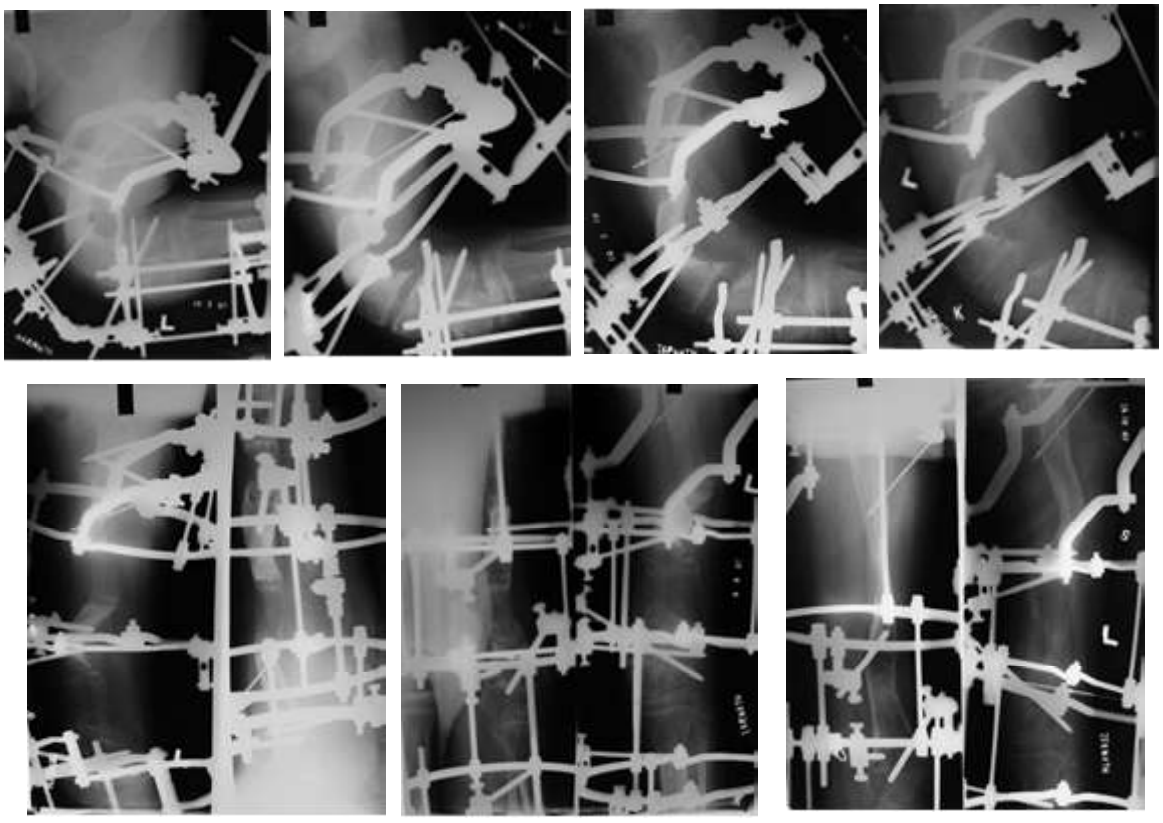
Procedure :



Her course of **femoral artery was identified by Doppler and marked**. To retain the marking during the surgery, that line was again marked with 'Henna'. It stayed for 2 weeks.

A complicated pre assembly was made, with options for future adjustments, additional pin/wire placements and additional rings.

We have planned IT band release through anterolateral approach and got ready to face peroneal nerve problem if in need later. Both corticotomies through medial approach, and pins on middle and distal femoral segments through medial side only as lateral entry was impossible. Additional pins & wires were planned as the fragments came out of the deformity. We expected no movement at the knee as we are planning for full correction of deformity and lengthening in one go (a sacrifice for correction).



Finally, we did it. Both corticotomies got opened out gradually. The frame modified as it came out of deformity. Additional wires were added as and when necessary.

At last we got the full correction of deformity and limb length disparity at the expense of knee movements; there was no peroneal nerve issues. Total fixator time was 11 months She happily walked there after. 2yrs after surgery, she has only 30^0s of knee movement.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TUMOUR INDUCED OSTEOMALACIA – A CASE REPORT

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Abstract :

Tumour induced osteomalacia (TIO) is a para neoplastic syndrome with very low occurance , typically presents in adulthood as bony and muscular pains, myopathy, multiple insufficiency fractures, loss of body mass and height[1].

Reaching the accurate diagnosis is difficult considering the non specificity of symptoms and its age of presentation. Diagnosis is possible only by clinical experience of physicians and battery of tests . Awareness of this diagnosis is of paramount importance to orthopaedic surgeons.

We present a case of 34 years old working male with phosphaturic tumour along the anteromedial aspect of left distal femur metaphysis. Enbloc excision of tumour along with periosteum and bone was done after which symptoms relieved completely and parameters returned to normal.

Key Words :

Tumour induced osteomalacia (TIO), Phosphaturic tumour, Enbloc Excision.

Introduction :

Tumour induced osteomalacia (TIO) is a para neoplastic syndrome with very low occurance , typically presents in adulthood as bony and muscular pains, myopathy, multiple insufficiency fractures, loss of body mass and height which is debilitating to the patient associated with low intake. It is usually associated with benign mesenchymal phosphtauric tumour[1,5] (mixed connective tissue variant) , which inherantly raises Fibroblast Growth Factor -23 (FGF-23)[2], leading to physiological disturbance of phosphate reabsorption in the proximal renal tubule causing increased urinary excretion of phosphorous (hyperphosphaturia) low serum levels of phosphorous (hypophosphatemia), low 1,25 Dihydroxy cholecalciferol[2], low normal levels of serum calcium (low Ca^{2+}), secondary or

tertiary hyperparathyroidism(normal to high PTH)[3], high serum levels of FGF-23. It is also known as Oncogenic hypophoshatemic osteomalacia[21] , although benign variety , histologically malignancies were also reported. We are hereby presenting a case of a young adult who suffered with TIO disease per se, delayed diagnosis and specific treatment.

Case Report :

A 34 years old working male patient who had bilateral heel pain and difficulty in walking in the year 2015 for which he consulted an orthopedician and used analgesics , supportive medication for 6 months but not relieved, rather symptoms were progressed as generalized body pains, back pain ,pain at ribs, weakness and sleep disturbances which led to restrain from his work . he had no similar complaints in the recent past and childhood , no family history of any metabolic or neoplastic disorders. He started consulting physicians, neurologists who started investigating him which showed low border calcium and vit d levels for which adviced supplements after which lab parameters showed little improvement but not at all improved clinically. When he consulted an endocrinologist, he suspected some rare metabolic disorder and started him investigating thoroughly in 2017 in which lab parameters showed normal values for thyroid, sugar and cortisol levels, but low normal serum values for calcium (8.9 mg/Dl), vit D (32ng/mL), very low levels of phosphorous (1.8 mg/dL) , renal tubular reabsorption of phosphorous TMP/GFR (1,53 mg/Dl , very much elevated levels of Alkaline phosphatase (223IU/ml), Parathyroid hormone 106.5(pg/ml), after which he was adviced for parathyroidectomy, but he was not willing. He continues to be symptomatic even after 3 years of initial complaint , which led to further investigations like 3 phase bone scan that revealed increased tracer uptake in the bilateral humerii, bilateral ribs at multiple sites S/O multiple fractures (Metabolic bone disease), GA 68 DOTONAC PET CT whole body showed lesion along the anteromedial surface of left distal femur probably periosteal mesenchymal neoplasm and MRI LEFT LOWER FEMUR showed 15 x 11 x 4 mm sized soft tissue mass along the anteromedial cortex of left distal femur metaphysis. Finally his condition was confirmed as “ Tumour induced osteomalacia” in 2018 november and

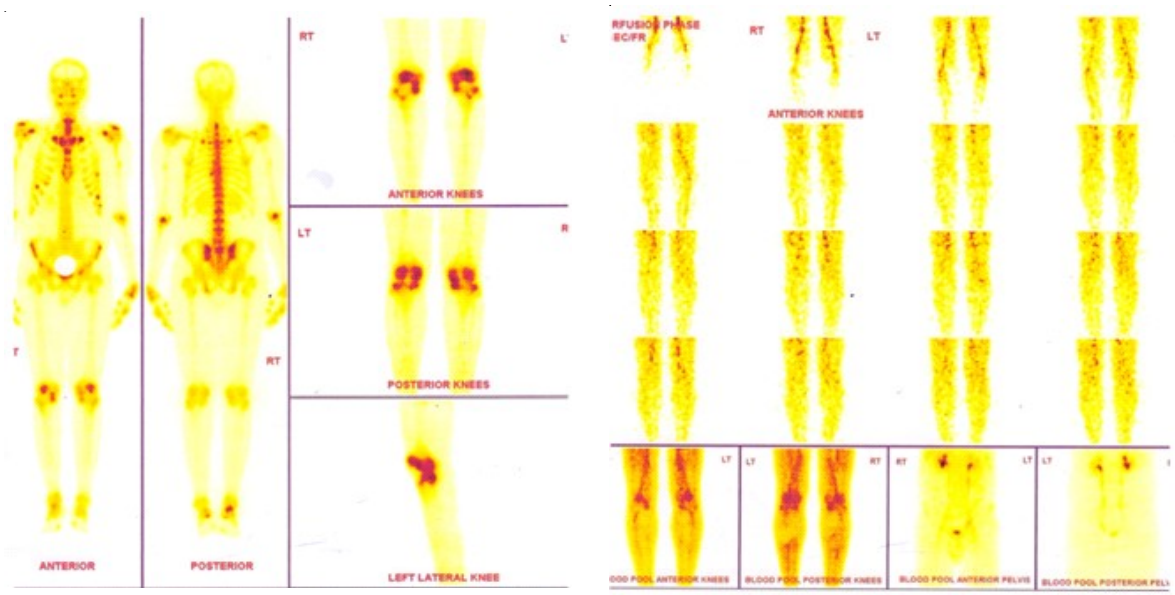
planned for removal of tumour from the left distal femur . we excised the tumour in toto along with the Cortico periosteal sleeve from the antero medial aspect of left distal femur as there are reported reccurences with incomplete removal[15,16]. he had near complete relief of symptoms within 2 weeks and lab parameters showed gross improvement within 1 month and completely normal within 3 to 6 months as depicted in the table below. he resumed his regular work within 1 month. He was followed up regularly for every 3 months in the 1st post operative year and for 6 months in the 2nd year and yearly thereafter.

Table 1 : Sequential Lab parameters pre operative and post operative period.

Lab parameters	2017	2018		2018 Immediate Post surgery(1 week)	2019		2020
		1st	2nd		1st	2nd	
Serum phosphorous (mg/dL)	2.5	1.8	1.4	1.9	4.7	3.9	4.1
Serum calcium(mg/dL)	8.5	8.0	8.2	9.0	9.3	8.9	9.4
Alkaline phosphatase	180	223	236	191	199	109	92

Lab parameters	2017	2018		2018 Immediate Post surgery(1 week)	2019		2020
		1st	2nd		1st	2nd	
Serum phosphorous (mg/dL)	2.5	1.8	1.4	1.9	4.7	3.9	4.1
Serum calcium(mg/dL)	8.5	8.0	8.2	9.0	9.3	8.9	9.4
Alkaline phosphatase (IU/mL)	180	223	236	191	199	109	92
1,25 $(OH)_2$ Vit D (ng/dL)	46.98	32.07	30.2	45.4	48.3	-	-
Serum PTH (pg/ml)	106.5	112.1	120	54.04	58.1	-	-
TmP / GFR (mg/dL)	-	1.53	1.46	1.5	4.5	-	-

(TmP/ GFR Maximum renal tubular phosphate reabsorption per unit volume of glomerular filterate)



(Fig 1,2 : Triple phase Bone scan)

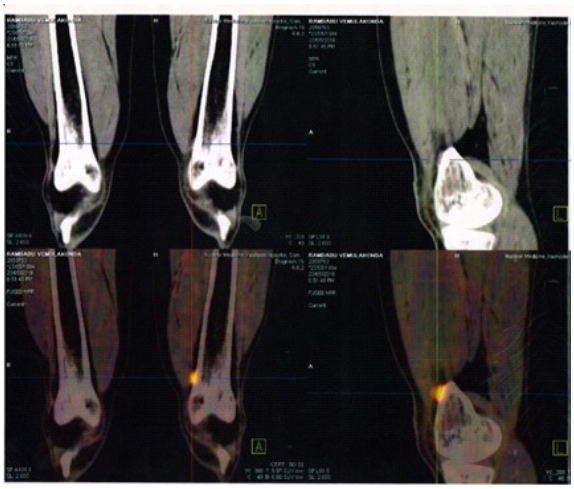


Fig. 3 (GA-68 DOTANOC – PET-CT WHOLE BODY)

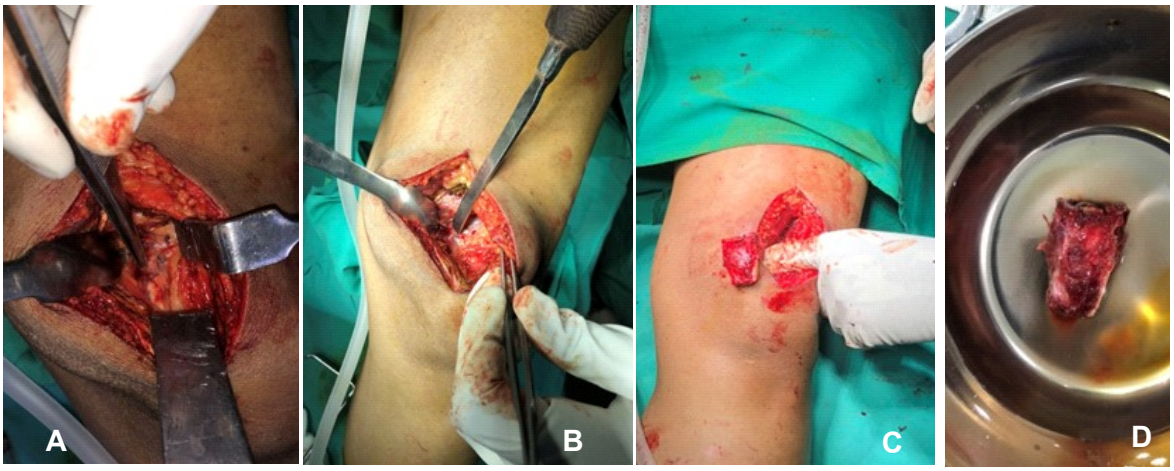


Fig 4 : Intraoperative images : sequential images A. Localizing the tumour ,B.Excision of tumour, C. Tumour with Cortico periosteal sleeve, D.Excised Tumour in toto.

