Gujarat Orthopaedic Association

An affiliated chapter of INDIAN ORTHOPAEDIC ASSOCIATION I Regd. No. E/13423

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FROM THE PRESIDENT'S DESK

Dear Members and Colleagues,

I am thrilled to announce the third issue of the Gujarat Orthopaedic Association's eBulletin. As the President of our esteemed association, it is both an honor and a privilege to witness the continued growth and dedication of our members.

In this issue, you will find a wealth of knowledge, insights, and updates from the world of orthopaedics. Our dedicated team has worked tirelessly to curate content that will enrich your professional journey and keep you abreast of the latest developments in our field.

I encourage you to explore the articles, case studies, and research papers featured in this eBulletin. Let it serve as a platform for collaboration, learning, and networking among our members.

Your active participation and contributions have been the cornerstone of our association's success. I extend my heartfelt gratitude to each one of you for your commitment to advancing orthopaedic care in Gujarat.

As we move forward, let us continue to work together towards our shared mission of enhancing orthopaedic healthcare, improving patient outcomes, and fostering a strong sense of community among orthopaedic professionals in Gujarat.

Thank you for your unwavering support, and I look forward to your continued engagement with the Gujarat Orthopaedic Association.

Wishing you all a successful and fulfilling journey in the world of orthopaedics.

Warm regards,
Shrinivas Rao
President - Gujarat Orthopaedic Association

FROM THE DESK OF SECRETERY

The third edition of e-bulletin of GOA is now ready to be launched. The scientific content in the previous two editions has been scintillating and stimulating. The dedication and dexterity in planning and implementing this nouveau activity has been top class.

This edition is a collection of meticulously selected articles, case presentations and a thought provoking review article. The cocktail of academic information expertly amalgamated by the guest editor Dr. Umang Gandhi from Vadodara will showcase the technical skills and scholastic acumen of our Vadodara colleagues. You would certainly appreciate the sincere efforts of all the contributors who have done a marvellous job of presenting their interesting and innovative analytical work. After Rajkot and Ahmedabad team's superlative endeavour, I am sure the vibrant Vadodara vibes will be as invigorating.

Of course, as usual, the coordination and streamlining by the ever- ready and dynamic duo of Dr. Ketan Shah and Dr. Pareen Kantesaria has been diligent and importantly very punctual. To meet the expected deadlines of publication is an achievement in itself. Kudos to them.

Once again, would request more and more colleagues to keep reading and inculcating these fantastic scientific materials by our own friends. Please do take time to offer positive suggestions and feedbacks for improvement. This is a honest urge to all! We can all do better once we join hands and strive to thrive within our chosen and loved field of Orthopaedics. There's that constant thirst to learn and relearn our ideas and expertise to become more proficient and create a win-win situation for all of us.

We have put up the previous 2 issues of our e-bulletins on our website- ***www.gujortho.com*** for quick reference and detailed perusal. It would be worthwhile to visit our website for other updates and activities also- especially the Osteoporosis drive which is a project, near and dear to our President Dr. Shrinivas Rao; once again with exemplary involvement by the Executive Committee in their respective zones we have attained commendable success.

We have revived and rejuvenated the Mid Year meet of GOA which will be held at Rajkot on 8th October with 'ELBOW trauma and more' - being the theme under the stewardship of the avid academic enthusiast and EC member Dr. Pranav Shah who is leading a team of eminent speakers who will share their knowledge on ELBOW. Be there- it's a typical Kathiawadi invitation adorned with the sin qua non hospitality!

We have two more scientific jackpots coming up in near future- (1) HTO seminar led by Dr. Dinesh Thakkar at Rajkot (2) Pathological fractures in Children, adults and senior citizens led by Dr. Jaymin Shah at Ahmedabad. Keep in touch for details and do visit and revisit our website for updates.

GOA is the happening place! It's rocking!!

Dr Ketan Thakkar

Secretary - Gujarat Orthopaedic Association

GUEST EDITOR MESSAGE

My Dear GOA members

Elbert Hubbard, famous American writer and philosopher said - "An editor is a person who is employed by a newspaper whose business is to separate the wheat from the chaff, and see that the chaff is printed"

It is an honour for me to be invited as a guest editor for this edition of the e-bulletin of GOA. The ball was set rolling by the Rajkot team and then, kept in play by Dr Dhirenbhai and Ahmedabad team. The Baroda team has tried to keep up with the lofty standards set up by the preceding editions and hope that it matches the expectations of all readers.

I sincerely thank all those who have contributed for this bulletin. There is a plethora of work being done in different parts of Gujarat and this forum is an ideal ground for budding as well as established talents to showcase their expertise and skills. Learning is a continuous process and this endeavour from GOA is beneficial to all its members.

Tiffany Madison remarked - "While Writing is like a joyful release, Editing is a prison where the bars are my former intentions and the abusive warden my own neuroticism".We received articles from different corners and selecting and editing was a tough exercise. There were legitimate constraints of space and limitations with regards to the number of articles and hence, some noteworthy articles could not be included. Suitable care has been taken to include contributions from different specialities of Orthopaedics.

I hope that this bulletin is useful to the end user - the members of GOA who read it.

Warm Regards

Dr Umang Gandhi

Review Article

Insight into 3D Printing in Foot and Ankle Disorders

Dr. Rajiv Shah
Dr. Vaibhav Mohanty

Abar B, Kwon N, Allen NB, Lau T, Johnson LG, Gall K, Adams SB. Outcomes of Surgical Reconstruction Using Custom 3D-Printed Porous Titanium Implants for Critical-Sized Bone Defects of the Foot and Ankle. Foot Ankle Int. 2022 Jun;43(6):750-761.

The article focuses on critically sized defects (CSD). CSDs are bone voids that exceed the body's natural ability to heal. CSDs in foot and ankle orthopaedics could be because of trauma with bone loss, non-union following prior surgical fixation attempts, avascular necrosis, Charcot arthropathy, failed total ankle replacements, debridement following osteomyelitis or correction of congenital deformities.

The article demonstrated a promising potential solution in the form of 3D printed porous titanium implants. 3D printed implants offer advantages like the ability to provide the exact, patient-matched size and shape needed to fill the CSD with improved structural integrity over allograft bone, lack of invasive harvesting of a patient's own tissues, to carry and deliver biological agents to the surgical site and a single operation with shorter anaesthesia time.

In the present study out of 39 patients who underwent surgery using 3D printed porous titanium implants (midfoot wedge/ navicular replacement cage/ hindfoot wedge/ talus replacing sphere/ tibial and talar replacement tower/ intratibial cage/ tibial replacement tower), only 26% of the patients required the removal of the 3D implant because of non-union (both septic and aseptic) showing a statistically significant success rate of surgeries.

Mu MD, Yang QD, Chen W, Tao X, Zhang CK, Zhang X, Xie MM, Tang KL. Three dimension printing of talar prostheses for total replacement in talar necrosis and collapse. Int Orthop. 2021 Sep;45(9):2313-2321.

The article focuses on Total Talus Replacement (TTR).

Cases with talar necrosis and collapse diagnosed by symptoms (severe hindfoot pain, instability) and findings on X-rays, CT or MRI examination which have failed conservative treatment (oral drugs and physical rehabilitation for at least 1 year) were included in this study. Exclusion criteria were age less than 18 years, active osteomyelitis, inability to tolerate anaesthesia and surgery, severe osteoporosis and hindfoot deformity requiring other surgery.

3D printed talar prosthesis (shape and size designed by CT post-processing and mirror symmetry technology) was used in 9 such patients who reported good to excellent post operative scores regarding pain relief, activities of daily living, and return to recreational activities with statistical change in activity range. There is a good amount of preservation of subtalar and ankle joint movements which were otherwise getting sacrificed by the traditional method of arthrodesis.

One of the major drawbacks of using custom 3D printed implants is the cost and the time it takes to design and manufacture the implant.

Broadly in foot and ankle orthopaedics, 3D technology helps in cases with deformity, trauma, and bone loss.

Deformities

Deformities in the foot and ankle are unique in nature because of weight bearing function of the foot. Moreover, bones in the foot and ankle have typical shapes and sizes and are compactly positioned to produce multiple small but interrelated joints. Hence, even a single deformed bone will create a huge impact on surrounding joints thereby affecting weight bearing function of the foot. In developing countries, because of neglect by patients who continue to walk over a deformed foot and ankle; a long standing deformity will get converted into a multidirectional deformity which is in multiple planes. The 3D printed plastic bone model allows surgeons to carry out a rehearsal of surgery on a plastic bone model before actual surgery is performed.

Deformity Case

A 40-year-old female with a congenital deformity could never walk without the use of analgesics for the past two years. She presented to us for correction of deformity (Figures1a and 1b).



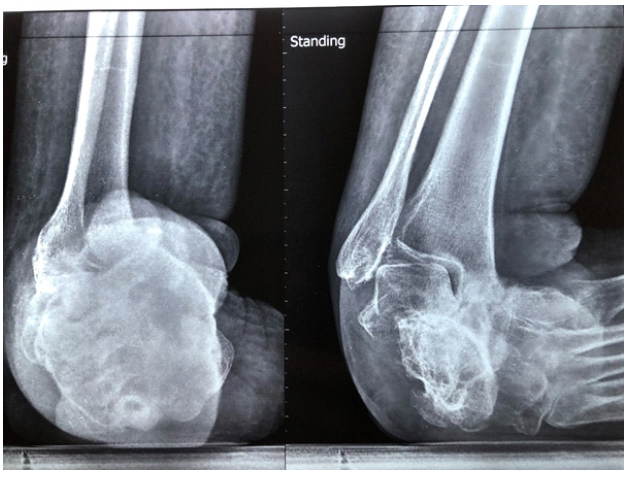


Figure 1a: Clinical pictures of case with multiplanar deformity.

Figure 1b: Weight-bearing images of the same patient.

A 3D printed bone model was created for a better understanding of this multiplanar deformity (Figure 2).

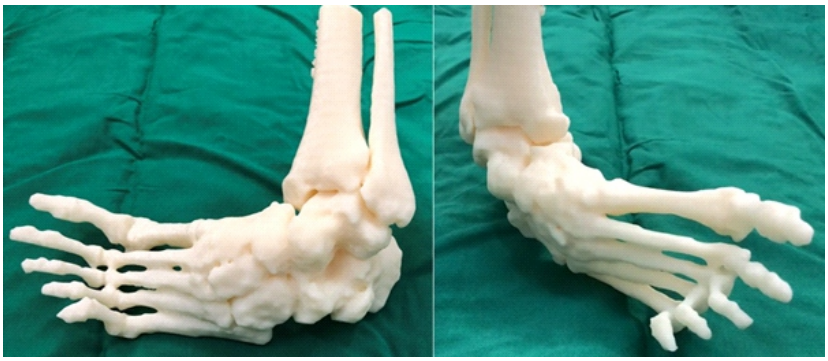


Figure 2: The 3D printed plastic bone model of the same case.
Rehearsal of surgery before actual surgery helped us to plan osteotomies to correct the deformity (Figure 3).

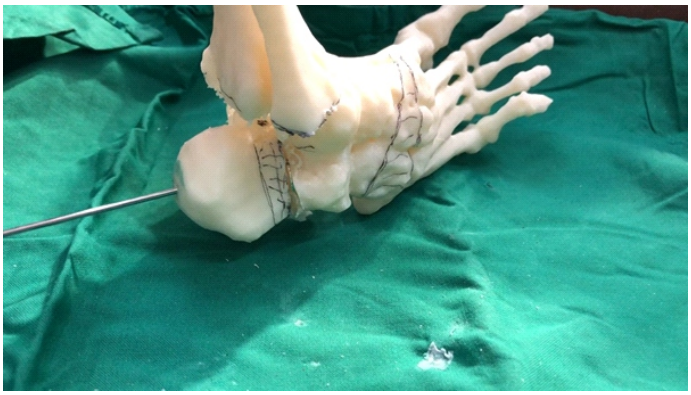


Figure 3: Marking of various osteotomies over the plastic bone model.
Deformity correction helped the patient to go back to her routine activities (Figures4a and 4b).