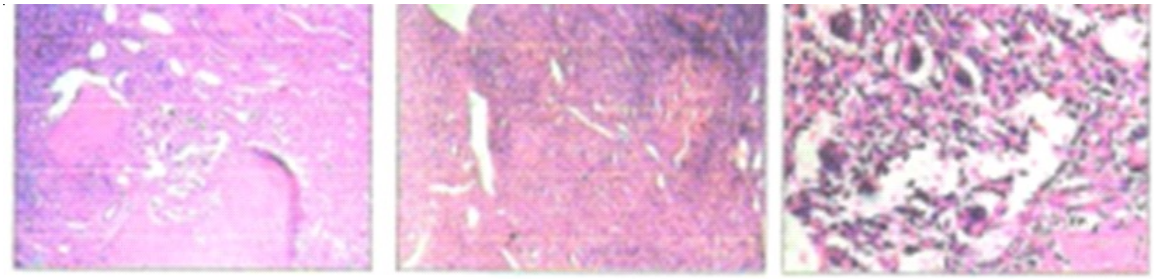


Fig 5 : HPE Showing hyper cellular spindle cell lesion with scattered osteoclastic type of Gaint cells.

Discussion :

Tumour induced osteomalacia is associated with high renal losses of phosphate (hyperphosphaturia), hypophosphatemia mainly due to elevated Fibroblast growth factor -23 (FGF – 23) leading to osteomalacia in combination with a mesenchymal tumour (paraneoplastic syndrome)[1,5,6] .

Because of its rarity and less knowledge about this condition duration from the occurance of symptoms to diagnosis is longer averaging 3 to 5 years[9] because of which usually progresses to multiple fractures, weakness, loss of weight and height due to generalized debilitation.

Till 2016 more than 300 cases of TIO were reported in the literature[1]. Mean age

affected is 45 years(range 10 to 85 years)[1,3] ,with majority of the cases noted in adults. Soft tissue origin of the tumour (55%) is little higher than bone (40%). Though it is diagnosed as TIO ,locating the tumour is challenging in most of the cases. Male and females are found to be near equal occurance. Order of occurance[1,9] in body parts is thigh and femur(23%), craniofacial region(20.7%), ankle and foot (8.8%), pelvis (8.2%), tibia and fibula (6.5%) and arms (6.5%) and other regions with less occurance were vertebra, hand ,chest , knee, perineum and gluteal region. Liver ,lung, tongue, and thyroid occurance was also reported[9]. Multiple sites occurance in a patient were also noted.

In 1991 Weidner[10] designated these tumours as Phosphatauric mesenchymal tumours and classified into four sub groups 1.Mixed connective tissue variant - PMTMCT , 2.Osteoblastoma like variant , 3. Ossifying fibroma like variant , 4. Non –ossifying fibroma like variant of which PMTMCT is most common type.

Locating the tumour is challenging in this condition and some of the cases were dignosed as unlocalized tumours also. Genetic and acquired other causes for hypophosphatemia should be ruled out.

Clear history, physical examination, blood, serum and urine analysis along with functional and anatomical imaging like CT, MRI Whole Body[11], scintigraphy using radiolabelled somatostatin analogue[13] (such as 99mTc-Tektrotyd); fluorodeoxyglucose (18FFDG) PET/CT[12] and galium (68Ga) DOTANOC PET/CT[14] and selective venous sampling for FGF23[15] will be very useful in diagnosing the condition and localizing the tumour. Fine needle aspiration and cytology (FNAC)[16] is also helpful in diagnosing this condition.

Treatment of choice for TIO is wide excision of tumour as reccurence is possible and reported with incomplete removal of the tumour[17,18]. Immeadiate clinical improvement will be noted within 1 or 2 weeks of removal of the tumour and normalization of lab parameters with normal FGF,Ca,P,ALP ,TMP/GFR and Vit D within 1 or 2 months.

For the unlocalized and non resectable tumours medical therapy with Phosphate,calcium and vit D supplementation should be done with monitoring the lab parameters at regular intervals. Octreotide (somatostatin

analogue)[20] and Cinacalcet[22] (calcium sensing receptor agonist) also found to be helpful in some of the cases. Anti FGF23 Antibodies[21] are helpful but human studies are still pending.

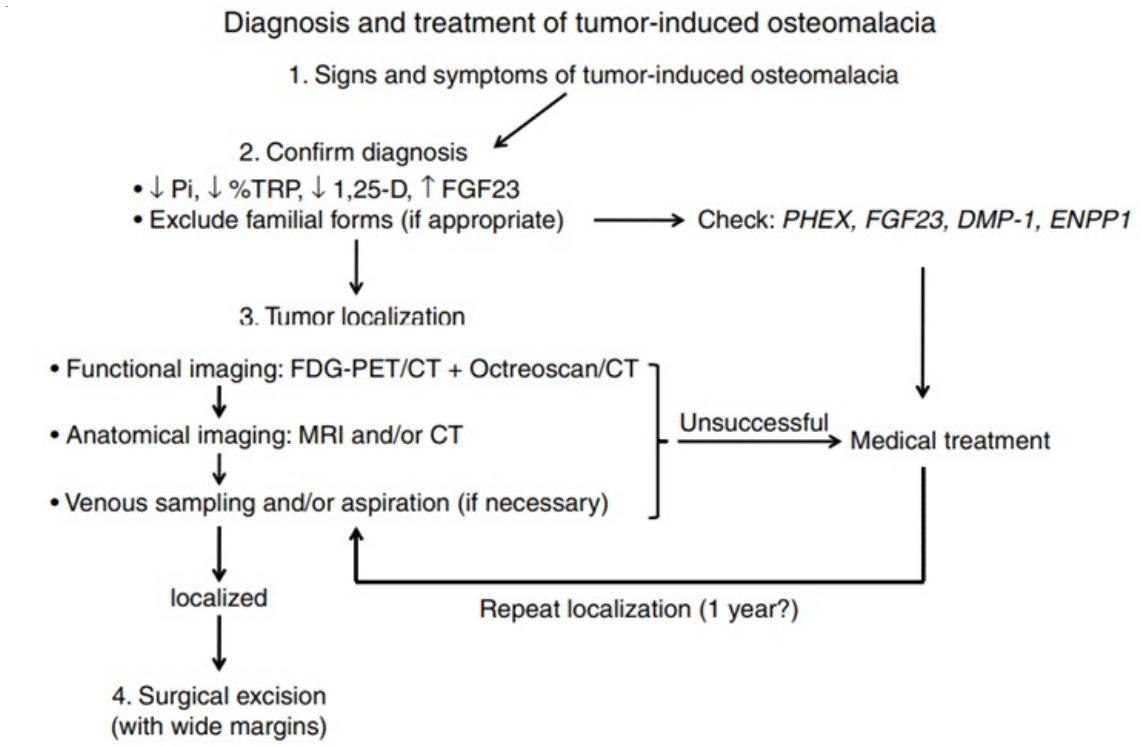


Chart 1: Algorithm showing Diagnosis and treatment of Tumour induced Osteomalacia[23].

Conclusion :

Tumour induced osteomalacia (TIO) is a rare but debilitating condition . FGF 23 which is potent regulator of phosphate and vit D metabolism is oversecreted from tumour leads to osteomalacia. Recent advances in lab parameters and imaging helps in preventing the diagnostic delay and localizing the small tumours. Wide excision of tumour along with cortico periosteal sleeve is the treatment of choice.

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Abbrevations :

1) TIO : Tumour Induced Osteomalacia
2) FGF -23 : Fibrobalst Growth Factor – 23
3) Ca^{2+} : Calcium
4) P : Phosphorous
5) Vit D : Vitamin D
6) PTH : Para Thyroid Hormone
7) TMP/GFR : – Maximum renal tubular phosphate reabsorption per unit volume of glomerular filterate.
8) GA-68 : Gallium -68
9) PET-CT : Positron Emision Tomography
10) MRI : Magnetic Resonance Imaging
11) HPE : Histo Pathological Examination
12) ALP : Alkaline Phosphatase
13) PMT MCT : Phosphaturic Mesenchymal Tumours Mixed Connective Tissue varient

Management of Bone Tumors

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Bone tumors are historically manged by amputation but limb salvage surgery has taken its place as the primary treatment of bone tumors in the recent past.

Limb savage reduced the disability and also the psychological impacts of amputation. This was passible because of the advances in the field of medicine and biomechanics like:

- Effective induction chemotherapy
- Good imaging and staging
- Prosthetic availability

Criteria for limb salvage surgeries:

Aims :

- To eradicate the disease
- Retain the integrity of the skeletal system
- Preservation of the limb with useful function

Guidelines :

1. No major neurovascular involvement

2. Wide resection of the affected bone, with a normal muscle cuff in all directions.

3. En bloc removal of all previous biopsy sites and potentially contaminated tissues.

4. Resection of bone 3 to 4 cm beyond abnormal uptake,

5. Resection of adjacent joint and capsule.

6. Adequate motor reconstruction and soft tissue coverage

Contraindications :

1. Major neurovascular involvement

2 .Pathological fracture - risk of local recurrence

3 .Inappropriate biopsy sites

4 Infection

5 . Leg length discrepancy should not be more than 6 to 8 cms

Planning of LSS :

LSS requires through planning from the level of staging,diagnosis and execution.

Staging :

Radiology is the primary modality of finding a bone tumor and staging it. This requires a specific level of suspicion in any doubtful lesion in routine physical and radiological examination

Xray: plain x ray is a very important investigation and it should be considered as a gross specimen of the bone tumor.

Cect : helps in staging and also the vascular involvement.also is useful for chest screenng

MRI : better visualisation of sof tissue and neurovascular relations

Bone scan : to know any skip lesions and metabolical tumor extent

Pet ct : whole body imaging to exclude metastatic lesions.

Diagnosis :

The most important part of the management of bone tumors is taking a biopsy of the tumor. This is not only important to get tissue for diagnosis but also important to facilitate future surgery.

Guidelines- for a biopsy :

- Decide the part of the lesion that should be biopsied along the planned incision of the definitive surgery.
- Track should be the shortest way to the lesion.
- Must not violate more than one compartment.
- Away from the neurovascular bundle.
- The joint should never be violated

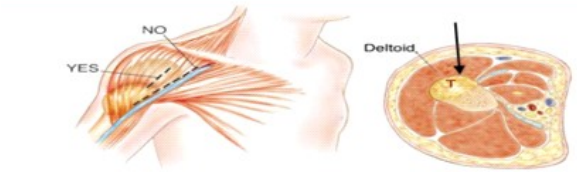
The biopsy should always or preferably done by the operating surgeon or the team involved.

Sites of biopsy :

Clavicle – parallel to the long axis of the clavicle.

- Scapula – over the line joining from supero-lateral

part of acromion to inferior and medial angle



- Proximal humerus :

- **Distal humerus** – posterior arm in midline.

- **Pelvis –**

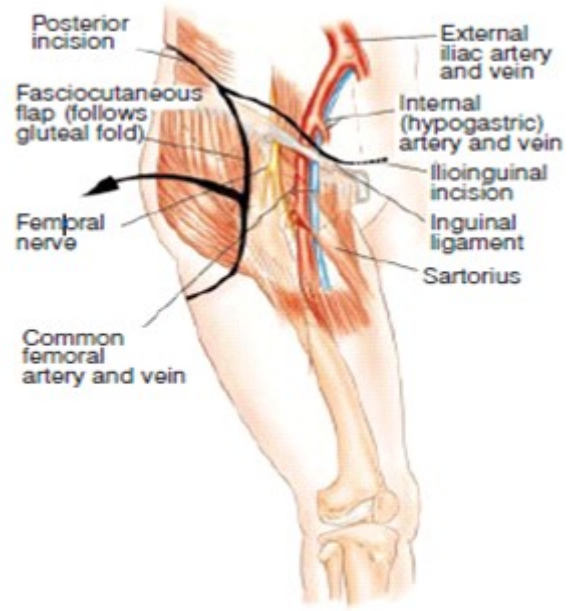
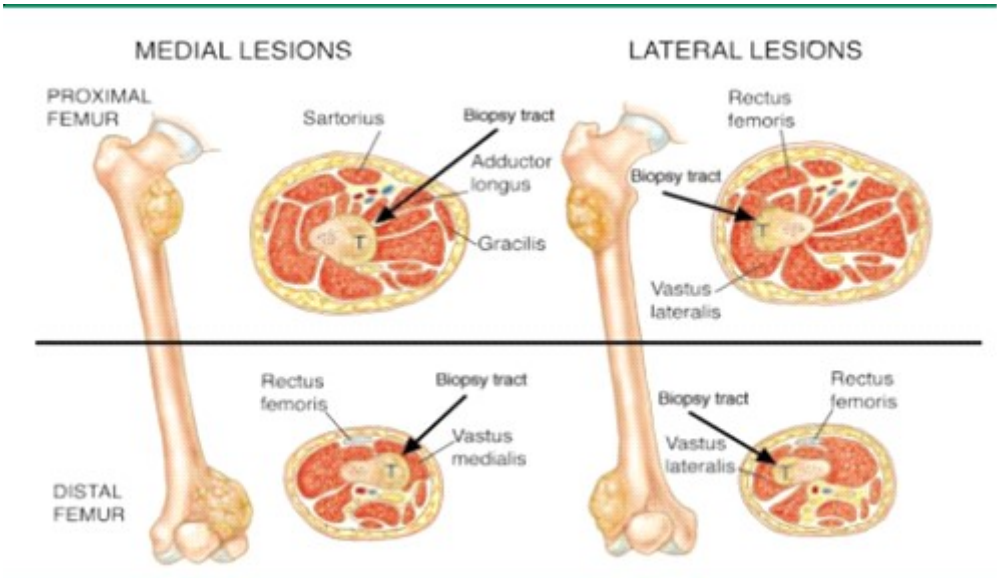


Figure 10.16 The utilitarian pelvic incision.

- **Femur**



(never through rectus femoris)

Principles of doing a biopsy :

- Incision - smallest longitudinal incision transverse incisions are contraindicated
- Do not raise the flaps.
- Cortical window
- Use knife or the curette to avoid crushing of the tissue.
- Obtain enough tissue – send the tissue for frozen analysis.
- Meticulous hemostasis – to prevent postoperative haematoma plug the cortical window
- Tourniquet is rarely used, if used the limb should not be exsanguinated
- Use drains only if necessary

Definitive treatment:

Treatment is defined by the biology of the tumor and stage:

- Osteosarcoma CT - SURG - CT
- EWINGS RT - SURG
- CHONDROSARCOMA - SURG
- MFH SURG +/- CT

  GCT - SURG

Stages of LSS:

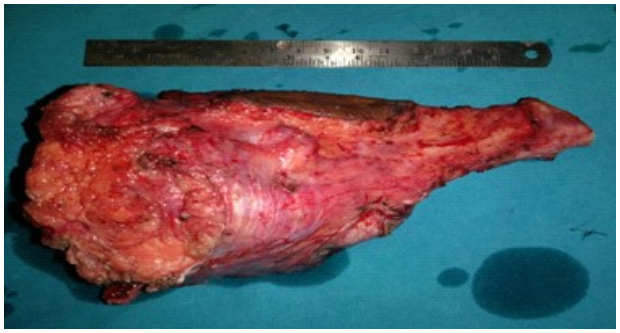
1 . Resection of the tumour

2 . Skeletal reconstruction

3.Soft tissue and muscle transfer

Planning the resection:

- Resection of bone tumors requires
- Adequate exposure – appropriate incision and adequate flaps are raised
- Dissection of neurovascular bundles
- Dissection of tumor with adequate muscle cuff



Skeletal reconstruction :

The various ways of reconstruction include:

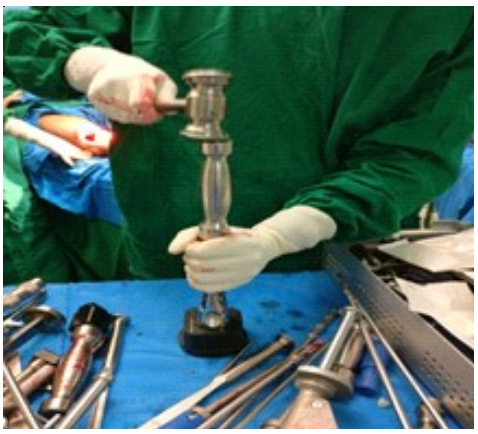
- **Endoprostheses.**
- **Autograft**
- **Allograft**
- **Limb lengthening**
- **Rotationoplasty**
- **arthrodesis**

with the advent of advanced biomechanics prosthesis has taken over as themost preferred way of reconstruction.

Various endoprosthesis include:

Custom made Prosthesis

Modular Prosthesis



3D Printed Prosthesis

Soft tissue reconstruction :

Goals :

adequate coverage of the prosthesis

- restore muscle power and joint stability
- A variety of local and regional muscular flaps are required.
- Minimizes the risk of periprosthetic infections.
- Skin closure patients with tight skin closure are best served by leaving the skin open and performing the primary or secondary split thickness grafting.

Modified Dunns procedure for treatment of Moderate-severe Slipped capital femoral epiphysis- Intra operative steps and our experience with this technique

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Abstract :

In situ pinning for any degree of deformity has been practiced in earlier days, though in situ pinning gives good results for mild and moderate slips it is not recommended for severe slips due to poor remodeling of subsequent deformity and further progression to a painful, restricted and an arthritic hip. Overzealous reduction maneuvers in an attempt to convert severe slips to mild or moderate to make them amenable for in situ pinning should be avoided at all costs to prevent avascular necrosis, which is a disastrous complication in an young hip. Modified Dunns procedure offers excellent anatomical reduction of the deformity with good radiological outcomes and avoids FAI to provide a painless mobile hip. Though theres a risk of iatrogenic AVN, good understanding of vascular anatomy especially the course of deep branch of medial circumflex femoral artery and meticulous dissection with patience achieves excellent outcomes without the risk of AVN.

Introduction :

Slipped capital femoral epiphysis (SCFE) is a relatively common hip disorder presenting in adolescents with an overall incidence of about 10 cases per 100,000 children.(1,2)Treatment of SCFE has been controversial and evolving over the years. The main goals of SCFE treatment are to prevent further slip progression, achieve stabilization and restoration of hip function, and avoid premature hip osteoarthritis while minimizing the risk of AVN and subsequent proximal femoral deformity (35)]. Realignment osteotomies have been proposed to restore the proximal femoral anatomy, but historically, AVN complications remain controversial (6). The primary risk associated with osteotomy is damaging the posterior

branch of the medial femoral circumflex humeral artery. Therefore aiming to correct deformity and protect the femoral head blood supply, Ganz and his colleagues recently described a modified Dunn osteotomy performed through the surgical dislocation of the hip, which could entirely expose the hip joint protecting the retinacular vessels(7,8) This approach has gained popularity over the past decade in treating moderate to severe adolescent SCFE(9,10). The rationale behind correcting deformity is to prevent femoral acetabular Impingement and future arthrosis and to normalize the hip range of motion. FAI has been associated with increased pain, reduced ROM, chondrolabral damage, and early hip osteoarthritis (9)The retinacular vessels are protected in a periosteal flap during the femoral head reduction with low complications rate after SCFE, ranging from most severe AVN of the femoral head to metaphyseal deformity, which may lead to femoral acetabular impingement and cartilage as well as labral damage(1113). We present a case of one and half month old slipped capital femoral epiphysis for which modified Dunns procedure was done as described by Ganz et al.

Case :

A 14 year old boy presented to our ER with history of right groin pain since 45 days and difficulty in walking. He had a history of trivial fall in bathroom 45 days ago for which he didnt take any treatment till he presented to us. On examination the kid was moderately obese with right lower limb in external rotation. He has been walking since then with limp. An x-ray was taken immediately which showed slipped capital femoral epiphysis (Fig 1).

Fig 1- Xray at presentation showing Slipped capital femoral epiphysis right hip with minimal callus formation

No further manipulation or examination was done. An MRI was taken to know the status of contralateral hip if it were in any pre slip stage. Patient was taken up for surgery the next day. Considering the degree of slip Safe surgical dislocation with capital realignment was planned. No attempts at any reduction were made.

Patient was kept in lateral decubitus position. Straight lateral incision was made centered over trochanter. Subcutaneous tissues and tensor fasica lata were incised in the line of dissection and along anterior border of gluteus maximus and Gibson interval between maximus and medius was developed. Trochanteric bursa was excised and piriformis tendon was identified.

Trochanteric flip osteotomy was made using a saw blade, the osteotomy was performed in such a way the most posterior fibers of gluteus medius were left intact. This ensures that deep branch of medial circumflex femoral artery is left intact. Care was taken to make sure that the trochanteric osteotomy is parallel to the femur and not too inclined to endanger femoral neck. The trochanteric flip was retracted anteriorly leaving behind a stable trochanteric segment posteriorly with piriformis attached to it (Fig 2). Capsule was identified by developing the

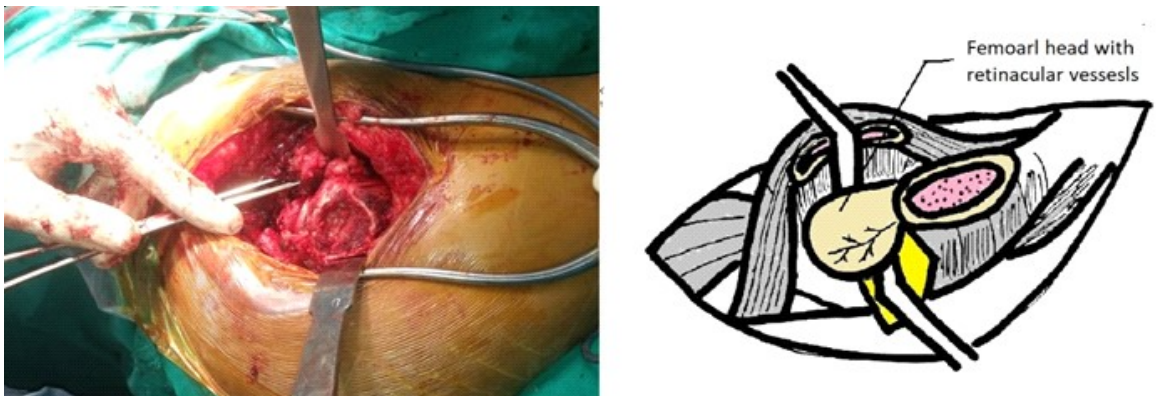

Fig 2 : Intraoperative image showing trochanteric flip osteotomy and dislocated femoral head

Gluteus minimus piriformis interval and few fibres of minimus were removed to facilitate capsular exposure.

Z shaped capsulotomy was made and the metaphyseal bump along with epiphysis were visualized (Fig 3). Head was dislocated by external rotation and

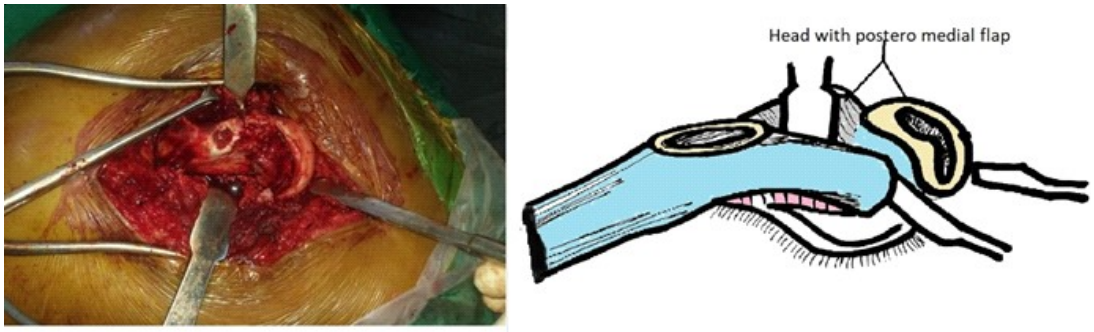

Fig 3: Intraoperative image showing metaphyseal bump and epiphysis with posteromedial retinacular Flap

gentle traction after provisionally fixing the epiphysis with a 1.8 mm K wire. Viability of head was checked by drilling the articular surface with a 1.8 mm K wire Continuous ooze of blood was noted. Acetabulum was checked for any chondral damage and head was relocated back into acetabulum.

Retinacular soft tissue flap was carefully developed. The flap contains deep branch of medial circumflex femoral artery, periosteum, piriformis and posterior capsule. Cancellous bone was removed from the stable part of greater trochanter to relieve the tension while extending the retinacular flap distally. The retinacular flap was developed till lesser trochanter level by meticulous dissection. Once the retinacular flap was divided attention was then given to the mobilization of epiphysis. Epiphysis is gently removed by passing an osteotome through the callus and slowly externally rotating hip (Fig 3). No attempts were made to use force while reducing the epiphysis as this would harm the posterior retinacular vessels. Once epiphysis is separated the metaphyseal bump was carefully remodeled using a high speed burr. Femoral neck was resected for at least 5 mm to facilitate tension free reduction of epiphysis. We believe this is a critical step as any forceful reduction of epiphysis would stretch and damage the posterior retinacular flap. Under direct vision epiphysis was realigned on to the metaphyseal bump and provisionally fixed with a 2 mm k wire passed retrograde from the femoral head articular cartilage. Femoral head was reduced and alignment was checked under C arm (Fig 4). Femoral head was also checked for

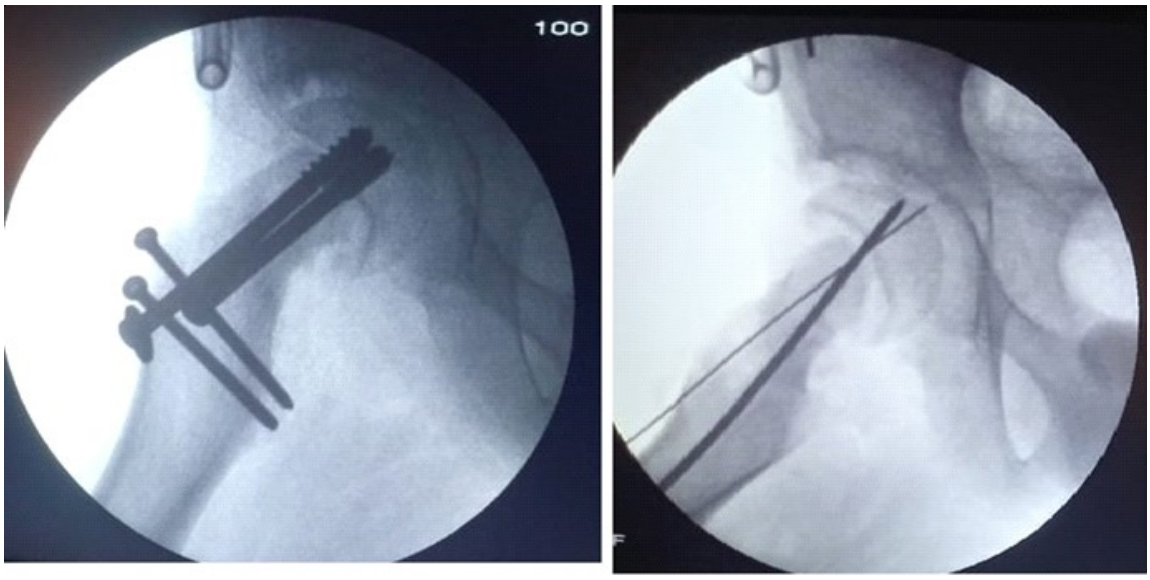

Fig 4 : Intraoperative C arm images showing provisional K wire fixation and definitive fixation

viability by drilling a 1.8 mm K wire hole, subsequent bleeding was seen which reassured us of the preserved blood supply.. Definitive fixation was done by two 4mm cancellous screws. Capsule was repaired and trochanteric fragment was fixed with 3.5 mm cortical screws (Fig 5). No prophylactic fixation of contralateral hip was done. Post operatively patient was immobilized for 6 weeks. A removable derotation boot was applied to facilitate immobilization of hip.

Fig 5 : Final postoperative image showing well reduced epiphysis.