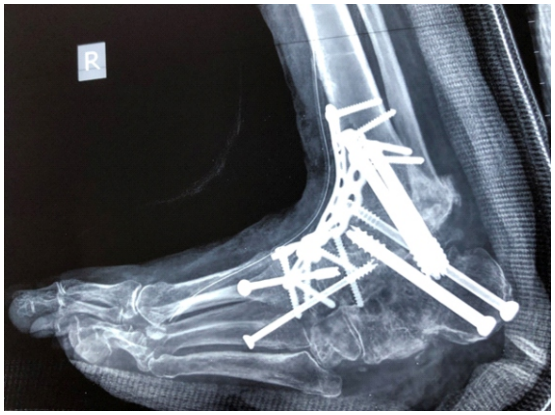


Figure 4a: Post-operative lateral radiograph of the same patient after corrective surgery.



Figure 4b: Immediate post-operative clinical pictures and weight bearing picture of the same patient.

Complex Trauma

For complex foot and ankle trauma management, 3D printing helps in two ways. Creation of a 3D printed model of an injured foot and ankle helps in the formation of patient-specific jigs over and above a better understanding of fracture geometry and planning of a surgical procedure (Figure 5).

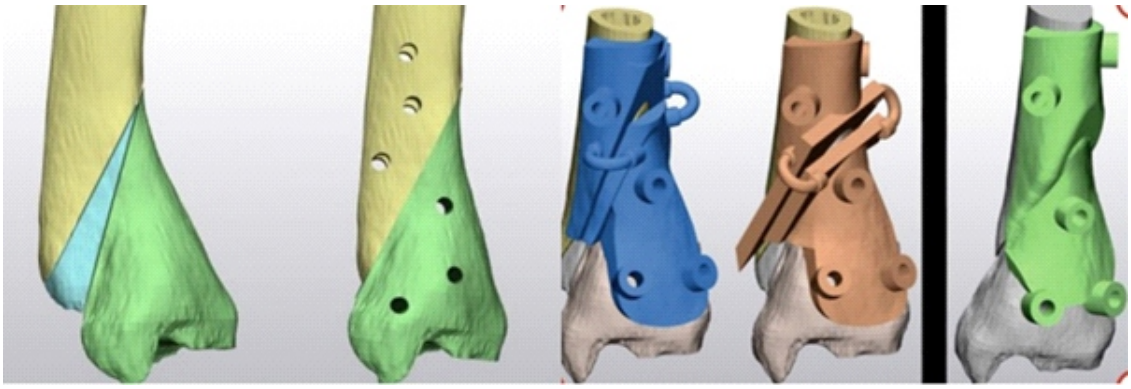


Figure 5: 3D printed model of a case with lower end tibia malunion where customised jigs for osteotomy were formulated with the use of 3D printing technology.

Bone loss

The field where 3D printing technology has made a huge impact is the management of bone loss. Bone loss in foot and ankle orthopaedics could be because of trauma, non-union, avascular necrosis, Charcot arthropathy, failed total ankle replacements, debridement following osteomyelitis or correction of congenital deformities. Patient-specific implants and jigs can be prepared for managing bone loss with arthrodesis. Reconstruction of talus avascular necrosis and talus malunion with a customised patient-specific total talus replacement (TTR) is the way forward (Figures 6a and 6b).

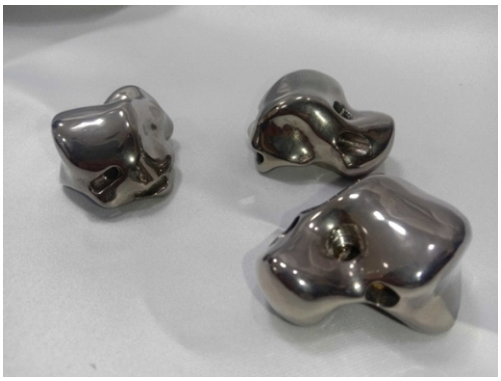


Figure 6a: Picture showing three different sizes of 3D printed total talus replacement (TTR) implants.

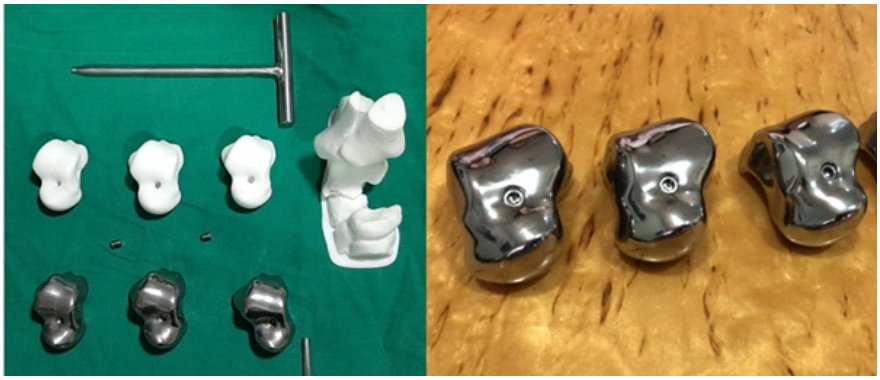


Figure 6b:A 3D printed plastic model of the ipsilateral ankle, trial plastic models and final TTR prosthesis are demonstrated.

A customised patient-specific ankle replacement (CTAR) is also possible and could be a boon in countries like India, where total ankle replacement implants are not readily available. The senior author has developed such a CTAR implant and is in line for patent registration (Figure 7).



Figure 7: Senior author's patient-specific, 3D printed customised total ankle replacement (CTAR) implant. The picture also demonstrates instrumentation, customised jigs, and implants for CTAR.

TTR for a trauma case

29 year old male patient with polytrauma had a compound wound over his left ankle with loss of talus bone. Debridement and spanning external fixation were done at the left ankle as an emergency procedure. The defect at the ankle was filled with a cement spacer (Figures8a, 8b and 8c).

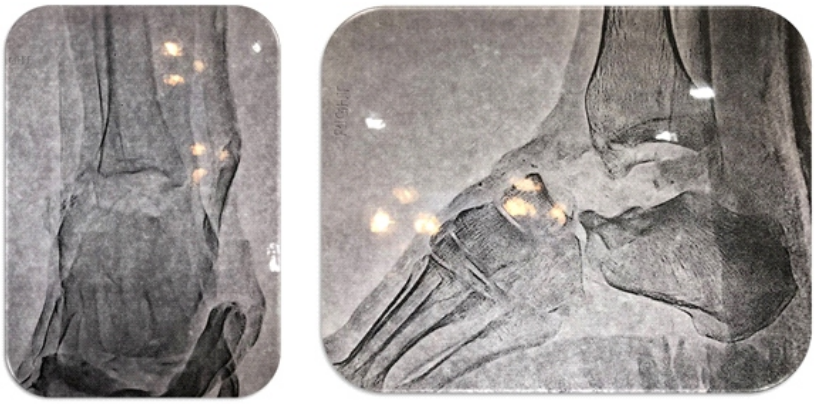


Figure 7a: Anteroposterior and lateral radiograph of the right ankle of the patient demonstrating lost talus.



Figure 8b: Anterolateral wound after debridement and cement spacer to fill up the defect created at ankle due to lost talus.



Figure 8c: Anteroposterior and lateral radiographs of the same patient treated with external fixation and placement of a cement spacer for lost talus bone.

Three days after the injury, relatives found extruded talus from the site of trauma, wrapped in cloth, and brought it to us (Figure 9).



Figure 9: Post cleansing picture of a lost talus bone brought from the injury site after three days.

Instead of throwing dirty extruded talus bone, we decided to get a CT scan of the extruded talus bone and got a 3D printed model. Six weeks post-trauma, once serology was normal and wounds healed; we implanted 3D printed talus in the ankle (Figure 10). Five years post trauma, the implant has survived, and the patient returned to all activities of daily living (Figure 11). The patient has preserved ankle movements with restricted subtalar movements.

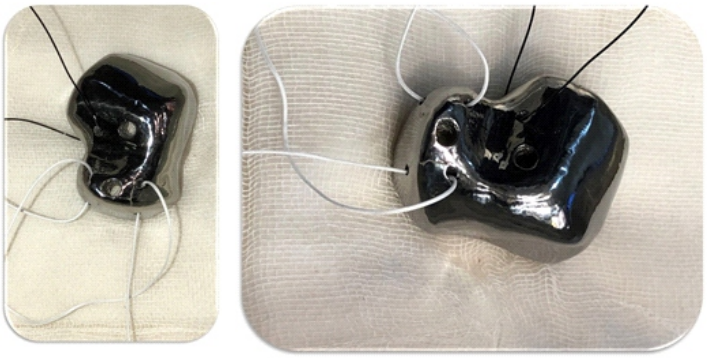


Figure 10: Total talus replacement implant with threaded sutures for talonavicular joint stability, ready to implant.

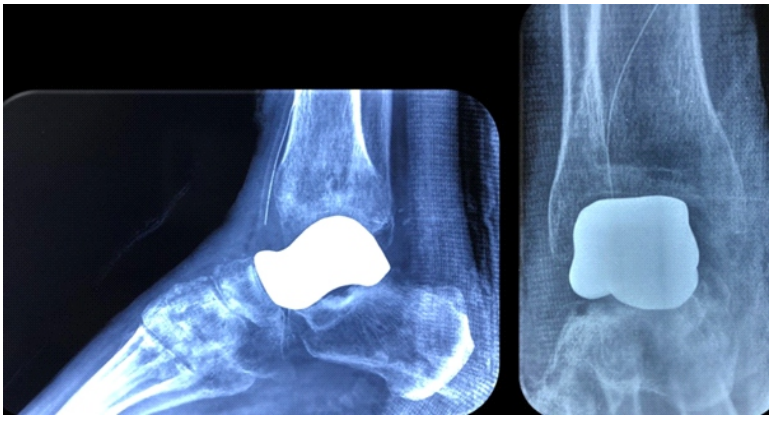


Figure 11: Postoperative anteroposterior and lateral radiograph of the same patient at the end of five years.

TTR for AVN case

The male of 30 years had primary avascular necrosis of the talus, presented with pain and inability to carry out activities of daily living (Figure 12).

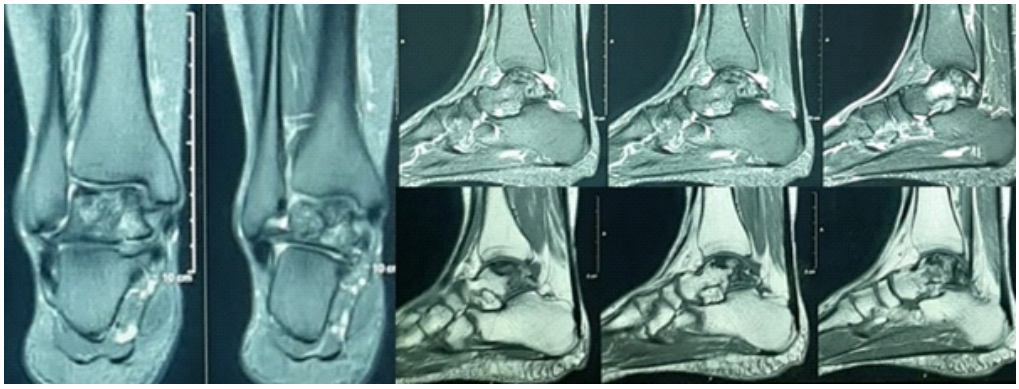


Figure 12: MRI pictures showing avascular necrosis of the talus.
3D printed TTR was carried out (Figure 13).

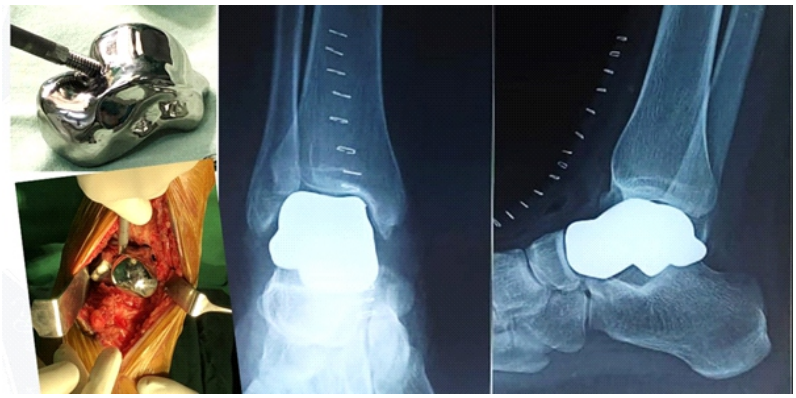


Figure 13: Intraoperative clinical picture and postoperative radiograph of patient operated for TTR for avascular necrosis of the talus bone.
At, 5 years post-surgery, the patient has full movements and can carry out all activities of daily living without pain (Figure 14).