Discussion :

In-situ pinning has been the gold standard for mild SCFE as it ensures minimally invasive fixation of the slip without risk of iatrogenic AVN. Moderate slips can be pinned in situ with or without primary osteochondroplasty. However, treatment of severe SCFE remains a challenging problem. Insitu pinning of a severe slip is not only technically difficult owing to the extreme anterior entry one needs to take and the difficulty in keeping the pin central to epiphysis but it often leads to severe femoro acetabular impingement reduced range of motion, chondrolabral damage and early osteoarthritis.

Various corrective Osteotomies have been proposed to improve hips with a moderate to severe slip. Osteotomies at the base of the neck(14,15) or at the inter-subtrochanteric level (16,17)introduce a distal reverse deformity to restore loss of movement at the hip joint. Only those osteotomies at the level of the physis (7,18) can correct the anatomy and the alignment at the head neck junction. To resolve the above issues, the modified Dunn procedure has been a promising technique that can address both physeal stability and residual deformity with possible lower complication rates in the treatment of SCFE. Capital realignment of SCFE with open physis through the surgical dislocation approach can be performed with low AVN rates. We believe this technique is most appropriate for moderate to severe SCFE and especially for unstable SCFE. The safe execution of this procedure requires a full understanding of the hip's vascular anatomy by the surgeon. This procedure restores the proximal femoral anatomy, and we assume restoration of normal anatomy would lead to good long-term outcomes. This procedure is technically demanding; however, we believe it is worth the investment of effort and skill for a condition that could have lifelong consequences in an otherwise young patient. Several advantages of the modified Dunn procedure have to be mentioned. First, it permits the complete removal of the posteroinferior callus and allows epiphyseal reduction without stretching or kinking of the retinacular vessels. Second, capital realignment and offset at the head-neck junction can be directly visualized. Third, the impingement free movement of the hip can be tested intra-operatively. Fourth, the blood supply to the femoral head can be checked during surgery, and measures for

improvement during surgery are possible. And fifth, the correct extra-articular position of all implants can be assured without an image intensifier, thus avoiding intra- articular implant penetration with subsequent chondrolysis. The practice of in situ pinning for any degree of deformity that is widely practiced should be avoided as modified dunns procedure when done with good understanding of vascular anatomy and patience will give better radiological outcomes and moreover the remodeling after insitu pinning in severe slips often is incomplete and leads to severe FAI and further Osteoarthritis.

Conclusion :

The modified Dunn procedure offers the possibility to achieve near anatomical realignment of the capital epiphysis in SCFE hips and preserving vascular supply to the epiphysis. Though its technically challenging the results are often worth the steep learning curve.

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Single stage surgical correction - Congenital Hallux varus withPoly-Syndactyly and duplication of first metatarsal

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Abstract :

Introduction :

Congenital hallux varus is a rare condition characterised by medial deviation of metatarsophalangeal joint of great toe. The deformity can vary in severity causing cosmetic and functional difficulty to the patient. Various surgical techniques have been described in the literature for congenital hallux varus correction depending on the underlying pathology. We are reporting a rare case of Congenital Hallux varus with Poly-Syndactyly and duplication of first metatarsal.

Case report :

A 13 year male child presented with untreated congenital hallux varus with poly-syndactyly, difficulty in wearing footwear and cosmetically unacceptable deformity. Radiographs revealed duplication of first metatarsal which was hypoplastic resulting in bow stringing and severe varus deformity. Single stage correction of deformity was performed by excision of the extra great toe along with metatarsal and arthrodesis of meta tarso phalangeal (MTP) joint.

Results :

Single stage correction has resulted in satisfactory functional and cosmetic outcome.

Conclusion :

Congenital hallux varus, with duplication of the entire 1st ray is a rare deformity. We have not come across similar presentation in our literature search. Following single staged correction patient is now able to wear regular shoes, attends school and is no longer a

withdrawn child. The procedure gave a cosmetically acceptable result and removed the stigma of an ugly deformed foot.

Key Words :

Secondary congenital hallux varus, Poly-Syndactyly, Duplication of first ray

Intrdocution :

Congenital hallux varus is a rare condition characterised by medial deviation of metatarsophalangeal joint of great toe. The deformity can vary in severity causing cosmetic and functional difficulty to the patient. Various surgical techniques have been described in the literature for congenital hallux varus correction depending on the underlying pathology. We are reporting a rare case of Congenital Hallux varus with Poly-Syndactyly and duplication of first metatarsal. Secondary type of congenital hallux varus is most commonly associated with metatarsus adductus[1], shortening of first metatarsal, duplication of metatarsal, polydactyly and longitudinal epiphyseal bracket[2,3]. Treatment of this deformity has many options such as removal of accessory bones, medial sesamoidectomy, release of medial fibrous band[4], reinforcement of lateral capsule and transfixing of metatarsophalangeal joint with Kirschner wire[5], rotational skin flap and syndactylisation of first and second toes[6], metatarsal osteotomy and arthrodesis

Case report :

A thirteen year male child presented with deformity of great toe of the right foot since birth. He was unable to wear regular footwear, had difficulty in pulling up trousers and unacceptable cosmetic appearance .As a result of this unsightly deformity the child became reclusive, avoided school and refused to go out and mingle socially. Patient did not have prior consultation for this problem due to financial constraints.

Examination :

Patient had polydactyly with syndactyly of right great toe and the toes are almost perpendicular to first metatarsal with increased web space between first and second toes. Each great toe had a separate nail bed and the lateral toe was longer than medial one (Fig 1). Plantar flexion and dorsiflexion of 10 degrees was possible and correction to neutral was not possible at

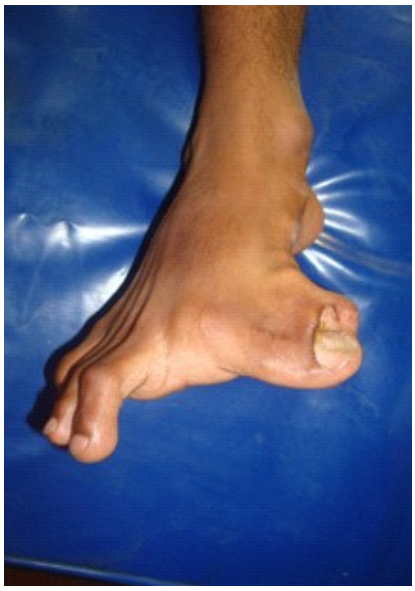

Fig 1: Clinical Picture showing hallux varus with poly-syndactyly

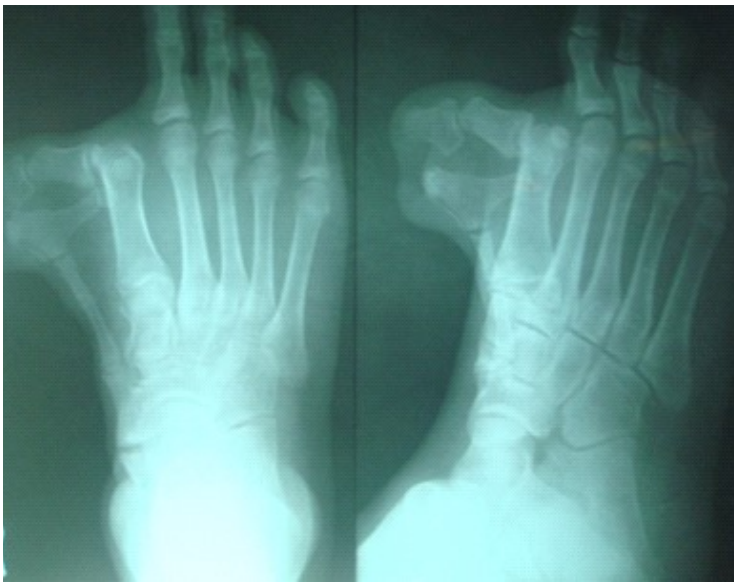

Fig 2 : Preoperative antero posterior and oblique radiographs showing short and wide first metatarsal with duplication of first metatarsal and phalanges

metatarsophalangeal joint due to contracture of medial soft tissues and attenuated bony structures.

Radiographic evaluation :

Weight bearing anteroposterior and oblique radiographs of right foot were taken and showed short and wide first metatarsal with duplication of first metatarsal and phalanges. The medial metatarsal was small, segmented and attached to navicular proximally. The distal end was broadened with a bony bar extending to the base of the proximal phalanx. This attachment combined with hypoplasticity of the supernumerary ray was responsible for the bow string effect (Fig 2). The patient had no other musculoskeletal or neurological abnormalities.

Treatment plan: We planned for single stage correction by removal of medial metatarsal (since it was smaller and shorterthan the lateral)and phalanges combined with arthrodesis of metatarsophalangeal joint of the larger ray.

Operative technique :

Under Spinal anesthesia with the patient in supine position, tourniquet was applied and draped in standard manner.

Dorsomedial incision of about 10cm was made centered over the medial metatarsal. Skin flap was incised down to bone in order to preserve vascularity and the hypoplastic metatarsal and phalanges were skeletonized (Fig 3). This was done by sharp dissection avoiding surgical diathermy. The proximal attachment to the navicular was released and dissection progressed distally. The bony bar by which the phalanx was attached to the metatarsal was released and the bony structure excised totally. (Fig.4) Attention was now paid to the contracted soft tissues leaving the redundant skin alone. The capsule of the metatarso-phalangeal joint was incised and reduction of the toe onto the metatarsal was attempted. Some soft tissue tension was still evident at this point. The articular surface of the metatarsal head and the base of the proximal phalanx were removed with an oscillating saw. This bony excision resulted in minimal shortening of the ray but relaxed the soft tissues. Arthrodesis of the MP joint was achieved by railroading a K-wire across the joint under

Fig 3: skin flaps raised to expose the metatarsal and phalanges

Fig 4: After complete excision of medial metatarsal along with phalanx and bony bar

C-arm. Tourniquet was removed and hemostasis secured with bipolar cautery. Redundant skin edges were excised, wound closed in layers without tension (Fig 5) and occlusive dressing applied. Post- operative period was uneventful with good wound healing (Fig.6). Patient was partial weight bearing in a plaster

Fig 5 : post operative xray showing k wire fixation

Fig 6: post operative wound closure

Fig 7 : post operative healed scar at 8 weeks

Fig 8 : post operative xray at 12 weeks followup

shoe until x-rays showed evidence of fusion of the MP joint (Fig 7). K-wire was retained for 8 weeks and removed.

Result :

Patient started unprotected weight bearing 12 weeks after surgery by which time bony fusion was achieved at the MTP joint (Fig.8). The first ray showed satisfactory alignment and was plantigrade although it was short. Patient had a painless gait, able to wear shoes and could perform his daily activities without difficulty (Fig. 9).


Fig. 9

Discussion :

Congenital hallux varus is an uncommon deformity which presents as three broad categories[1]. Primary which does not have any other associated deformity is the rarest. Secondary type associated with anomalies such assyndactyly, polydactyly and metatarsus adductus,club foot[7,8,9,10] . The patient managed by us falls into this category. Tertiary form is associated with severe deformities like diastrophic dwarfism. Our patient presented with secondary type of CHV in the adolescent age group with bony deformities and complete duplication of the first ray. The supernumerary ray was hypoplastic with a bony bar extending from the phalanx to the metatarsal head. This aberrant anatomy was responsible for the bowstring effect, pulling the phalanges at right angle to the metatarsal axis. Treatment of Neglected congenital hallux varus deformity is challenging because of the the soft tissue contractures, bony deformities and arthritis Single stage correction was planned keeping in mind the vascularity and the need to obtain good skin healing. On clinical examination a bounding dorsalis pedis pulse was palpable, which along with the hypo plastic bony components, led us to excise the medial toe and reconstruct the lateral one. We came across a simiar deformity which presented with duplication of the phalanges alone and was treated by a two stage correction. The single stage correction adopted by us resulted in faster resolution of the problem with minimal scarring.

Conclusion :

Management of neglected congenital hallux varus is challenging. Secondary congenital hallux varus with poly-syndactyly can be managed by single stage correction with excellent cosmetic and functional results.

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Use of axillary crutch as a reduction tool for sagittally unstable trochanteric fractures- A case report

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Abstract : Trochanteric fracture displacements often reduce with traction and internal rotation of the lower limb however few displacement patterns like posterior sag of distal fragment at times complicate accurate alignment. We describe a method for addressing this displacement using a commonly available axillary crutch. We believe this method is particularly useful when working with less assistance and helps in reduced operating times.

Introduction : Surgical management of proximal femoral fractures has become a day to day procedure in orthopedic practice, everyone has their own tweaks and tips regarding reduction of variable fracture patterns. One of the most common deformity seen during intra operative reduction of peri trochanteric and femoral fractures is the posterior sag of the distal fragment. Usually it is addressed with the help of an assistant lifting the thigh with his elbows or a mallet, this reduction is either provisionally fixed with a K-wire or the assistant maintains the reduction throughout the procedure. This at times become tiresome and mandates the need of an additional assistant.

We describe a simple reduction technique using a standard axillary crutch to reduce and hold the posterior sag without the need for any additional assistance.

Case report :

A 67 year male patient with a history of fall at home presented to our ER with complaints of difficulty to walk and pain in left hip.

On radiological examination he was diagnosed as a case of intertrochanteric fracture(AO 31A2.3) left hip. After initial

stabilization and thorough anesthetic evaluation he was taken up for surgery the next day.

Intra operatively patient was placed on traction table after regional anesthesia. Fracture reduction was assessed under C-arm guidance in anteroposterior and lateral views. A posterior sag was noticed on C-arm which was easily corrected by elevating the thigh with hand, as rest of the reduction parameters were good we have decided to use an axillary crutch as a reduction tool.. A standard axillary crutch is taken and draped with sterile sheet (Fig-1).Drape is kept in place with a sterile roller bandage. The axillary pad of the crutch is placed at the apex of the deformity while the rubber ferrule is in contact with the ground away from the table(Fig-2). Then we gave a slow upward directed force by holding the hand piece and moving the rubber ferrule towards the table till the posterior sag is reduced. Once we achieved a desired reduction then the crutch is left in that position and procedure of nailing with a proximal femoral nail was done in a standardized manner. The crutch was retained throughout the procedure till a nail was passed and at the end reduction was found to be satisfactory. There were no signs of sciatic nerve neuropraxia.

Fig-1 : Standard axillary crutch draped with a sterile sheet.