Figure 14: Clinical pictures of the same patient at the end of five years post-surgery showing well healed scar and complete range of movements.

Technique 1

Strategies in Infected non union Subtrochanter fracture

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Infected non union Subtrochanter fracture is therapeutic challenge, usually associated with high velocity injury in young individuals, at times in also seen in elderly. Overall literature is scarce and that too case reports, not case series. This is an humble attempt to share strategies to deal this with Ilizarov method.

Treatment strategies :

Conventional treatment strategy requires staged treatment with aim of converting infected non union into non infected non union, followed by second stage definitive internal fixation and bone graft. The objectives of treatment are : to eradicate infection and achieve Union, to preserve native hip joint. Infected non union cases are likely to have some bone loss post debridement, when one is treating infected non union Subtrochanteric fracture with conventional strategy priority is to achieve Union first- Limb length discrepancy is usually addressed at later date- “Union First, Length Later”.

Conventional treatment strategy requires multiple surgeries,
bone grafting and associated donor side morbidity, prolonged intravenous antibiotics, prolonged hospitalisation,and usually such patients are nil weight bearing stage for around 6 to 8 weeks.

With Ilizarov Distraction Osteogenesis, one can simultaneously address all issues : eradication of infection, achieving union and length. Patient remains ambulatory throughout treatment period and overall hospitalisation is significantly less.
There are some issues with Ilizarov method too, like pin track infection, tolerance, knee stiffness, residual varus.

While treating infected non union Subtrochanteric fracture with Ilizarov technique, following are pre-requisite to achieve optimal outcome.

1. To achieve and maintain adequate Valgus

2. Stable frame. Adequate Hold of Half Pins in proximal fragment is essential to maintain stability and valgus.

3. Prevent Knee Stiffness. Half pins should be inserted in such a manner that it should allow pain free excursion of Quadriceps.

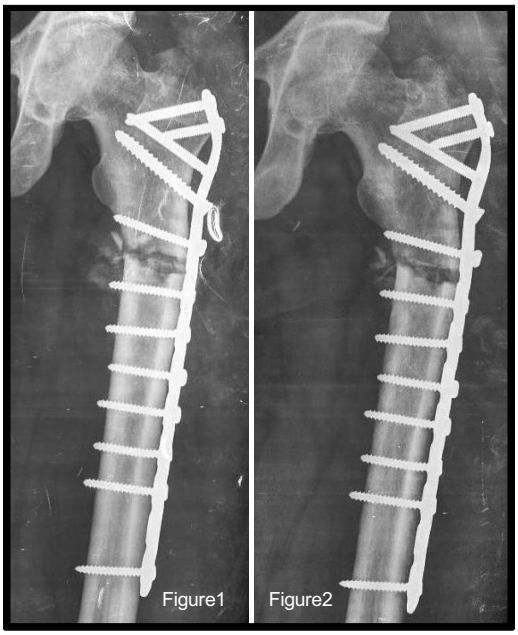
In contrast to conventional treatment strategy, Ilizarov technique will have following strategy :

1. Implant removal and thorough debridement.
2. Achieving and maintaining valgus
3. Acute/ accelerated compression at non union site. Delayed Corticotomy.

Sharing few illustrative cases based on above strategy

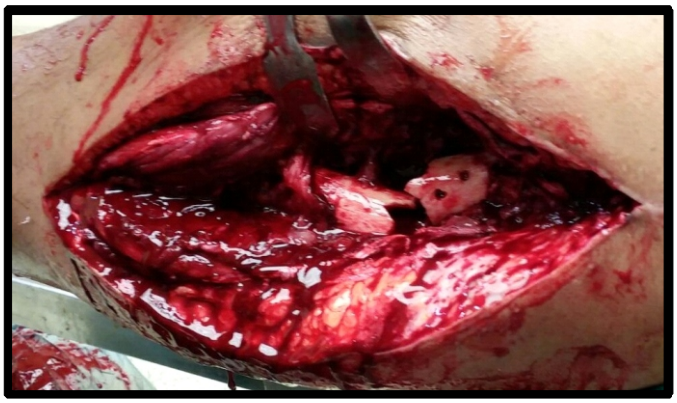
Case 1 -

Case 1 -

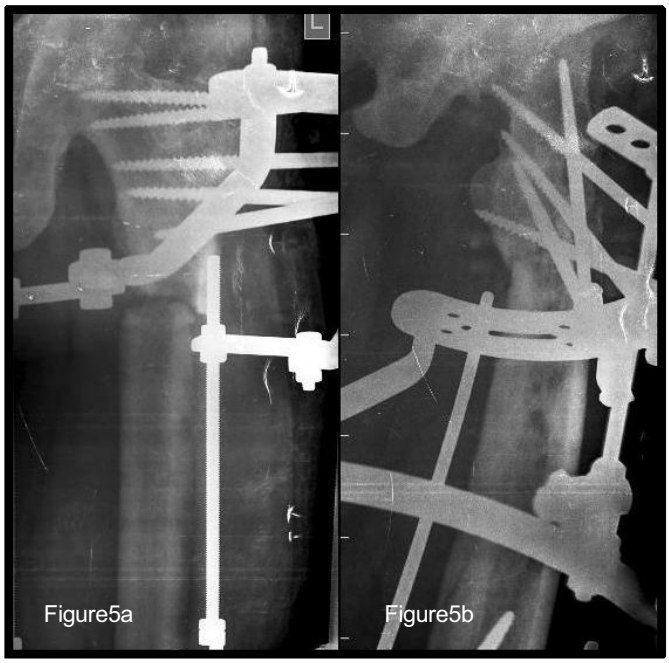


History : 35 year male, sustained Subtrochanter fracture treated with Proximal Femur Locking plate (Figure 1) presented at three months with bent plate and gross infection (Figure 2), treated with implant removal and thorough debridement as stage I procedure (Figure 3,4)





At second stage around 2.5 cm avascular bone ends resected, and Ilizarov Frame applied. (Figure 5 a, b)



As the bone loss is not significant, corticotomy was not done, mono focal osteosynthesis with compression at non union site done (Figure 6a). Full weight bearing ambulation started from first post operative day, initially with walker, later on at 8 weeks with stick and from 4 month onwards unaided walking allowed. Radiograph at 8 months post surgery shows good consolidation of non union site and all pins in proximal fragment holding well. Frame dynamized and removed at 9 month. Residual 2.5 cm limb length discrepancy addressed with compensation in footwear.

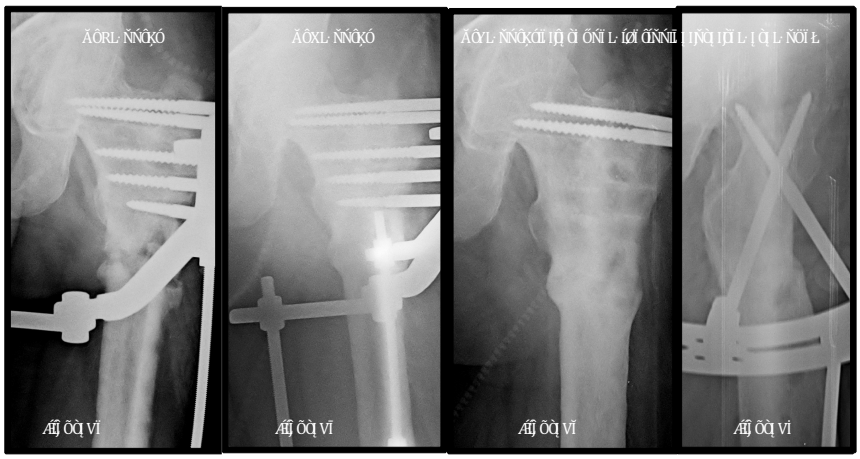


Figure 6 e)

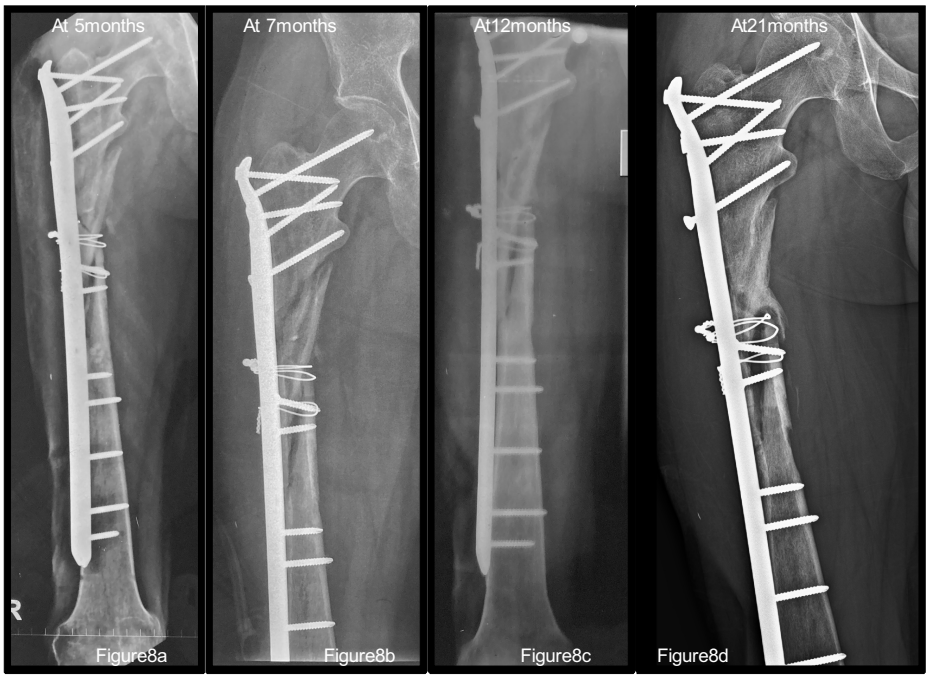


Post frame removal images at 9 months (

Case 2 :

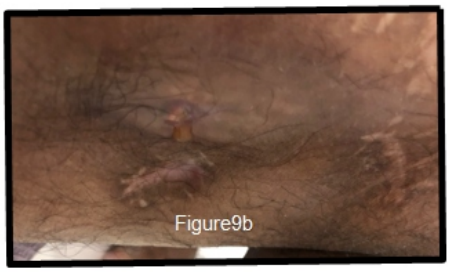
History : 27 year old male sustained Subtrochanter fracture (Figure 7a)post vehicular accident, treated at tertiary care centre with Cephalomedulary nail (Figure 7b), at 6 weeks post surgery nail migrated proximally (Figure 7c),revised at 8 weeks with Cerclage and Proximal Femur LCP(Figure 7d).





Follow up Radiographs at 5months, 7 months, 12 months and 21 months (Figure 8 a to d) do not show progressive visible signs of union, with persistent discharging sinus (Figure 9a and 9b).