Fig.2

Discussion :

Successful treatment of geriatric peri trochanteric fractures depends on reducing the surgical invasiveness,

obtaining acceptable reduction, rigid fixation without a device allowing controlled impaction and early mobilization. (1,2)

Nevertheless, this simple strategy is sometimes difficult, particularly when an unstable or even irreducible fracture is encountered. Some of these difficult fractures have sagittal displacement that can t be reduced closely. Although this might not be new, this fracture pattern can be called a "sagittally unstable fracture".(3)

In such scenarios good outcomes cannot be achieved with traction alone . Active management is required because accurate anteromedial cortex reduction, and restoration of neck-shaft angle and anteversion are essential in femoral intertrochanteric fractures.(4)

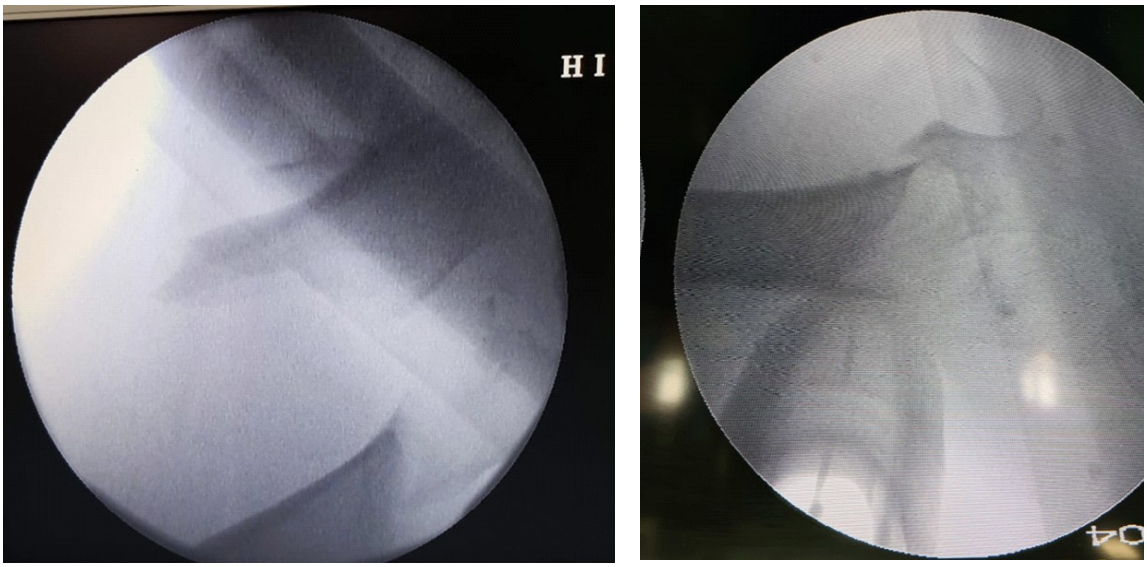
Placing a nail in a sagittally unstable intertrochanteric fracture can often aggravate the deformity and result in an unsatisfactory geometry. Few reports have offered surgical tips to reduce these difficult fractures. Most adopted the concept of elevating the distal shaft and direct compression of the proximal fragment. (2)(5) Most common methods for elevating the posterior sag involve using periosteal elevator , Steinmann pin etc . However these methods are semi invasive. Non invasive methods like manual elevation by an assistant using hands or mallet are tiresome and often lead to fatigue and sub optimal reduction.

Use of axillary crutch as a reduction tool is not a new method , however , its appropriate technique is not documented.

Technique :

A standard axillary crutch is used. The crutch is draped using a long drape while an assistant (unscrubbed) holds it from the lower part. The drape is tied using a bandage roll (unsterile/sterile) in its lower end. After draping the axillary crutch in this fashion the surgeon can now hold it using its rubber axillary pad.

The surgeon can now place the crutch at the apex of the deformity, initially the crutch is kept in an oblique orientation with the floor and depending on the amount of force needed it is gradually brought to a vertical orientation. The crutch usually doesnt slip as the rubber tip at its lower end gives sufficient friction, however if its unstable one can keep it in position by placing a foot at its lower end to prevent it from slipping.



Lateral view of intertrochanteric fracture after correction of posterior sag with an axillary crutch.

The axillary crutch usually hinders C-arm rotation and movement ,however with careful maneuvering of C-arm and proper communication it can be avoided.

The axillary crutch can be kept in the position till the entire procedure is completed, or can be used as a reduction tool until provisional fixation with K-wires is done.

Conclusion :

Inter trochanteric fractures are very commonly encountered in orthopedic practice and their incidence is increasing as the average lifespan is improving. Every surgeon has their own idea or tweak to tackle a particular fracture displacement, some of these techniques are learnt through experience and some passed on from mentors. We described a technique for addressing posterior sag in intertrochanteric fractures which reduces the need for manual reduction and other semi invasive methods. Though we described the technique in an intertrochanteric fracture we are sure it can be applied for sub trochanteric as well as femoral shaft fractures. Knowing this technique has helped us in reducing our operating times for such fractures and we hope this technique will be a valuable tool in an orthopedicians inventory while tackling such fracture displacements.

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Management of Type IIIB Compound fracture of Tibia with bone loss by Tibialization of Fibula with Limb Reconstructive System Vara Prasad G, Lokesh Sharma

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On 11th May 2019, A 29 yr male came to GGH Guntur with Type 3b compound fracture both bone right leg comminuted with bone loss due to RTA.

On arrival, thorough wound wash was given, and a uniplanar external fixator was applied. Soft tissue coverage was given by fascio-cutaneous flap and skin graft.

After four months, patient came back with sinus discharge and features of chronic osteomyelitis. The external fixator was removed.

Sequestrectomy was done, Tibialization of the fibula was performed, Orthofix Limb reconstruction system was applied.

Eight month Follow up x-ray Infection had subsided, x-ray showed union in progress.

After ten months, the patient was reviewed again, and orthofix was removed.

The patient can perform the following movements without any limitation

Knee Flexion

Knee Exyension and Weight

AFTER REMOVAL OF LRS

Knee Flexion

Cross Leg Sitting Extension

Knee Weight Bearing

Journey of a Resident - Begins with a blunder and ends with an eminence

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Surgical residency training programs in India are considered tedious and tough compared to the western programs, it is a general and a unified opinion. Long working hours, treating a huge number of patients every day and the tough hierarchical system add to their woes. Every physician who reads this article must have gone through more or less the same experience in their residency training program. We wish to present a routine trauma case which has taken twists and turns through the eyes of a professor and the heart of a resident doctor in a novel fashion and hilarious way.

Case Report :

A 45 year old male presents to the JPNATC, Newdelhi casualty after a Road traffic accident. He was diagnosed to have a Grade 3B compound Type C comminuted intra articular fracture of distal femur, comminuted fracture of patella, PCL avulsion at level of proximal tibia, lateral condyle fracture of proximal tibia and fracture both bones of right lower limb (fig 1). He was presented in rounds

Fig. 1

to the boss and posted for surgery the same day. Generally the professor operates the complex periarticular fractures and ones who can afford SYNTHES implants. The distal femur fracture was fixed with DFLCP by TARPO approach, patella fracture with encirclage wire, PCL avulsion with 4 mm CC screw by Burk and Schaffer approach, proximal tibia with 2 6.5 mm CC screws and shaft tibia with expert tibial nail. The extrensor mechanism was repaired and wounds were primarily closed with drains. All fixations were stable enough as evidenced in immediate post op x rays (fig 2). Boss is very particular with early

Fig. 2

mobilization and range of motion but this thing was a bit neglected by the resident. Postoperative period was uneventful and the wound is healthy, so discharged on 4th POD.

He comes for follow up after 2 weeks for suture removal to boss OPD, there starts the **CELLULOID**. Wound is healthy, sutures were removed and he has only a jog of motion at knee. Boss calls the resident who has admitted the patient and asks him "**YOU GUYS ONLY TAKE CARE OF PATIENTS YOU OPERATE AND NEGLECT THOSE WE DO, SEE HIS ROM, TAKE HIM TO OR FOR MANIPULATION UNDER ANESTHESIA I WANT FULL RANGE OF MOTION OF KNEE"**. The resident follows the orders and manipulates the knee with full avenge. He achieves a full ROM of knee and sends him to ward missing one important thing to be picked up by boss in the next day rounds QUADRICEPS TENDON AVULSION at level of patella. He only has passive ROM but no active ROM.

Resident is completely down and takes the lash of the boss. Patient undergoes re-surgery of complete repair of the quadriceps tendon and extensor

mechanism torn by him and puts him in an Above knee plaster. Wound heals well, sutures were removed 2 weeks later and plaster was continued for 6 weeks. Range of motion knee was started after removal of plaster at 6 weeks. Patient was advised aggressive ROM exercises by the resident to achieve something miraculous.

Now it is time for the patient to screw himself, he hears a loud pop up and wound gaping at the superior aspect during an exercise session. He is damn scared of all the surgeons at the institute and thus chooses a quack for his treatment. The quack gives him a medicated dressing for his wound and allows walking for him, the patient completely loses his active ROM. After a few days, he realizes the wound is not healing and his knee starts to buckle when he starts to walk. **Oh no! Something has gone wrong.**

One fine day he comes to the hospital again when things are going fine for residents in the ward. Boss had a look at him and calls the resident again, enquired about the post operative protocol advised and what the patient did. **YOU GUYS DO ALL THE COMPLICATIONS AND WE NEED TO HANDLE THEM, NOW I DONT KNOW YOU GOT TO MAKE HIM RIGHT OTHERWISE YOU ARE OUT OF THE INSTITUTE** (fig 3)

Fig. 3

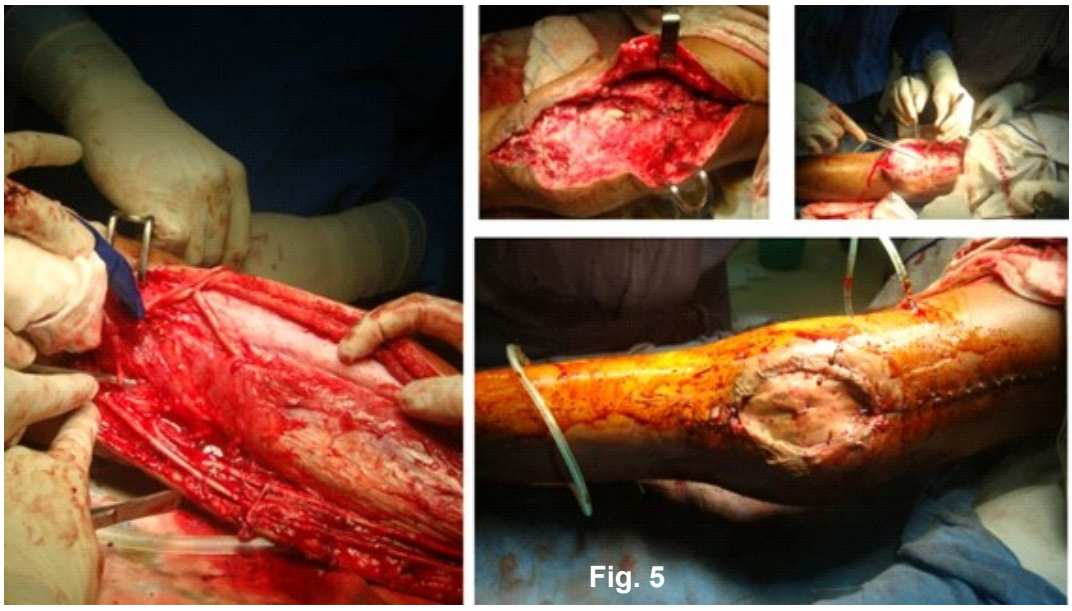
First the patient is taken for primary debridement of the wound to OR and the resident finds a big wound of 8x8 cm and a defect in the extensor mechanism around 10x12 cm (fig 4). The extensor mechanism above the patella is irreparable and the existing edges are not opposing finds himself in a dilemma **What to do now??**


Fig. 4

The resident is completely down and doomed. He approaches the primitive plastic surgery dept at the institute who does only split skin grafting for any defect whatsoever the bed is may it be bone, tendon or soft tissue. The resident is not happy with their opinion and starts to look at the literature online to find something close to this sort of scenario. Luckily he finds an article by Dr Thilak jepegnanam from CMC,Vellore and rings him to discuss the case (1,2). The resident takes all the relevant literature to the boss and convinces him about the reconstruction procedure. Luckily the boss agrees to it as the residents at the institute have preliminary experience with gastrocnemius flaps to cover the soft tissue defects of tibia.

After a few dressings for the patient in the ward, the wound is healthy and the stage is set for reconstruction. Surgery was performed, Lateral gastrocnemius muscle is only selected for coverage leaving aside the medial gastroc as the postero medial aspect has already been approached once. A posterior midline incision was taken and common peroneal nerve was isolated along with sural nerve and small saphenous vein, these serve to identify the midline raphe. The lateral gastrocnemius muscle was dissected up to its origin from distal femoral condyle and lifted up from it to gain length. The muscle flap is turned 180 and tunneled to cover the defect. The extensor mechanism edges are sutured to the muscle flap to obtain full coverage and the flap surface is covered with split skin graft (fig 5).

Wounds healed well in post op, all fractures united and at six months follow up 10-100 ROM was achieved. The patient walks well and resumes his daily routine activities (fig 6).



That was the last surgery the resident performs at the institute and he moves on with a lot learned from his final case. The identity of the resident and boss are not revealed.

Conclusion :

Basic tenets have to adhered to like distension of joint before manipulation and customizing the postoperative protocols depending on the case

scenario. Surgical training might be hard in India but it makes the trainees tough enough to deal with a huge volume of patients alongside any complications if they happen. Online literature opens one eyes and gives an opportunity to deal with similar case scenarios contacting the authors when in doubt.

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From Mangled to Mended-Endurance of Bone in Open Complex Proximal Humerus Fracture

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Abstract :

We report a 25 year old gentleman who presented semiconscious to our emergency department with a history of road traffic accident. ATLS protocol was followed. The patient's hemodynamic status was normalized, and the patient was carefully examined. His polytrauma injuries included diffuse axonal head injury, Grade III A open comminuted right proximal humerus fracture, undisplaced right scapula fracture, Grade IIIA open right radius fracture, multiple facial fractures and pneumomediastinum. After initial resuscitation, we reconstructed his proximal humerus with a proximal humeral locking plate and non vascularised endosteal fibular strut.

Unfortunately, the patient fell from a bike seven months after the index surgery and fractured his humerus along with the endosteal fibular strut. He was operated again after ruling out infection and fixed with a long 4.5 locking compression plate and bone grafting. Implant removal was done after bony union as he developed a discharging sinus over the shoulder one year after his second surgery. This particular case presented challenges as soft tissue, bone and joint were severely affected at the time of injury and the management protocols were tailored according to the need of the hour based upon the current literature.

Introduction :

The incidence of proximal humerus fractures is 4-6% of all fractures[1].Open proximal humerus fractures are relatively rare and significantly the whole scenario changes in polytrauma and poses a very serious problem. In proximal humerus fracture the reconstruction of soft tissue, bone and joint is essential for best functional outcome. Surgical treatment choice is mostly dependent on the surgeon's interpretation of the type of fracture, open or closed injury, degree of comminution and displacement, bone

quality, and comfort level with a particular technique. In addition, patient's functional status and expectations play a large role in decision making.

Case Reports :

We present a case of a 25 year old young male patient who sustained a high energy-poly trauma with diffuse axonal head injury, Grade IIIA open comminuted right proximal humerus fracture with metadiaphyseal bone loss, undisplaced right scapula fracture, Grade IIIA open right radius fracture, multiple facial fractures and pneumomediastinum. ATLS protocol and guidelines were followed in evaluation and resuscitation[14]. There was no associated neurovascular injury. He was intubated and after correcting lactate levels, we planned for debridement and skeletal fixation.

Preoperative Radiographs :

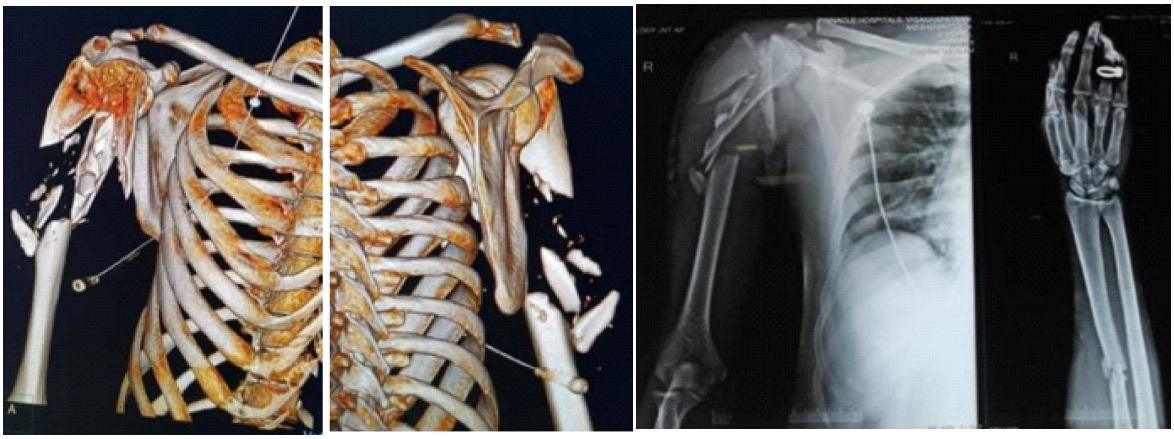


Fig. 1. (A) X-Ray radiograph of the right shoulder and right forearm
Fig. 2. (B) CT 3D reconstruction of the right shoulder showing

Showing a comminuted complex proximal humerus fracture with comminuted complex proximal humerus fracture with metadiaphyseal bone loss and fracture middle 1/3rd of right radius. Metadiaphyseal bone loss

Pre Operative Wound Photo :

Fig. 3. Sutured wound of Right shoulder.

Fig. 4. Open wound Right forearm

Procedure :

The Patient was positioned supine, we meticulously debrided the wounds. Through deltopectoral approach, proximal humerus open reduction done; greater tuberosity was positioned just below the articular margin of the humeral head [5] and preliminarily fixed with k wires. Tagging sutures[4] were applied for rotator cuff [8] and were anchored to the plate after final fixation .Multiple lag screw fixations done for diaphyseal fragments .For metadiaphyseal bone loss ipsilateral non vascularised fibular strut allograft harvested for endosteal grafting[2] and longitudinal slit was given on either side of the fibula for intramedullary incorporation. Philos locking plate was positioned below the greater tuberosity and posterior to the bicipital groove with k wires. Calcar screws play a major role in preventing varus collapse. In our case fibular strut graft [3] came in the aid of varus collapse and bone loss. Final fixation with locking and cortical screws[5] done under fluoroscopic guidance .wound closed in layers and proximal raw area covered with split thickness skin grafting. Patient improved clinically and was discharged in a stable condition.

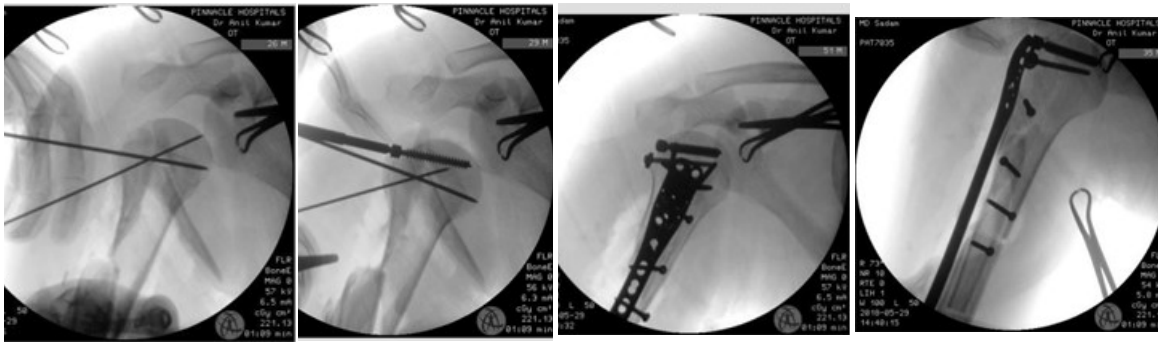


Fig. 5. Per operative fluoroscopic images showing the sequence of fixation.

Post Operative Wound Photo :

Fig. 6.Fibular strut graft with longitudinal slit for intramedullary incorporation.

Fig. 7. Right shoulder

Fig. 8. Right forearm

Fig. 9. Immediate post operative radiograph.

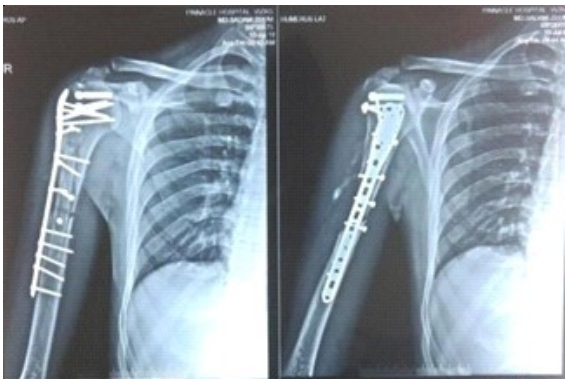


Fig. 10. 6 months post operative radiograph

He was under regular follow up. Improved well, achieved near normal range of movement[7] at 6 months after surgery.

7 months post op, patient had a fall from two wheeler even though he was advised not to do so as the bone is still short of complete consolidation .Radiographs of the right arm showed bent implant with refracture at the middle 1/3rd of fibular strut .Total leucocyte count, Esr and C reactive protein preoperatively were found to be within normal limits. [6]

Fig. 11. Range of movements of right shoulder after six months of surgery

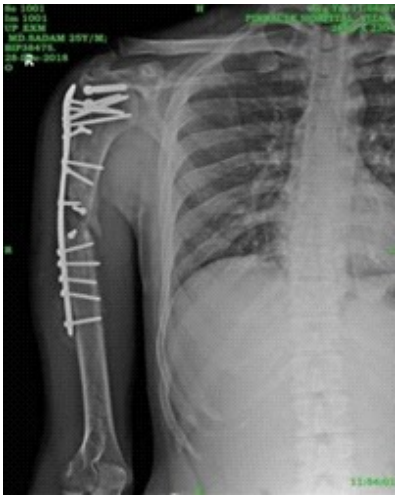


Fig. 12. Radiograph showing refracture with bent implant.

Fig. 13. Radiograph after one month

He underwent implant removal; intra operatively found no signs of infection with good bleeding bone edges. Hence open reduction and internal fixation with 4.5 locking compression plating for the right humerus was done. Cancellous bone graft [9] was packed at the fracture site, which was harvested from the right iliac crest.

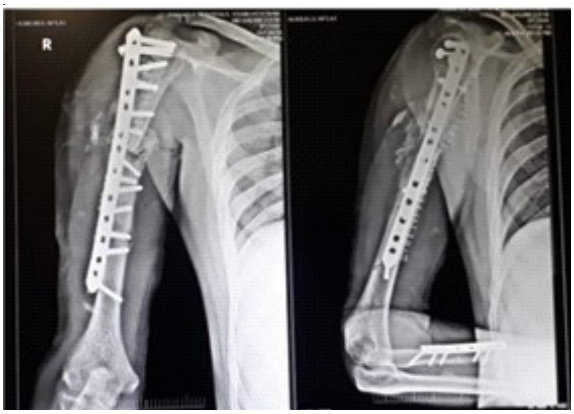


Fig. 14. Immediate post operative radiograph.

Post-operative physiotherapy was done and taught. Regular wound inspection and aseptic dressings were done. Stay in the hospital was uneventful and he was discharged.

Suture removal was done at 2 weeks. The patient was regularly monitored at 1 month, 2 months, 4 months, 6 months, 8 months, and 10 months post-operatively. Radiographs showed good bony union and clinically the patient had good range of movements.

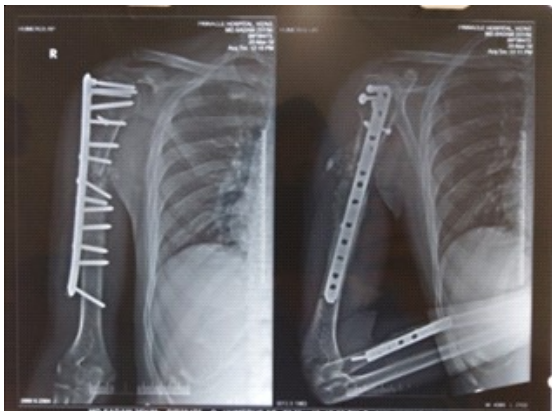


Fig. 15. Two months postoperative radiograph

Fig. 16. Four months postoperative radiograph

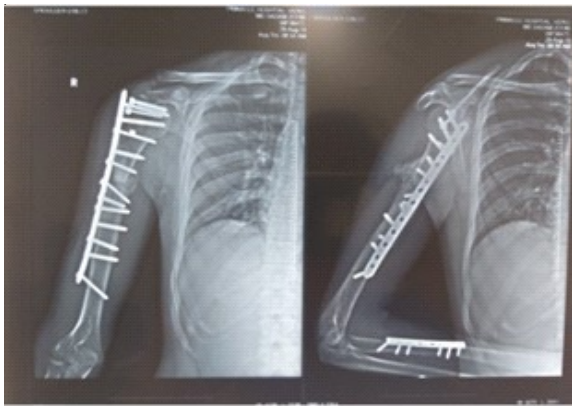
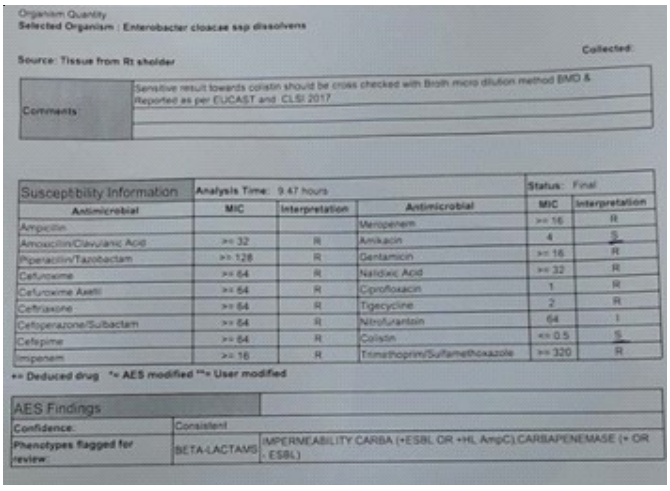


Fig. 17. Eight months postoperative radiograph

Fig. 18. Ten months postoperative radiograph

One year after the second surgery he presented with a sinus over the right shoulder with seropurulent discharge.

Fig. 19. Sinus at the right shoulder



Organism Quantity
Selected Organism : Enterobacter cloacae ssp dissolvens

Source: Tissue from Rt sholder

Collected:

Comments	Sensitive result towards colistin should be cross checked with Broth micro dilution method BMD & Reported as per EUCAST and CLSI 2017

Susceptibility Information	Analysis Time: 9.47 hours			Status: Final	
Antimicrobial	MIC	Interpretation	Antimicrobial	MIC	Interpretation
Ampicillin			Meropenem	>= 16	R
Amoxicillin/Clavulanic Acid	>= 32	R	Amikacin	4	S
Piperacillin/Tazobactam	>= 128	R	Gentamicin	>= 16	R
Cefuroxime	>= 64	R	Nalidixic Acid	>= 32	R
Cefuroxime Axetil	>= 64	R	Ciprofloxacin	1	R
Ceftriaxone	>= 64	R	Tigecycline	2	R
Cefoperazone/Sulbactam	>= 64	R	Nitrofurantoin	64	I
Cefepime	>= 64	R	Colistin	<= 0.5	S
Imipenem	>= 16	R	Trimethoprim/Sulfamethoxazole	>= 320	R

** Deduced drug *= AES modified **= User modified

AES Findings		
Confidence:	Consistent	
Phenotypes flagged for review:	BETA-LACTAMS	IMPERMEABILITY:CARBA (+ESBL OR +HL AmpC);CARBAPENEMASE (+ OR - ESBL)

Fig. 20. C/s and MIC report of the isolated organism.

Pus samples were sent for culture and sensitivity. We debrided the wound and excised the sinus tract which communicated only to the implant. Implant was removed[10] leaving three proximal screws which were buried inside the bone. Post-operatively, antibiotics were administered according to culture sensitivity and MIC report. Surgical site healed well.