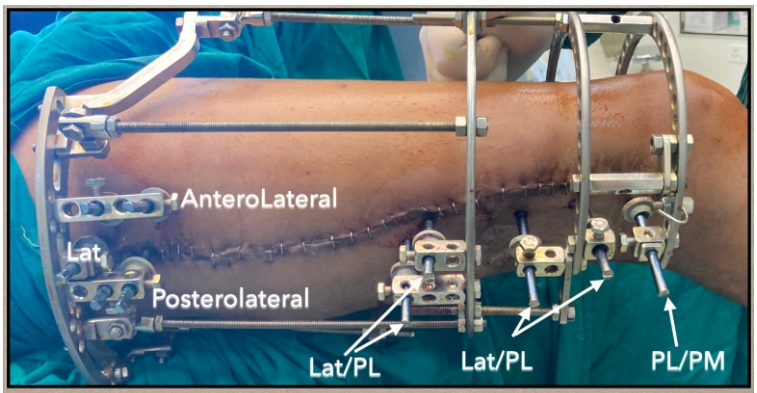


Treatment Strategy : Implant removal, thorough debridement, refreshening of bone ends, Stable frame application, delayed corticotomy. Extensile lateral approach used, Cerclage and inter fragment screws removed, bone ends at non union site and butterfly fragment found distinctly avascular (Figure 9 a) and removed. Post debridement gap 9cm(Figure 9 b)

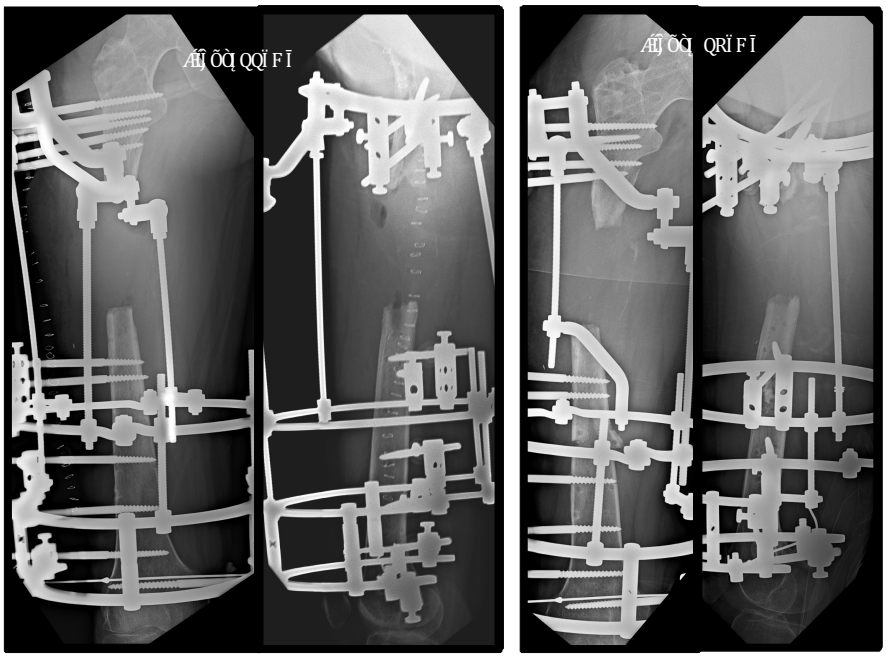




Quadriceps sparing pins. (Figure 9 c)
Immediate post operative Radiograph (Figure 11 a & b), Distal Femur corticotomy done between second and third Ring at two weeks(Figure 12 a & b)

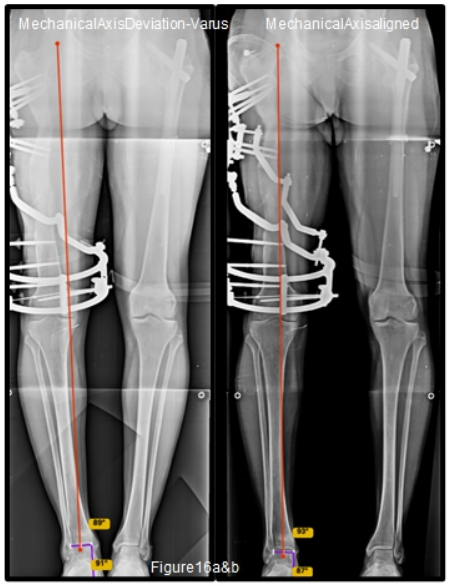


Clinical picture of frame- emphasis on Quadriceps sparing pin placement.

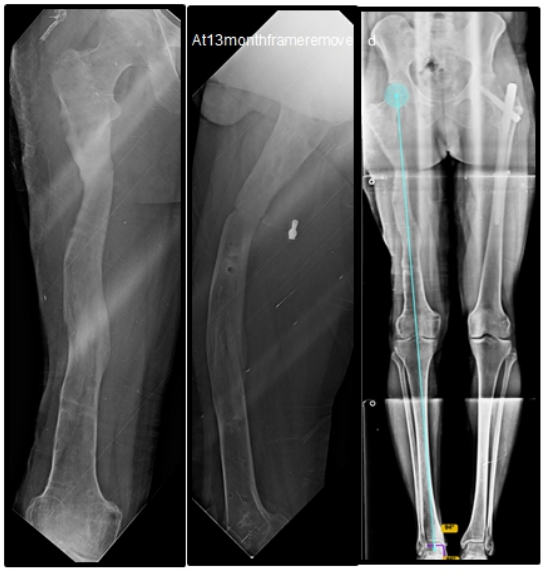






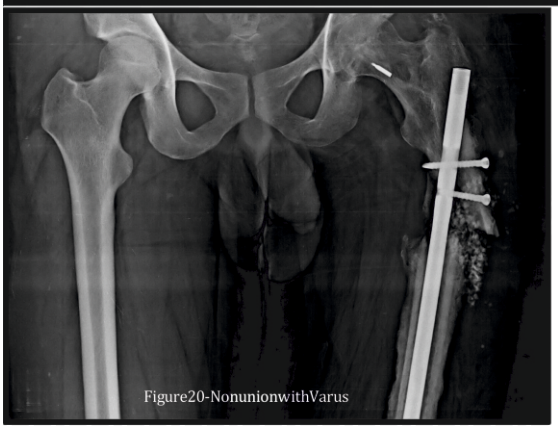


Bifocal Osteosynthesis- simultaneous distraction at corticotomy at 1mm/ day (0.25mm four times a day) and compression at gap at 1 mm/day
(0.25mm four times a day) started after 1 week of latency post corticotomy. Figure 14 a & b are images during transport and transported fragment reached towards proximal fragment at around 3.5 months, when open Docking done (Figure 15 a & b).



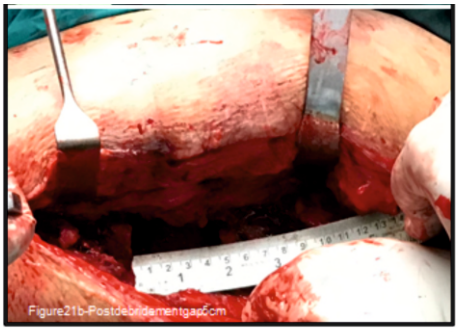
one can address it in due course of time (Figure 16 a & b) Eventually frame was removed at 13 months (Figure 17 a & b) with well aligned HKA axis (Figure 17 c) and functional knee motion (Figure 17 d)


Figure19-Clinicalpictureatthetimeofpresentation


Figure20-NonunionwithVarus

History : 24 year old male sustained Subtrochanter fracture back one year, treated initially with Proximal Femur Nail followed by Debridement at two weeks post injury, at 5 months post injury Proximal Femur Nail was removed and Interlock nail was inserted with Stimulan. 1 year post injury he had persistent discharging sinus (Figure 19)infected non union with Varus deformity(Figure 20)


Figure21a-IntraopClinicalpictureavascularboneends


Figure21b-Postdebridementgap5cm

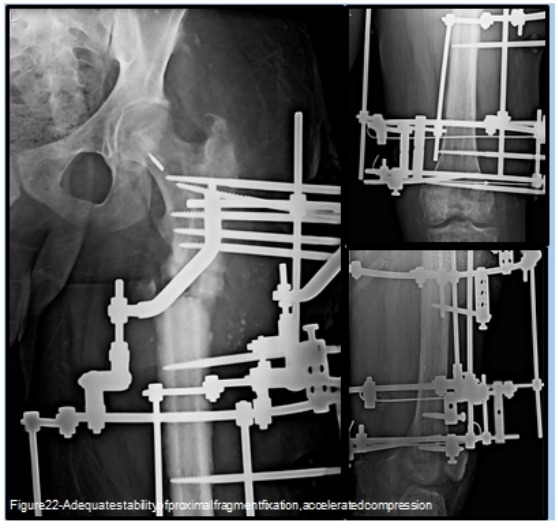

Figure22-Adequatestability,fproximalfragmentfixation,acceleratedcompression


Figure23-Quadricepssparingpins

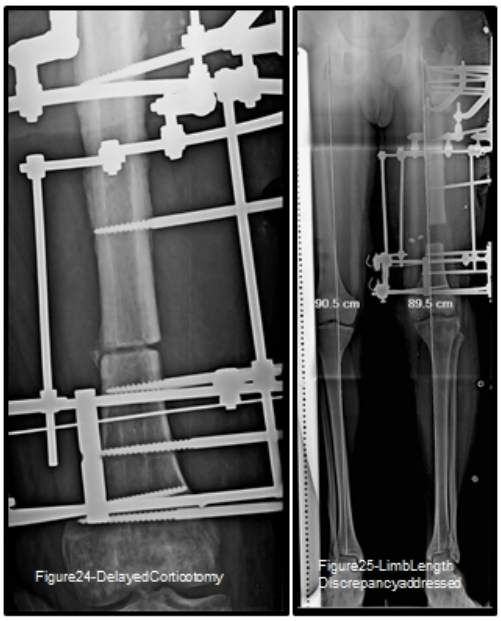


Figure24-DelayedCorticotomy

Figure25-LimbLength Discrepancyaddressed

Treatment Strategy : Implant removal, thorough debridement, avascular bone ends resected, bone ends refreshened. Post debridement gap 5 cm(Figure 21 a & b). As post debridement gap was relatively small, acute compression done at non union site (Figure 22) and resultant limb length discrepancy to be addressed with delayed distal corticotomy (Figure 24) and distraction osteogenesis. Half pins are inserted in such a manner to allow pain free excursion of Quadriceps (Figure 23)

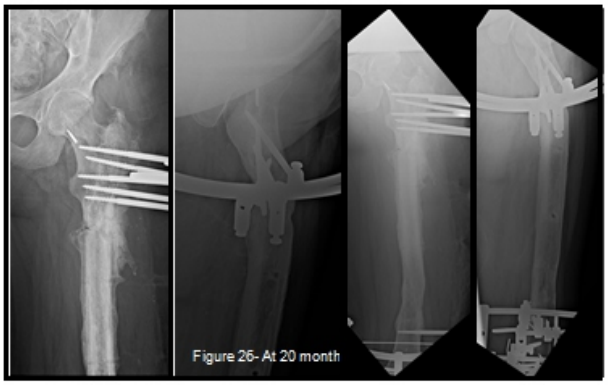


Figure 26- At 20 month



Figure27-At21months

Figure28-At21months

At 10 weeks post surgery, limb length discrepancy was addressed and minimal residual shortening of about 5 mm was addressed with further distraction at corticotomy site(Figure 25)

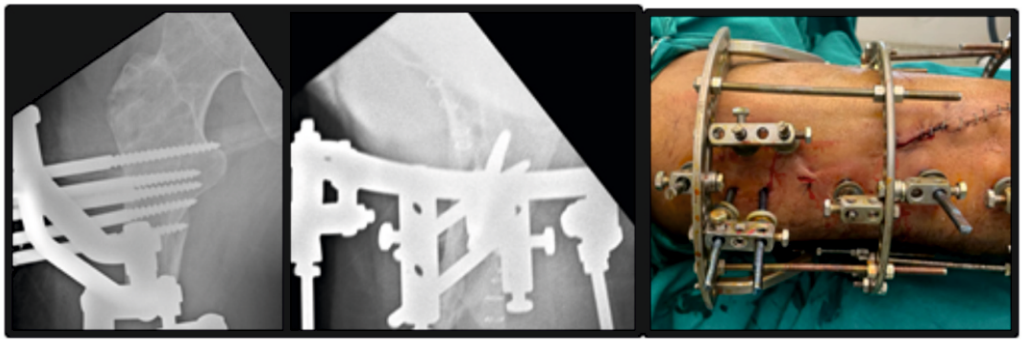
He was advised to walk full weight bearing with stick. Due to some social issue he could not come in follow up for 7 months. At 20 months union and regenerate consolidation was optimal (Figure 26) and frame was removed at 21 months (Figure 27)

Key factors to achieve optimal outcome are following :

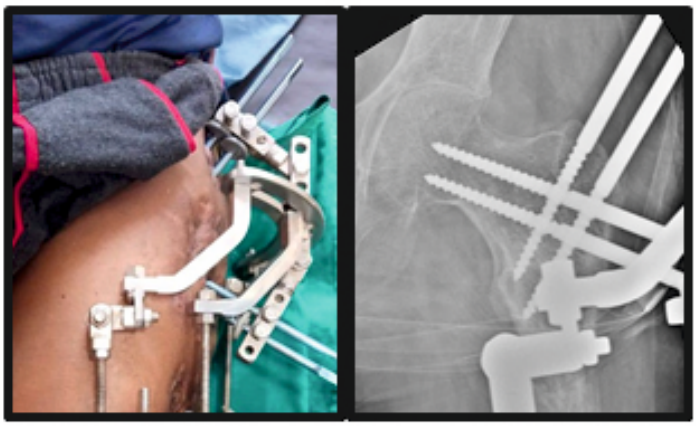
- **Debridement** : It is essential to understand that thorough debridement is must for optimal outcome. Debridement is job of Surgeon, not assistant. Debridement is considered as less lucrative job and at times job of debridement is left to junior resident. Suboptimal debridement is the main reason for persistent infection, and one should understand no amount of parenteral antibiotics, given for howsoever long duration can substitute proper surgical debridement. At times due to fear of creating large defect one tends to do suboptimal debridement with poor outcome. If one is dealing such cases with Ilizarov method, size of defect does not alter the treatment strategy much.

- **Stability :** Stable frame is essential, one should provide adequate stable fixation in proximal fragment. There are various configuration for fixation in proximal fragment

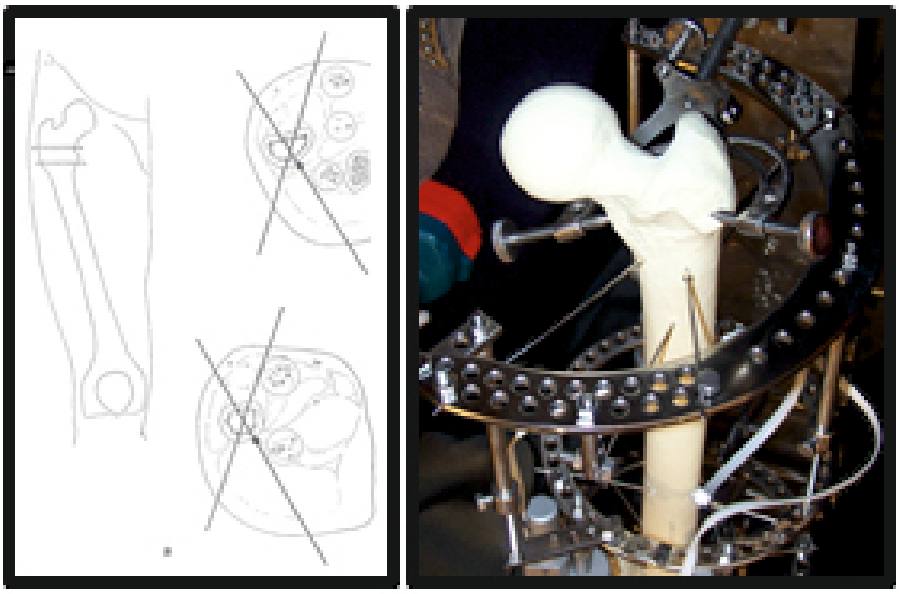
i) A transverse pin, 2 Anterolateral Half pins, and 2 Posterolateral Half pins.



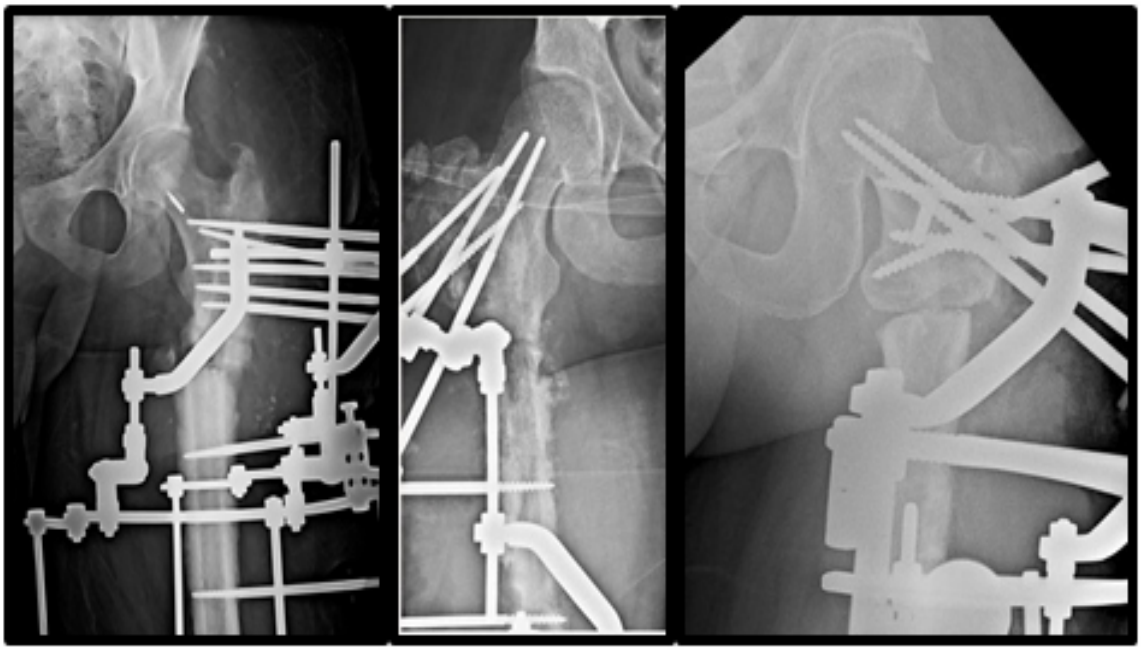
I # Configuration - 2 Half pins from Greater Trochanter towards lesser trochanter, 2 Half pins from lateral cortex of proximal femur to Head.



iii) Anteroposterior wires attached with Russian Arch.



Valgus reduction : Varus angulation is detrimental to fracture healing. Non union site sustains more shear stresses with Varus reduction. Achieving and maintaining Valgus reduction is essential. With Varus reduction even if non union heals, chances of re-fracture post frame removal are high.



Rehabilitation : Femur Ilizarov is commonly associated with Knee stiffness. Pins in distal fragment should be “Quadriceps sparing” - should be inserted in such a manner to allow pain free excursion of Quadriceps. With Quadriceps Sparing pis and excellent Rehabilitation protocol one can avoid knee stiffness.

Conclusion :

Ilizarov technique is excellent tool to address complex infected non union. It has ability to simultaneously address all issues- eradication infection, achieving union, avoiding limb length discrepancy and if due care is taken, knee stiffness can be prevented.

Patient remains ambulatory throughout the treatment period.

Pin tract issues are relatively less common with 6 mm radially preloaded Titanium Half pins inserted in multi-planner configuration as evident from above case examples and pin track issues never interfere with ultimate goal.

Overall intravenous antibiotics, hospital stay, cumulative morbidity is quite low and one can address both " Union and Length Simultaneously" in contrast to "Union First, Length Later" strategy with non Ilizarov method of reconstruction.

Technique 2

Cost effective but clinically effective solutions for insertional tendon and soft tissue in juries

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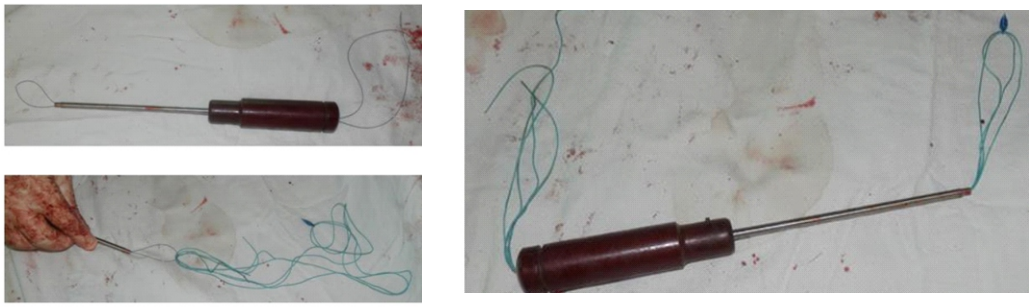
Introduction

The Union government of India devised plans and implemented low-cost health insurance schemes for universal health coverage (1). Private hospitals are the key providers of this government scheme (2). Due to the financial challenges posed by the Government's low-cost health insurance schemes (MA, PMJAY), there is a need to balance the quality of care provided and the expenses involved. Suture anchors are commonly used for repairing soft tissue injuries. The cost of the Indian-made suture anchors is approximately 5500 INR and that of imported companies are still costlier. Hence there is a need to develop cheaper but clinically effective innovative solutions for tackling this issue.

There is a constant dichotomy between the need to embrace newer advanced technologies and to ensure that the cost of the implant or the cost of surgery increases to the extent that it becomes a non-viable alternative. Here, comes the role of innovation and also the need to re-look into older traditional surgical techniques of treating soft tissue injuries such as rotator cuff tears, collateral ligament injuries of the elbow, distal biceps, distal triceps, quadriceps tendon, patellar tendon and the Achilles tendon.

The author has described the technique for creating a double-loaded suture anchor from a non-loaded suture anchor (3). This published article describes the technique in detail. Figure 1 describes the method briefly. The advantage of this technique is that the cannulated inserter for the suture anchor can be autoclaved after every use.

Fig 1 – Upper image: Ethilon suture passed through the cannulated inserter with its looped end at the insertion side and the free ends at the handle side. Middle image: Two Ethibond sutures have been passed through the eyelet of the suture anchor and all the four strands are passed through the looped end of the ethilon suture. Lower image: The ethilon loop is pulled from the handle side thereby withdrawing all the Ethibond strands. By this technique the suture anchor is easily loaded and ready to be deployed.



The above technique includes the use of two No 2-0 Ethibond sutures for 4.5 mm and 5 mm suture anchors. For 2.8 mm suture anchors, one can create a single-loaded suture anchor using the above technique because the narrow eyelet of the 2.8 mm suture anchor prevents the passing of double Ethibond sutures.

Cases

Rotator cuff repair

Current high-level evidence from a systematic review has concluded that the results of mini-open rotator cuff repair and arthroscopic rotator cuff repair are identical with no difference in functional outcomes, range of motion, incidence of re-tear and postoperative shoulder stiffness (4).

I perform the rotator cuff repair using the Mackenzie Anterosuperior approach.

The key points for a successful outcome include recognition of the tear pattern, adequate mobilizing of the tear particularly in chronic cases, and using appropriate repair techniques based on the pattern of the tear.

For L-shaped and inverted L-shaped tears

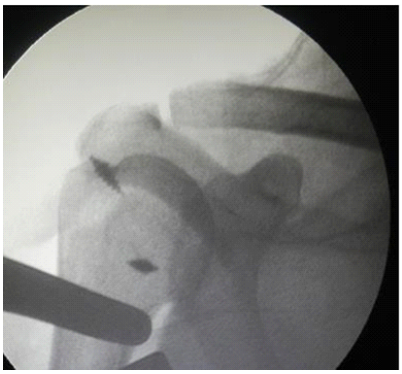
· First, repair the apex of the tear to the footprint
· Second, margin convergence
· Third, repair the base of the tear to the footprint using either suture anchors or transosseous tunnels or a combination of suture anchor and transosseous tunnel

For U-shaped tears

· First, margin convergence
· Second, repair the base of the tear to the footprint with either suture anchors or transosseous tunnels or a combination of suture anchor and transosseous tunnel

In chronic tears with fatty degeneration and massive cuff tears, the author prefers Mason-Allen locking stitch to prevent cheese wiring of the suture through the cuff tissue.
Treatment of full-thickness tear of supraspinatus and subscapularis is shown in Figure 2. Treatment of massive cuff tear involving all three major tendons along with anterosuperior subluxation of the humeral head is shown in Figures 3 and 4.

Fig 2 – Suture anchors passed for repairing supraspinatus and the subscapularis.