Fig. 21. Immediate post operative radiograph

Fig. 22. Surgical site after suture removal

Patient was monitored at regular intervals, improved clinically and achieved near normal range of movements and he was able to do his activities of daily living and was back to his normal occupation.

Radiographs of the arm after 10 months surgery showed complete union and soft tissue status was also normal with no signs of infection.

Fig. 23. Range of movements after eight months of surgery

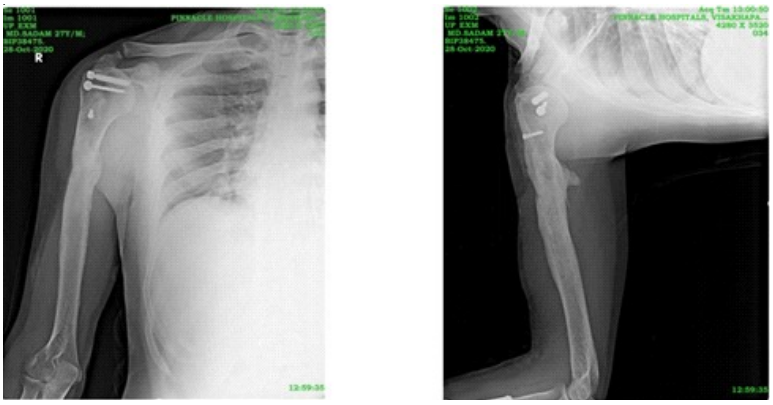


Fig. 24. Radiograph at 10 months after surgery showing good union.

Discussion :

The ultimate aim in treating any complex open fracture is to prevent infection with timely intervention, restore normal anatomy, soft tissue healing and aim to regain complete function. To achieve this, we need adequate debridement which leads to good soft tissue healing, near anatomical restoration by excellent fracture reduction and fixation ,prevent ,anticipate and treat the unforeseen complications and timely rehabilitation. All of these criteria were fulfilled in our case. The difficulty however for some injuries lies in the fact that no single method yields consistent results in different set ups and the methods are not without complications. However, a thorough knowledge of anatomy, biomechanics, implant choices, infection management should help us achieve the aim without having serious complications.For good bone healing adequate soft tissue preservation is the key. Internal or external fixation depends on the per-operative status after thorough debridement and wound cover. Achieving articular reduction and rotator cuff reattachment plays a major role in the functional outcome which was achieved in our case. Metadiaphyseal bone loss can only be dealt with allograft, autograft, Masquelet technique or optimal shortening [11, 12, 13]

Rehabilitation protocol[15] has to be customized depending on the goal of functional recovery through team approach in these types of complex injuries and should be well understood

both by the patient and the team.

Conclusion :

The uniqueness of this case was the patient, his bone and soft tissue which had endured extreme hardship over a period of two years. Scrupulous Preoperative planning, Timely intervention, Holistic approach, maintaining persistent hope to achieve bone healing even after facing complications resulted in accomplishing this excellent outcome.

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Standard vs Stand'Hard' : The application of PRISM concept in our case and its importance in our set ups

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Abstract :

We report a 17 yr old male who sustained blunt Polytrauma (Chest injury, Abdominal injury, Pelvic #, open Rt femur #, open Lt humerus # with vascular injury, Lt radius #) due to a fall from height . He was assessed and resuscitated with adequate adaptation of the ATLS guidelines and protocols. He faced the lethal triad of Hypothermia, acidosis and Coagulopathy and an additional set of insults in the form of infection and missed injuries. A complete holistic care by a team of Speciality Consultants with address to pro active strategies, anticipation of complications and timely interventions have finally paid results in the form of a patient who is back to normal function

Introduction :

Polytrauma is a challenging scenario and often the first responder or incharge consultant in many set ups is the Orthopaedician. We play a major role in providing care and most often we are the ones patients look upto for guiding their decision making. Hence, a thorough knowledge on Polytrauma, its physiology, and pathology the holistic approach and the current guidelines is extremely crucial for the patient care and outcome. It is with

this idea, we choose to present this case where in we tried to show our challenges faced, planning done, team approach and how we have overcome the hurdles.

Case report : A 17 yr old male was brought to our ER after being referred from another centre 3 and 1/2 hours after injury with an open thigh wound and a clinically evident femur fracture; an open wound over arm with skin loss, damaged musculotendinous units and a visible neuromuscular bundle with clots and a fractured humerus. An ER physician, Anaesthesiologist, Orthopaedician and General surgeon received him on arrival. ATLS protocols for assessment and resuscitation initiated . Primary Survey and resuscitation taken up. In view of the suspected vascular injury vascular surgeon was immediately summoned. His GCS was 15/15. Chest tenderness was present with crepitus. Respirations were normal. Per abdomen was tender. Pelvic tenderness present. Spine was cleared. The left radial pulse and finger movements were absent. The arm laceration was bleeding. A Moralle Lavelle lesion was noted on the right proximal thigh upto the loin. Extremities were cool and there were no other visible external injuries . His SPO2 on room air was 92-93%; BP - 92/54mm Hg ; RR -24/mt ; PR - 146/mt ; Foleys catheterisation done - No urine ; FAST revealed free fluid and pleural effusions ; Labs showed Hb-2.9 gm%, S.lactate - 4.0 mmol/l, Acidosis on ABG. Available radiographs showed Segmental femur # + Humerus # + Rib #s . Hence , a diagnosis of Polytrauma with hemorrhagic shock was made. Doppler was done and revealed a brachial artery injury. Patient was intubated and IV lines secured with two 16G cannulas. Fluid resuscitation started and after 2 units of crystalloids and 1 unit of colloid we received blood and transfusion was started with PRBC.



Preparedness for Massive Transfusion protocol was initiated . Arterial line was secured. After close to 30 min of resuscitation there was very little improvement both clinically and laboratory wise . The patient has all the risk factors for setting in of lethal triad and hence a decision to operate (Surgical resuscitation was made) . We collectively came to a conclusion that hemorrhagic shock was the major culprit and the vascular injury was mainly responsible and hence prioritised as the number 1 option for surgical resuscitation. Also there is the factor of acute limb ischemia in a 17 yr old. A debridement + vascular repair with interposition graft from Saphenous vein + shortening and fixation of humerus was done. Since femur fracture was an open fracture too, we decided to do a debridement and Ex fix for femur.

Coagulation parameters and ABG's were periodically monitored per operatively. They showed an increasing trend despite our resuscitation and Ionotrope requirement was increasing too. In view of this scenario, a probable further detoriation of patients condition was anticipated if we continue with the surgery.

And hence, only debridement was done for the femur and wound closed. Thomas splint was applied. Ionotropes were continued. Heparin was started for the vascular repair. Antibiotic coverage started for Gram +ve and Gram-ve organisms. Transfusion with blood products done (8 FFP; 4 Platelets ; 6 Cryoprecipitates; 6 PRBC). Urine pH monitoring started and CPK was sent for. CRUSH protocol initiated as it could contribute to the lethal triad. Bicarbonate infusion was started too.

During the later half of the day not much clinical improvement was seen, and he had increased creatinine levels and ionotrope requirement with no response in coagulation parameters. Now, he was mobilised to whole body Ct scan for search of any other source of bleeding which had been missed. Chest showed pulmonary contusions and moderate effusions; Abdomen showed liver contusions and hemoperitoneum; Pelvis showed undisplaced acetabulum and pubic rami fractures; Spine showed transverse process fractures. Brain was a normal study. Expectant management was planned for everything. Resuscitation was being continued and the patient was on continuous monitoring with ABG, temperature and Coagulation profile.

Over the next 48 hrs mild to moderate response was noticed in some areas like ventilatory requirement and ABG and no response in some areas like coagulation status and urine output . Feeds have been started. Same treatment was being continued and a thorough secondary survey done. A closed left radius shaft fracture was picked up. Over the subsequent 48 hrs we noticed some improvement (U/o increased to 1.0ml/kg/hr; S. Lactate <2.0mmol/l; Sys >90mm and MAP 65 ; least inotropes; improved acidosis) . So, femur surgery was planned since it was already Day 5. A chest tube was inserted. Under GA, a recon nailing for femur and plating for radius done. Extubated post op. Four days post-surgery, continuous high-grade fever and discharging thigh wound was present. Cell counts elevated. Debridement and Ab beads placement was done. Cultures sent.

The antibiotics changed to culture guided drugs. Despite this over next 48 hrs pt continued to have high grade fever and elevated counts. Urine, blood, sputum cultures and wound swabs sent. All this while limb, chest and in bed physiotherapy was being done.

Culture guided combination antibiotics were started. High protein oral diet started. De escalation of antibiotics done from day 14. Anti - Pseudomonal drugs were continued for another week and patient was planned for discharge 5 weeks from admission.

At the first follow up visit (3 weeks from discharge) wounds healed well. Some movements possible with fingers but sensory loss noted on arm and proximal forearm. Anticoagulation and Vasodilators were continued. Patient regained full ROM at knee. However, hip ROM was painful and limited. At 6 months follow up patient was still having sensory loss at arm and no active shoulder and elbow movements. On evaluation found to have a Brachial plexus injury which was not detected earlier. This was addressed at another centre.

At 2 and half yr follow up patient had a good functional outcome and is currently pursuing course at NIT. All fractures united. Implant exit done. Upper limb function is reasonably normal too.

Discussion :

Polytrauma in our country and region is not so uncommon. Even earlier data suggest a RTA every 3 minutes and a death due to it every 10 minutes. This has only increased with further urbanisation. The very fact that it leads to rapid systemic inflammation and multi organ

failure if not addressed promptly is what puts Polytrauma as one of the leading killers. If we introspect and analyse our own experience during our evolution to a specific level of practitioner most of us would realise a heterogeneity in Polytrauma care across various set ups. According to M.K. Joshipura et.al Trauma care systems have not matured in India and are even at a primitive stage in certain areas. There are lacunae in many administrative, clinical, operations and formulating future directives. One of the major problem when it comes to providing care, we are either not completely knowledgeable about the guidelines and a team approach, or we fail to adapt them to our set ups.

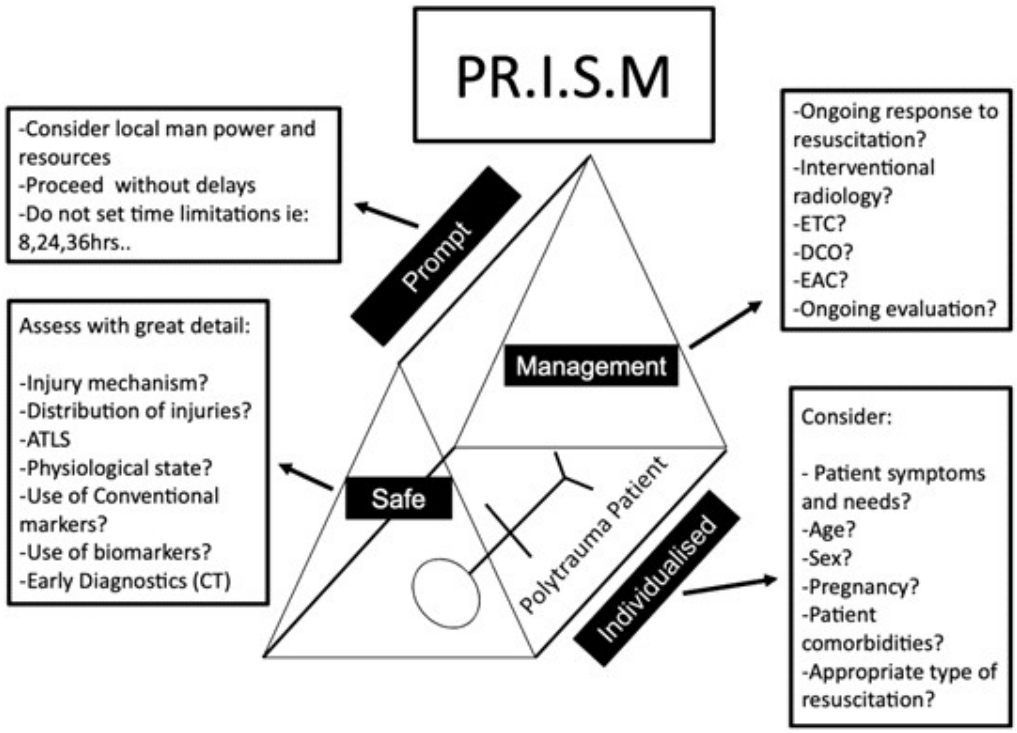
Another very important drawback are the pre hospital services. The evacuation of a trauma victim and transfer to a particular centre are often made at the behest of patients attendants or some other significant people and factors considered as we all know are seldom care guided. Let us not forget, these are most often made by taking their time and theoretically speaking Golden hours are very rare. Our set ups are varied, resources are varied and operational logistics are varied when compared. Except may be in few institutes (both govt and private) and highest order corporate set ups a dedicated trauma team concept is non-existent. The trauma care systems of developed countries which are used as yardsticks for care are continuously evolving regarding early total care, damage control or early appropriate care etc. This only adds to the complexity of our problem. Adapting something which is continuously in debate to our set ups is even more difficult.

In view of the above background we felt that it is best to adapt the PRISM concept suggested by Peter.V. Giannoudis et.al. It is not a fixed concept but it stands for **PR**ompt **I**ndividualised **S**afe **M**anagement. The idea is to fulfil 3 principal aims : 1. Save patients life 2. Do no harm 3. Apply your available strategies in the best interest of the patient. An easy way to do this is, assess our resources and facilities , designate a team of responders, formulate a basic in house protocol of evaluation, resuscitation and management and follow this protocol.

Considering facts in our case, if we categorise him into a specific pathway as described by various guidelines then we tend to see many flaws. But the outcome

says otherwise. This is because we were able to give a prompt patient specific care. According to a specific guideline this patient was an ideal candidate for whole body CT scan . But, in view of CT scan being present in another building and the probable time we would have wasted we made clinical and FAST assessment and acted accordingly. It has been recommended to monitor coagulation by Thromboelastogram as it gives real time assessment given that coagulopathy in Polytrauma is a rapid and dynamic process and our routine lab monitoring would not indicate the exact current status. However, once again we monitored using APTT. PT , INR, platelets and clinical assessment. It was recommended to use IL 6 for best assessment of the immune response. We were not using IL -6 but instead we monitored him with S.lactate, pH, acid base balance, clinical parameters like BP, Hb% etc and also considered his injury pattern, age , treatment given and a probable response incited. We were not having an in house blood bank (which is common thing in many major set ups across our region) and hence depending on his clinical scenario we activated Massive transfusion protocol on arrival itself and could procure the required components well in time. It is recommended to transfuse 1:1:1 and we were close to it but not exactly 1:1:1 and still because of proper monitoring we could avoid any transfusion induced coagulopathy. There is a minimal debate on complex reconstructive procedures in unstable patients but given his age and upper limb we went ahead with the procedure. On day 5 where he was starting to respond given his age and fracture pattern we did a definitive fixation for femur too. And since he was maintaining per op the radius fracture was fixed too. We sent prompt cultures from wound and once we had only a minimal response we sent for other cultures. We did miss a Brachial plexus injury, but was addressed in time helping the patient recover with good function.