For massive cuff tears, one might need to use three 4.5 mm suture anchors or use three transosseous tunnels for repairing the cuff. No 1 Loop PDS can be used to make the bone tunnels and sometimes in hard bones, one might need to make drill holes using 2 mm Kirschner wires to facilitate passing the loop PDS suture. The looped portion of the PDS is used to shuttle the Ethibond or the Fiberwire sutures across the bone tunnel. Another important point to consider especially in massive cuff tears with anterosuperior migration is to avoid excision of the Coraco-Acromial Ligament as part of the subacromial decompression and acromioplasty procedure.

Fig 3 – Preoperative radiograph in a massive rotator cuff tear involving supraspinatus, infraspinatus and the subscapularis with anterosuperior migration mimicking cuff tear arthropathy. MRI showed preserved articular cartilage and this was confirmed intraoperatively.

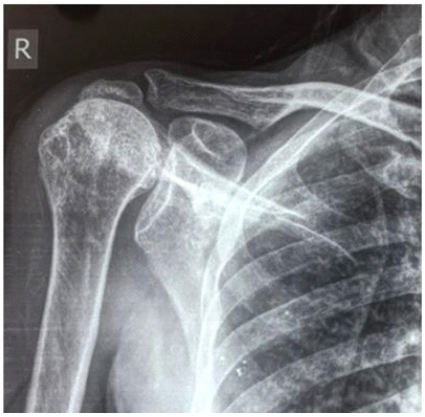


Fig 4 – Postoperative image of the case above. Three transosseous tunnels were made for repairing the rotator cuff. Postoperative radiograph confirms a congruent glenohumeral joint. Inferior humeral head osteophyte is visible and this might indicate possibly indicate the development of cuff tear arthropathy in the future.



SLAP repair (Figures 5,6,7)

I perform the SLAP repair using the Mackenzie Anterosuperior approach and enter the glenohumeral joint using the rotator interval between the supraspinatus and the subscapularis. Using stay sutures on the supraspinatus and the subscapularis aids both in retraction and then approximation of the rotator interval. Applying downward traction on the humeral shaft leads to inferior translation of the humeral head and this also bestows better vision of the SLAP tear and the superior edge of the glenoid fossa.

Fig 5 – A single 2.8 mm suture anchor is loaded with a single No 2-0 Ethibond.

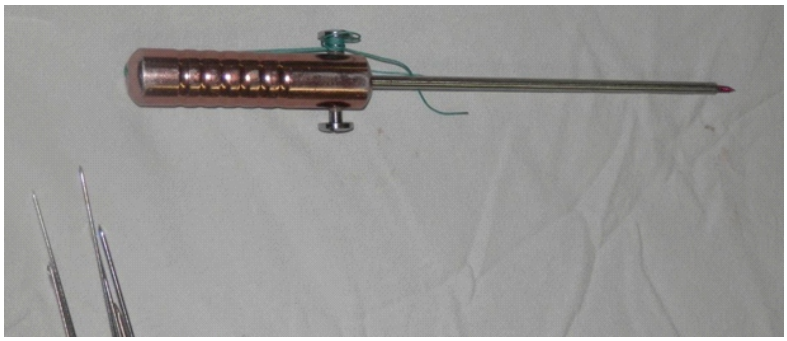


Fig 6 – A drill guide for 2.5 mm drill bit is used to pass 1.5 mm Kirschner wire for making a pilot hole. This is confirmed using image intensifier.

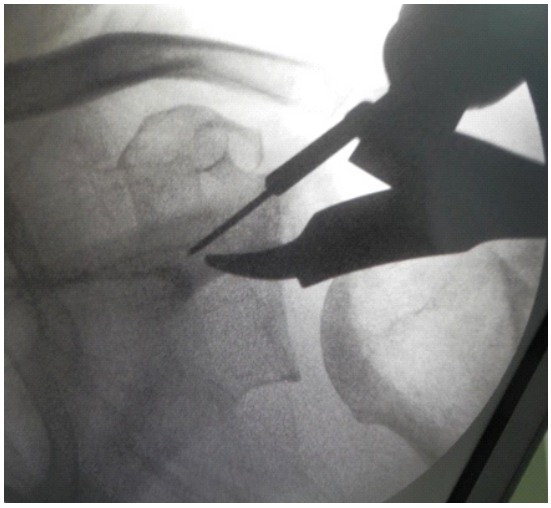


Fig 7 – A 2.8 mm suture anchor loaded using the author's technique was passed in the pilot hole



TFCC tear (Figure 8, 9)

A young patient with a symptomatic post-traumatic peripheral tear of the Triangular Fibrocartilage Complex (TFCC) was treated with a single loaded 2.8 mm suture anchor.

Fig 8 – MRI shows peripheral tear of the TFCC

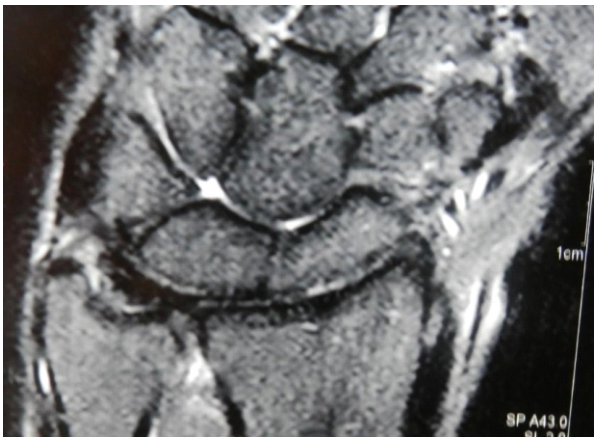
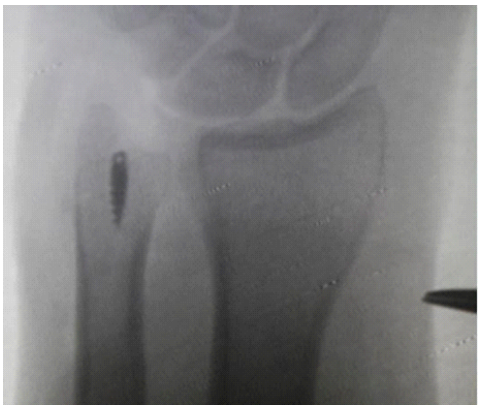


Fig 9 - Suture anchor is passed radial to the ulnar styloid process so that the TFCC is repaired to the foveal footprint.



Tendoachilles tear (Figure 10, 11)

The 4.5 mm or 5 mm double-loaded suture anchor can be used for repairing posttraumatic rupture of the Achilles tendon just proximal to the os calcis insertion which precludes safe end-to-end tendon repair.
Fig 10 – Suture anchor for treating posttraumatic tear of the Achilles tendon just proximal to the insertion on the calcaneum



Fig 11 - The suture anchor can also be used for insertional Achilles tendinopathy for repairing the Achilles tendon after removing the posterosuperior calcaneal bony prominence and the posterior calcaneal insertional spur.



Other uses

This technique can be used for insertional injuries of the distal biceps, triceps, quadriceps and patellar tendon.

Conclusion

Insertional injuries of the tendons can be treated using the novel low-cost devised suture anchor and the transosseous suture method still is a valuable technique for effectively treating these injuries.

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1. Case Report of Osteoid Osteoma of spine
One of the most frequently misdiagnosed spine pathology!

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Introduction

Osteoid osteomas (OO) are primary benign tumors that occur between the age of 20 to 30 years (1). OO accounts for 10% of benign bone tumors and about 10-25% occur in the spine (1,2,3). Posterior elements of spine – pars, lamina or pedicle are predominantly involved (2). The most frequent clinical presentation is nocturnal pain which responds to non-steroidal anti-inflammatory drugs (NSAIDs) (4).OO are characterized by a nidus of immature woven bone surrounded by sclerotic bone (3). Diagnosis of OO possess a unique challenge as X-rays, magnetic resonance imaging (MRI) which are routinely ordered for most of the spine pathologies are less accurate than a spinal CT-scan in detecting OO (1,2,3,4). Hence unless a CT-scan is ordered in suspected cases, missed diagnosis and misdiagnosis are common. Xu et al. have reported that about 90% of cases of OO are missed at their first presentation (4). This may lead to delay in treatment and more importantly, inappropriate treatment resulting in short or long-term consequences for the patient. Once a proper diagnosis is established, the patient may be subjected to a minimally invasive treatment modality such as radiofrequency ablation, cryoablation, laser photocoagulation or a traditional complete excision with or without fusion (5).

Case reports:

Case I:

A 22-year-old obese male patient presented with low backache of 6 months duration. Pain aggravated at night and is classically relieved by NSAIDs. He developed worsening S1 radiculopathy for last 3 months without any bowel/bladder disturbance or a neurodeficit. Conventional radiograph did not show any abnormality except for mild reduction in disc space at L5-S1. MRI showed a benign lesion in the lamina of S1 encroaching into the spinal canal and causing compression over left S1 root.
(Figure 1)



Figure 1 : Pre-operative magnetic resonance imaging (T1 & T2) showing benign lesion in S1 lamina compressing left S1 root in the spinal canal

The lesion was hypointense on T1 and T2 images and did not show classical perilesional sclerosis. CT showed an osseous lesion of size 13mm * 11mm * 8mm on the undersurface of S1 without any surrounding sclerosis (Figure 2).

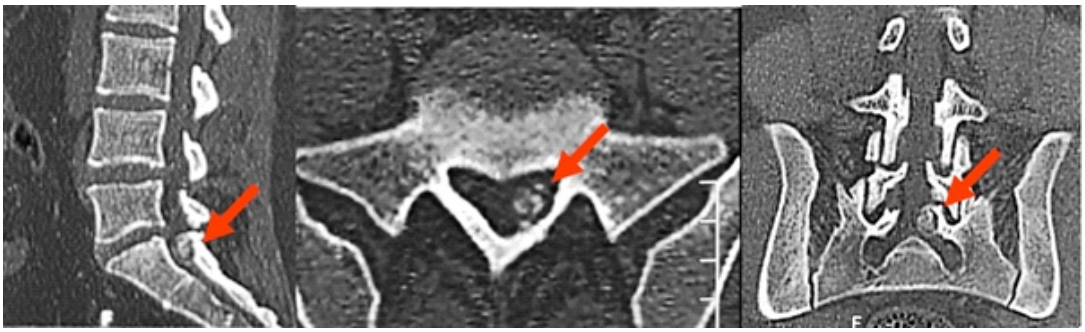


Figure 2 : Pre-operative computed tomography scan showing benign bone lesion without significant periosteal reaction in sagittal, axial and coronal sections.

The lesion was excised using a minimally invasive spine surgical technique (tubular retractor system) and subsequent histopathology confirmed the diagnosis of OO (Figure3). Ablation techniques were not used as the lesion was in close proximity to S1 root.

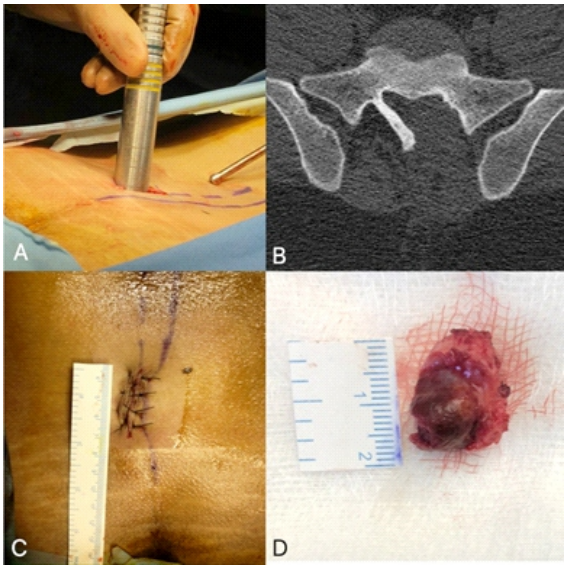


Figure 3
(a) Sequential dilatation through tubes for minimally invasive tumor excision
(b) Post-operative CT-scan showing excised lesion
(c) Post-operative scar (key-hole surgery)
(d) Excised tumor mass

Case 2:
A 35-year-old female presented with backache of 3 months duration with characteristic rest pain that relieved with NSAIDs. Neurological evaluation was normal and no bowel, bladder disturbances were noted. As no abnormality was noted on Xray, MRI was obtained which showed hyperintense/isointense signals on T2 images in the left pedicles, left transverse processes and left half of laminas of D7 & D8. There was significant surrounding muscle edema (Figure 4).

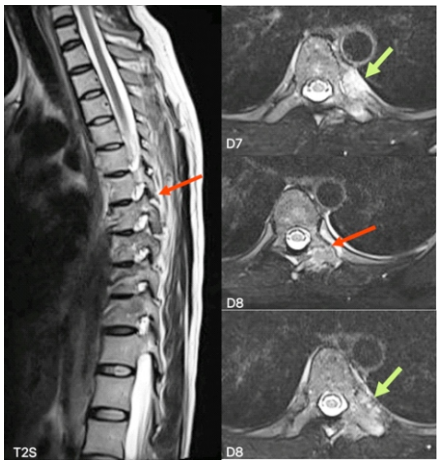


Figure 4 : Preoperative magnetic resonance imaging T2 images showing slightly hyper/iso intense signals in left D7, D8 pedicles, transverse processes with hyperintense surrounding soft tissue edema (green arrow). Nidus is not well differentiated from surrounding sclerotic bone (red arrow).

The patient underwent CT guided biopsy by the primary doctor which showed changes of chronic inflammation.As ESR was slightly raised (ESR=35), empirical AKT was started. No relief noted after 1 month of treatment. Due to high index of suspicion, when patient visited our center, a CT-scan was obtained. CT-scan showed significant reactive sclerotic bone in left D7, D8 pedicle, left D7, D8 transverse process and left half of the lamina at D7 and D8. A small nidus was visible at the inferior facet of D7 (Figure 5).

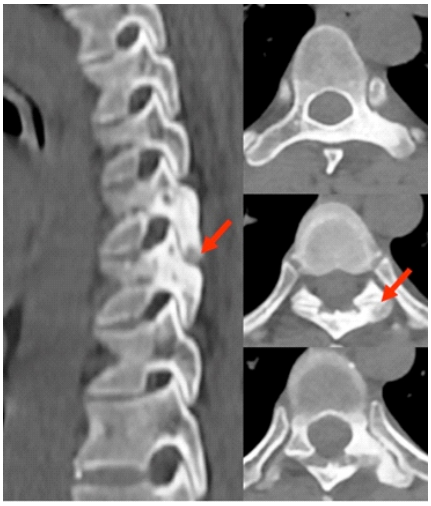


Figure 5 : Preoperative CT scan showing sclerosed D7 & D8 left pedicles, left transverse processes, left half of lamina with a nidus (red arrow) in the inferior articular process of D7.

Since the diagnosis could not be established convincingly it was decided to excise the lesion along with facetectomy and fusion. Histopathology confirmed the diagnosis of OO and patient obtained significant relief (Figure 6).

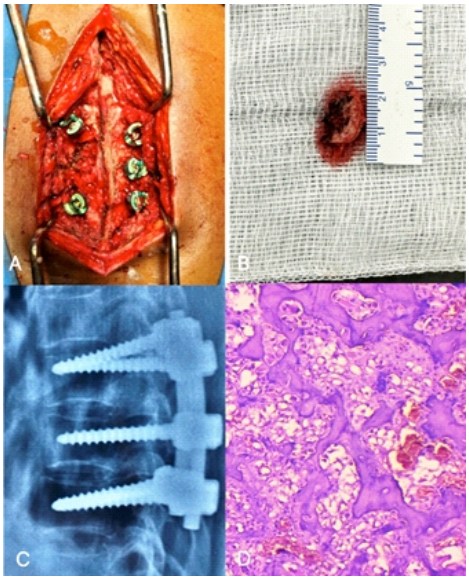


Figure 6
(a) Intraoperative image showing complete excision of the lesion
(b) Excised specimen showing nidus with sclerosed surrounding bone
(c) Post operative X-ray showing fusion
(d) Histopathology of nidus showing densely broad sclerotic bone trabeculaewith osteoblastic rim and fibrovascular connective tissue.

Discussion:

Osteoid osteomas are characterized by a nidus of immature un-mineralized bone and a surrounding sclerotic bone. A very high level of prostaglandin E2 and prostacyclin have been found in the nidus with an increased level of cyclooxygenase-2 expression (6). This is responsible for the surrounding sclerosis and the characteristic relief with NSAIDs. In addition to these a very high concentration of intralesional unmyelinated nerve fibers have been implicated for the nocturnal pain observed with OO (7). In order to prevent missing or misdiagnosing OO, a high index of suspicion should be placed on patients with nocturnal pain that responds well to the NSAIDs.In some patients, radiculopathy, neurodeficit or impaired physical activity may be present along with the characteristic pain pattern.

OO are difficult to diagnose on spine X-rays due to complex anatomy of the vertebral bones and the small size of the nidus which is less than 1.5 centimeters (4,8). MRI which is the investigation of choice for most of the spine pathologies may show nidus with perilesional sclerosis and surrounding soft tissue edema. The nidus shows hyper to intermediate signal compared to muscles on T1 weighted images while it appears hyper intense in T2 weighted images (9). The perilesional sclerosis is usually hypointense on both T1 and T2 weighted images. As the size of nidus in OO is always less than 1.5 centimeters,the demarcation between the signals of nidus and surrounding bone may not be apparent. Nidus can be hypointense in all sequences based on vascularity and mineralization adding much to the confusion (Figure 1) (5,9). However, MRI is very sensitive in picking up surrounding tissue edema and reactive bone. Adding contrast to the routine scan could reveal hyper vascular

nature of the nidus. The MRI picture of OO mimics that of posterior elemental tuberculosis, acute spondylolysis or inflammatory synovitis. Hence, a thin slice CT-scan is considered the gold standard investigation of choice for the diagnosis of OO (5). The classical finding for cortical variety of OO is an oval lytic/amorphous lesion (nidus) surrounded by a dense cortical bone (5,8). But when the lesion is present in the subperiosteal location or in the medullary location, the characteristic sclerosis is limited or absent (Figure 2). Due to these characteristic findings of OO, it is relatively easy to discriminate other differentials such as osteoblastoma or intracortical abscess. Osteoblastomas are tumors with nidus size more than 2 centimeters. Intracortical abscesses have irregular margin and don't show early arterial enhancement like OO in dynamic contrast CT-scan. The final diagnosis of OO is based on tissue diagnosis, but it was reported by Xu et al and Soliman et al. that yield of CT-guided biopsy is not more than 54% (4,10). This is attributed to the smaller size of nidus in OO due to which the needle may catch the reactive bone showing signs of inflammation and bone formation (10). Hence for a proper tissue diagnosis, complete surgical resection and pathological evaluation is mandatory. When a complete excision threatens to cause iatrogenic instability fusion may be added. Minimally invasive procedures such as radiofrequency ablation, cryoablation, laser photocoagulation are reserved for cases with a characteristic clinical presentation and radiological findings. As the biopsy may turn out to be negative, doubtful cases are better managed by complete excision followed by histopathological evaluation. Another pre-requisite for ablation techniques is to have a safe distance between the neural structures and the lesion (8-10 mm space or thick cortical bone). Hence these techniques are applicable for carefully selected cases.

In order to avoid misdiagnosis and missed diagnosis in OO, we recommend that patients with nocturnal pain & relief with NSAIDs, OO should be suspected and patients should undergo spinal CT scan along with MRI.

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2. Alkaptonuric Meniscus

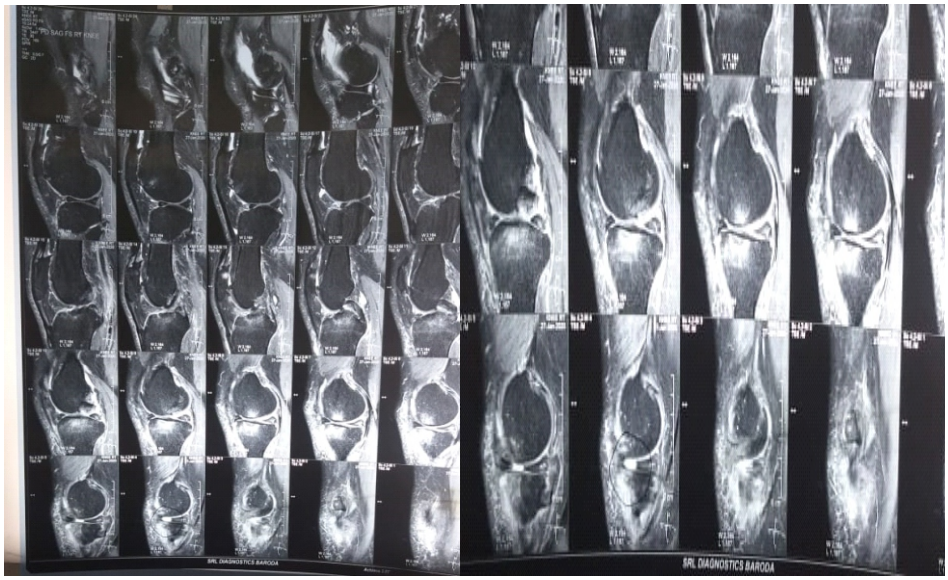
Dr Himanshu Shah,
Dr Rajesh Shah

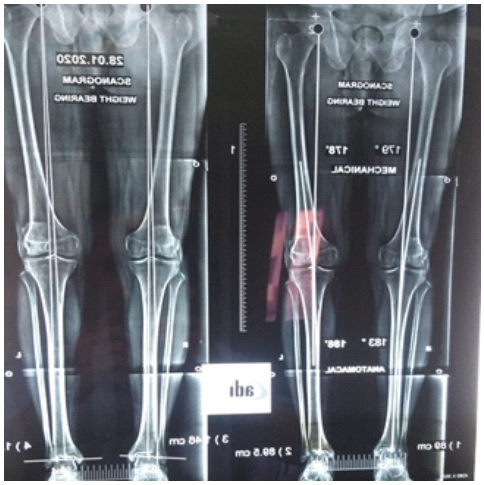
History:

A 46 year old male with no significant past history of any major illness presented with limping over right lower limb with gradually progressing pain since last 15 days following trivial trauma while parking vehicle On examination there was tenderness over medial knee joint line and medial tibial condyle .There was no effusion. Mcmurry test was positive. Drawer testes were negative with no cruciate laxity. Patellofemoral grinding test was positive.

Treatment history:

MRI done outside suggested medial meniscus injury and medial tibial plateau fracture. X ray was normal except Patellofemoral arthritis. We advised rrepeat MRI to confirm diagnosis which was suggestive of medial meniscus tear with medial tibial plateau stress fracture with Patellofemoral arthritis.



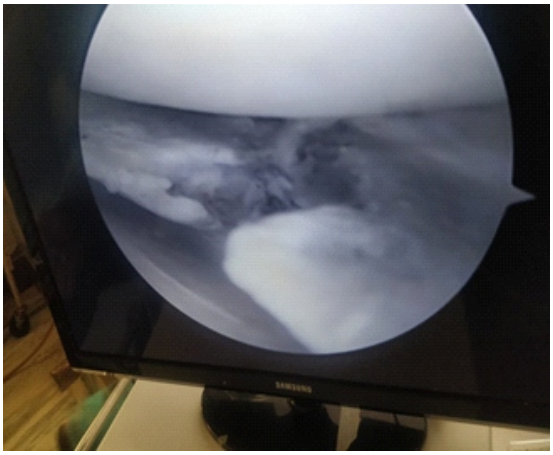
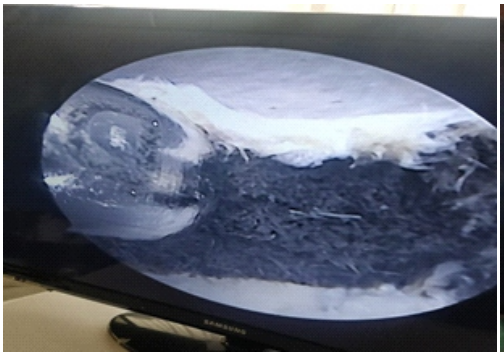
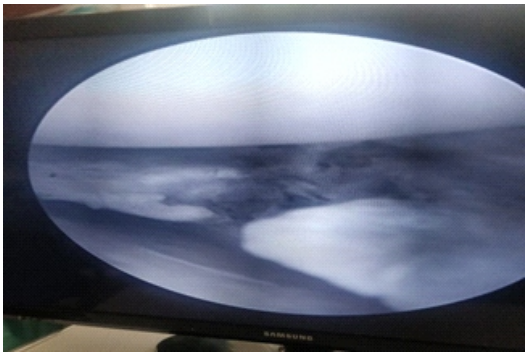


Treatment plan

We planned meniscus repair- considering age and activity and partial meniscectomy- if not repairable and debridement for arthritis especially for Patellofemoral joint. We kept following ready: All inside system- fast fix, Inside out system --- preferred plan as tear was in the body of meniscus, outside in system, Meniscus punch forceps.