We felt that adopting the dogma of PRISM for Polytrauma management as suggested by P.V. Giannoudis et.al is a much needed strategy for our set ups. Any algorithm should do fine as long as it is in line keeping with the specific clinical and physiological parameters the patient in front of us presents with. We utilised whatever was available in our armamentarium. Our positives were : 1.



From P.V. Giannoudis et al/ Injury, Int.J.Care Injured 48(2017) depicting PRISM concept

We had a dedicated in house 24*7 team of qualified ER physician, Anaesthetist, Orthopaedician, Neurosurgeon, CTV surgeon and General surgeon 2. We had a protocol for receiving, evaluation, resuscitation and monitoring which suits our specific set up 3. Timely use of available resources 4. Clinical decision making 5. Interdepartmental discipline and communication 6. Dedicated Intensivist and importantly 7. Very supportive parents of the patient. We however, had few lacunae : 1. CT scan in another building 2. No in house blood bank 3. No latest labs like TEG, IL-6 etc. Despite the lacunae, we could strike a balance by being prompt and delivering a patient specific resuscitation with timely use of available resources because of our protocols.

This only highlights the point that if we consider the fact that every patient is different, behaves different and the services offered to him are different, together with adequate knowledge we can achieve good results in Polytrauma.

To sum up our case - we continuously monitored the patient for lethal triad (hypothermia, acidosis and cagulopathy) and even though all three started to establish during some point of the treatment timely and certain pro active strategies coupled with delivery of definitive care as and when required using a team approach helped us achieve the goal.

Conclusion :

Trauma care continues to suffer in some of our set ups owing to various reasons. Polytrauma is further more challenging. With this background if we start categorising Polytrauma patients into specific pathways , the importance of patient specific treatment is overlooked. Each unit should utilise whatever they have available and develop a institutional protocol.

This should be done to simplify each individual evaluation and to standardise on a best applicable criteria and approach for assessment, evaluation , resuscitation and management . Safety of the patient should remain our sole priority and direct comparisons of protocols in different health care systems should be more constructive rather destructive. The concept of PRISM could be a game changer for Polytrauma care and this should be the unified concept and new language of surgeons involved in trauma care across various set ups. This would help us in designing individualised approaches using fixed institute and resource driven protocols and thereby minimising risk of unpredicted complications and mortality. This case was presented as an attempt to highlight the same.

Lastly, more and more presentations of such case and management scenarios on platforms (print, podium, audits etc) like our regional, state, national conferences and expert panels is need of the hour to identify our lacunae and continuously improve.Its not just the standards but the way we Stand hard on our ground is what matters.

Our thanks to our team : Anaesthesiologists - Dr Prasanthi, Dr Sathi Reddy; CTV surgeon - Dr Ramana Kumar ; Plastic surgeon - Dr PRK Prasad; General surgeon - Dr Raja ; Intensivist - Dr MAN Rajsekhar and Neurosurgeon - Dr T Suresh.

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Physeal separation of Distal humerus in a 2 year old child - a rare and an often missed injury

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Abstract :

Due to the cartilaginous nature of lower end of humerus in young children fracture patterns like physeal separation are often missed or misdiagnosed as elbow dislocations. This causes delay in management leading to physeal disturbances and residual deformity. We describe a rare case of distal humerus physeal separation in a 2 year old child which was treated by closed reduction using arthrogram and percutaneous pinning and we further discuss the proper technique of an elbow arthrogram and radiological cues for identifying a physeal separation.

Introduction :

Elbow fractures are common injuries in children, among these injuries supracondylar humerus fractures and lateral condyle fractures are more common(1) and are usually easy to identify. However physeal separation of distal humerus (PSDH) is an uncommon variety of elbow fracture that is often missed or misdiagnosed as elbow dislocation. Interpretation of pediatric elbow x-rays especially less than 3 year old is often difficult owing to the unossified cartilaginous region of elbow.

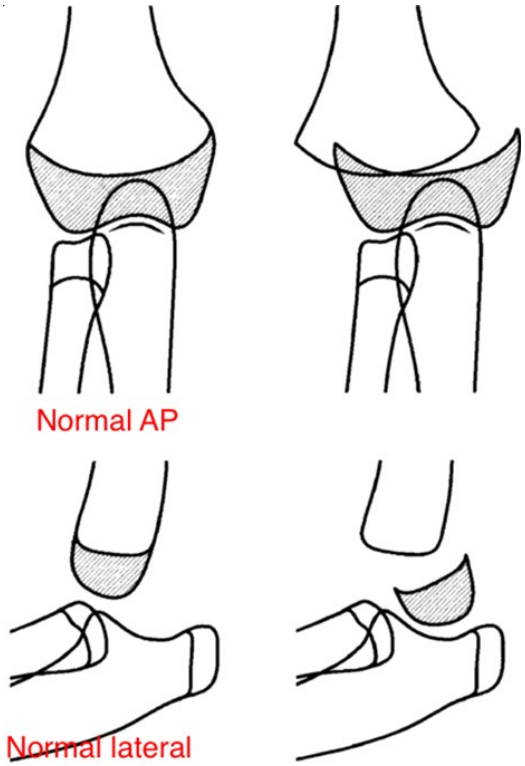
Missed PSDH often lead to cubitus varus deformity and appropriate management would include arthrographic evaluation and pinning,

Case report :

A 2 year old female kid presented with history of fall on outstretched hand, she initially went to a local hospital where she was immobilized by an above elbow slab. On examination there was swelling over entire right elbow and there were no neuro vascular deficits.

X-rays were done which showed no obvious fracture lines but there was medial translation of ulna and radius. (Figure 1)

Figure 1 – AP and lateral xrays at presentation showing medial shift of forearm in relation to humerus



A diagnosis of physeal separation of distal humerus was made and the child was prepared for emergency closed reduction and pinning.

Elbow was reduced by applying gentle traction for few minutes and any obvious mediolateral translation was corrected, elbow was flexed similar to the method used for reducing supracondylar humerus fracture.

Urograffin 76% dye (Diatrizoate meglumine and Diatrizoate sodium) was taken and diluted to 1:3 ratio with normal saline. Post reduction arthrogram was done using posterior trans triceps approach. With arm provisionally reduced and flexed needle was placed just proximal to olecranon and once the needle hit the bone it was gently retracted and a small amount of dye was injected under C-arm control. After arthrogram distal humerus was outlined and the reduction was found to be satisfactory in anteroposterior(shoot through view) and lateral imaging.(Figure 3, Figure 4). Reduction was fixed with 2 divergent 1.6 mm K-wires with entry from capitellum.

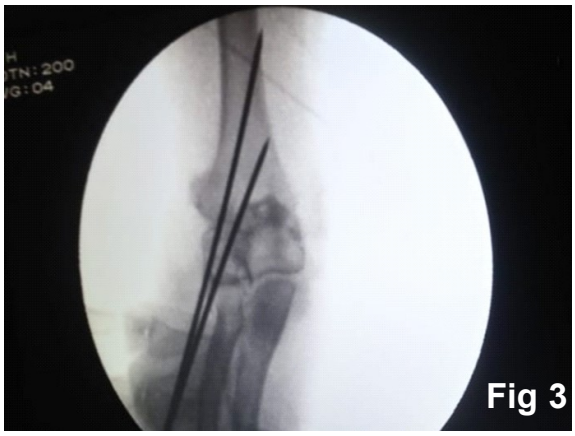


Fig 3

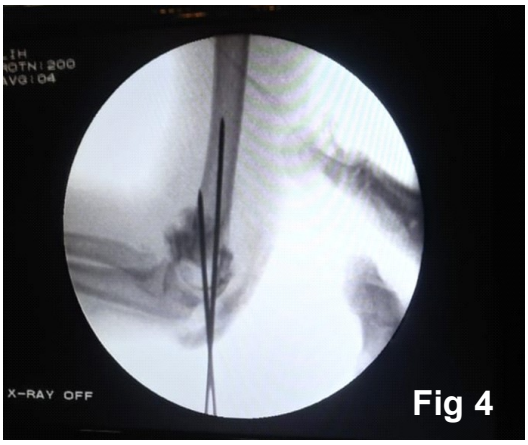


Fig 4

Radial pulse was checked intraoperatively.

Postoperatively elbow was immobilized in above elbow slab, which was changed to a cast after 3 days.

Cast was applied for 4 weeks duration and elbow was mobilized later. At 6 weeks the carrying angle was normal and there was no functional limitation (Figure 5).

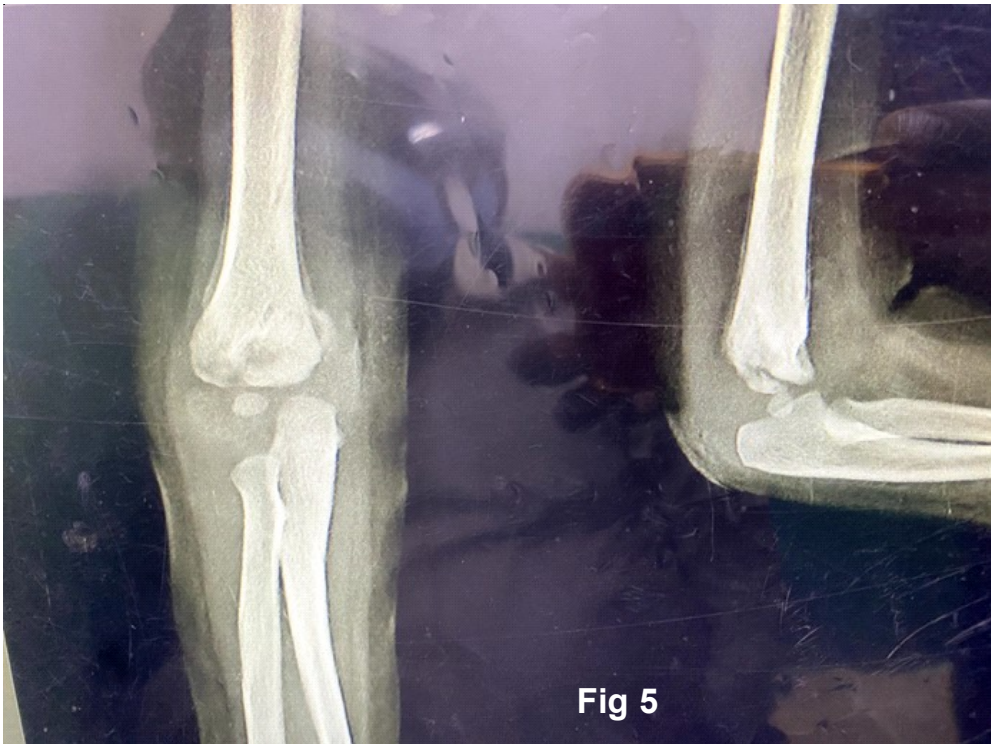


Fig 5

Discussion

Elbow dislocation almost always never happens in children less than 3 years as with any mechanism of injury humeral physis which is a weaker portion when compared to bone ligament interface gives away first.(Figure2). PSDH bears a lot of similarity with supracondylar humerus fractures with only difference being the fracture line passing through physis instead of bone. Posteromedial displacement is most common and anteriorly displaced physeal separations rarely occur when mechanism of injury is a direct blow to the posterior elbow. Non-accidental injury should be considered as an etiology in such unusual displacements. (2)The importance lies in the fact that PSDH is often missed which causes delay in diagnosis and management. This delay may lead to cubitus varus(3) which is more common than in supracondylar humerus fractures and medial humeral condyle AVN.(4)

A high index of suspicion is needed when evaluating elbow x-rays in younger children especially when there is significant swelling or when fat pad sign is positive. Key to the diagnosis would be Anteroposterior x-rays which show medial shift of ulna and radius and lateral xray showing posterior displacement of olecranon in relation to humerus. In simple terms the forearm is usually not aligned with humerus. Presence of capitellar ossification eases the diagnosis as it is aligned to radius but capitellum is not in alignment with lateral flare of distal humerus. This distinguishes PSDH from true elbow dislocation.(Figure 3)

Its always better to obtain radiographs of opposite elbow for comparison and if theres further dilemma ultrasound is a noninvasive and easy imaging that can help in identifying the separation.(5)

Any physeal injury is a semi emergency and has to be reduced as soon as possible if not immediately. Most authors recommend to avoid late manipulation(more than 4-7 days) to prevent iatrogenic growth disturbances. This is in contrast to supracondylar humerus fracture which can be reduced even at 7 days and primary concern would be myositis rather than growth disturbance.

Delay of diagnosis and neglected PSDH often doesn t result in functional

loss but however may lead to cubitus varus deformity. This cubitus varus seldom corrects on its own and hence would eventually need an osteotomy.

Arthrography helps in delineating unossified structures and help in assessing reduction intraoperatively. Use of arthrographic technique for reduction and fixation using either pinning or overhead traction give excellent results.(6) Even in the absence of arthrography setup closed reduction to a valgus carrying angle and pinning gives good results.(7)

PSDH of newborn are rare entities often due to obstetric trauma, theyre much difficult to recognize when compared to younger children as the capitellum is not ossified till 3 to 9 months age(8)(9). Ultrasound or MRI are often needed in newborns when the diagnosis cant be made.

Conclusion :

PSDH is a rare elbow injury in children less than 3 years that is often missed and needs a high index of suspicion. Medial shift of forearm in relation to humerus in an anteroposterior x-ray is a reliable sign to diagnose PSDH. Delay in diagnosis or missing this injury often leads to cubitus varus deformity, which can be avoided by closed reduction and pinning. Arthrographic evaluation intraoperatively is an easy technique and helps a lot in assessing postoperative reduction.

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