Arthroscopy

Bad patellar undersurface with eroded cartilage and subchondral exposed bone .Medial meniscus tear whole substance from inner edge to capsular attachment was missing. Refreshing of ends is necessary in any musculoskeletal treatment either it is bone or soft tissue to have better chances of healing. On shaving the ends of torn region of meniscus, intrasubstance showed black degenerative meniscus .In hope of getting better meniscus tissue, shaving was carried out further to find only more blackened meniscus .This led to suspicion of Biochemical disorder of ALKAPTONURIA. At the end we could only perform the partial meniscectomy with such diseased meniscus as chance of repair healing is poor with pathology inside the meniscus. Patellofemoral joint was not easy to negotiate the scope inside still some amount of debridement performed and biopsy was taken from the meniscus. Post operatively on getting retrospective history patients mother gave history of urine turning black after few minutes in both siblings but it was never investigated further.

Biopsy and urine sampling was suggestive of alkaptonuria.



Study of literature

Alkaptonuria leads to early arthritis. Healing of meniscus is poor in alkaptonuria. Very fewcase reports have been reported in literature for accidental finding of oochronotic meniscus and repair procedure not carried out. Prognosis is bad as far as soft tissue healing and arthritis is concerned.

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3. Surgical and Functional Outcomes of the Results of Conventional Two-Screw Proximal Femoral Nail (PFN) Versus Helical-Blade Anti-rotation Proximal Femoral Nail (PFNA2) .

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Professor Orthopedics, Sumandeep Vidyapeeth (Deemed to be University), Vadodara, IND

Abstract

Introduction

An intertrochanteric (IT) femur fracture is an extra-capsular fracture between greater and lesser trochanters. Unstable IT fractures are those where there is poor contact between fracture fragments (especially medial and posterior cortices), comminution, and fracture pattern, such that the weight-bearing forces tend to displace the fracture further or a reverse oblique type. Proximal femoral nailing (PFN) is one of the modalities for proximal femoral fractures. A newer modality for proximal femoral fracture is PFNA2, i.e., PFN anti-rotation, which makes use of a helical blade for a better compaction of bone. Both nail designs (PFN and PFNA2) are available in short and long sizes (so a total of four variants). Only a few studies have compared the treatment of IT femur fracture concerning fracture geometry, design, and length using either of the two nail types. In our study, we assessed the surgical and functional outcomes of PFN and PFNA2.

Materials and methods

This prospective observational study was carried out on 30 patients who had sustained IT fractures of the femur. All cases of IT femur fractures more than 18 years of age, closed injuries, and the patients who consented to participate in this program were included in the study. All open injuries, the patients who refused to participate in this program, patients who have associated injuries, patients with a subtrochanteric femur fracture, and patients with less than six months of follow-up were excluded. The patients were randomized into two types of implant groups. All patients were operated with a standard protocol. The study was conducted for 18 months from February 2021 to August 2022. The results were analyzed (of all four variants) by comparing patient demographics, implant size, implant type, locking methods, union time, and other parameters.

Results

Most of the patients were operated on with a 10 mm nail diameter (17/30 patients), 380 mm length (long- nail group) (five/11 patients), and 250 mm length (short-nail group). With the use of PFNA2, the overall duration of hospital stay was less. The overall operative time (incision to wound closure) with the use of the short PFNA2 was lesser than that with the use of other designs due to the use of the zig for distal screws. The use of a distal dynamic locking screw in a majority of the patients can get better compression at the fracture site once the patient starts weight bearing and decrease the chances of the Z-effect, reverse Z-effect, screw back-out, and screw cut-out. The union time was nearly the same in the majority of the patients, with an

early union seen with the use of PFNA2 nails. The overall modified Harris hip score (HHS) at the final follow- up was nearly the same with slightly better results with the use of PFNA2.

Conclusions

PFNA2 is the implant of choice in elderly patients with osteoporotic bone. It has less operative time, which is required in such patients with medical comorbidities; hence, it has marginal superiority over PFN. Short- nail design results in less operative time and less blood loss.

Introduction

An intertrochanteric (IT) femur fracture is an extra-capsular fracture between greater and lesser trochanters. It accounts for nearly 50% of all proximal femur fractures and is a major cause of disability in the elderly.

The incidence of IT femur fracture is gender and race dependent varying demographically [1]. Severalepidemiological studies in Asian countries suggest increasing incidence and general life expectancy during the last few decades [2]. In 1997, Gulberg et al. suggested that the worldwide incidence of hip fractures would double to 2.6 million by 2025 and 4.5 million by 2050 [3]. The incidence of proximal femoral fractures among females is two to three times higher than the incidence of such fractures in males [4]. Hagino et al. reported a lifetime risk of hip fractures for individuals at 50 years of age of 5.6% for men and 20% for women [5]. Cummings et al. noted that neither age-related osteoporosis nor the increasing incidence of falls with age sufficiently explains the exponential increase the hip fracture with aging [6].

Unstable IT fractures are those where there is poor contact between fracture fragments (especially medial and posterior cortices), comminution, and fracture pattern, such that the weight-bearing forces tend to displace the fracture further or a reverse oblique type [7]. The treatment has evolved and changed over a period of time, from conservative to operative, from open reductions and fixations to closed reduction and fixation and newer minimally invasive techniques. Among the treatment modalities, there are two types of devices, i.e., intramedullary and extramedullary. Intramedullary devices, such as the gamma nail (GN) and proximal femoral nail (PFN), have the same theoretical advantage over the dynamic hip screw (DHS) because they do not depend on the screw fixation of a plate to the lateral cortex, which can be a worrying part in osteoporotic bone. For PFN, Fogagnolo et al. found that the intraoperative technical or mechanical complication rate is as high as 23.4% [8].

PFN is one of the modalities for proximal femoral fractures. A newer modality for proximal femoral fracture is PFNA2, i.e., PFN anti-rotation, which makes use of a helical blade for a better compaction of the bone.

In PFN, two screws are used for fixation; the larger femoral neck screw carries most of the load. The smaller hip screw will provide rotational stability. In PFNA2, there is a single proximal blade that compacts the cancellous bone. Both nail designs (PFN and PFNA2) are available in short and long sizes. Only a few studies have compared the treatment of IT femur fracture with both designs. None of them have compared the results with respect to fracture geometry, design, and length using either of the two nail types. As per our literature search, no similar studies are available. In our study, we assessed the surgical and functional outcomes of PFN and PFNA2 (both with short and long varieties, so a total of four variants).

Materials And Methods

After getting clearance from the Ethical Committee of Sumandeep Vidyapeeth, the prospective observational study was carried out on 30 patients admitted to Dhiraj Hospital,

Piparia, Vadodara, Gujarat, India, who had sustained IT fracture of the femur after getting the written informed consent.

We included all the patients who met the inclusion and exclusion criteria for the study during February 2021 to August 2022. The sample size was calculated by the following formula:

$S=Z^2 \times P \times (1-P)/M^2$,

where S = sample size, Z = Z-score (1.96), P = population proportion (assumed as 50% or 0.5), and M = margin of error.

All the data were entered in Microsoft Excel (Microsoft Corporation, United States). All the quantitative data were presented in mean and appropriate tables, and graphical methods were used for the presentation of the data. For qualitative data, numbers and percentages were used, and appropriate graphs were used for the presentation of the data.

All cases of IT femur fractures more than 18 years of age, closed injuries, and patients who consented to participate in this program were included in the study. All open injuries, patients who refused to participate in this program, patients who have associated injuries (such as head injury, abdominal injury, or other bone injuries), patients with a subtrochanteric femur fracture, and patients with less than six months of follow-up were excluded.

Ours is a tertiary care hospital with a medical college setup. We have three units in the department. Each unit is assigned a specific day for the emergency and outpatient department (OPD). We included all the patients during the study period. The patients were admitted in their respective units as per the day of arrival in the hospital. Hence, selection bias was avoided. After X-ray scans, the patients were explained the management plan and prognosis. The affected limb was kept in ankle skin traction. Preoperative investigations and anesthesia workups were done. Implant size (long or short) and design (PFN/ PFNA2) were decided at random without any bias as per the unit head's decision. A rough judgment of the nail angle was decided as per the position of the center of the femoral head and the tip of the greater trochanter on the normal side. If the tip of the greater trochanter is higher, which means a coxa vara, an angle of 130° was selected. All the surgeries were performed by unit heads (who is a professor or an associate professor).

Operative procedure

All standard aseptic and antiseptic precautions were taken. The patients were operated on an orthopedic fracture table in the supine position. In all the cases, distal femur Steinmann pin (ST) skeletal traction with Bohler's stir-up was used (Figure 1).

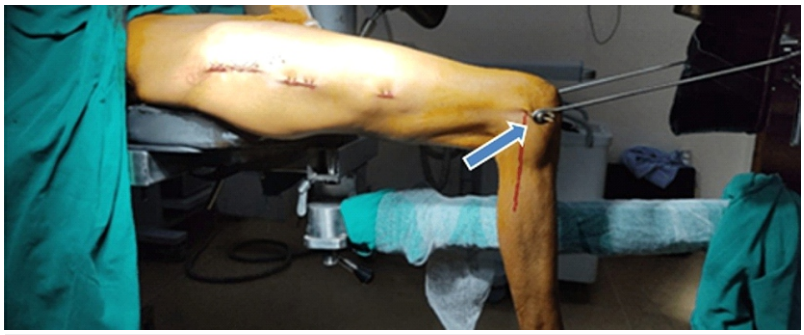


FIGURE 1: Steinmann pin traction in the distal femur

All long nails (PFN/PFNA2) were side-specific. All nails were available in 9, 10, and 11 mm diameters. Long nails were available in lengths from 340 to 420 mm. Short nails were available in lengths of 180 and 250 mm. Helical blades were available in 70 mm to 120 mm lengths.

The reduction was held by inserting ST pin/guide wires in the anterosuperior quadrant of the head and neck, keeping in mind the trajectory of future nail. Adduction was done (which now occurs at the hip joint rather than at the fracture site) to make the greater trochanter more prominent and palpable (in obese patients) for the entry of the nail and checked under the C-arm, as shown in Figure 2.

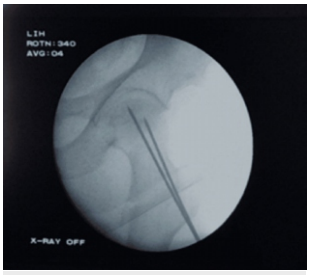


FIGURE 2: Reduction checked under the C-arm

Entry was made with an awl at the medial slopping edge of the greater trochanter (medial to the tip of the greater trochanter). Entry was confirmed in two views in the C-arm. A cannulated instrument (fossa finder)
was inserted and negotiated up to the level of a lesser trochanter. A 2.8 mm guide wire was inserted into the femoral shaft along with the help of a fossa finder. Reaming of the femur was done with the reamer provided with the set in the sizes 8-9-10-11-12. The nail diameter was confirmed preoperatively by the measurement on a true-size radiograph and intraoperatively by a template (under the C-arm) as per the standard intramedullary nail technique. Proximal reaming with a proximal reamer of size 15 mm was done before the insertion of the nail with a sleeve over the lateral cortex to avoid perforation/fracture of the lateral cortex. A proper-size nail was inserted with the zig in a routine manner.

For neck screws, first, the distal guide wire was inserted (parallel to the lower border of the neck) followed by the proximal one. In the case of PFNA2 likewise, a guide wire was inserted through the center of the femoral head up to the subchondral bone.

First, the 6.4 mm derotation screw (anti-rotation) was inserted followed by the 8 mm hip screw (keeping in mind the concept of the tip apex distance). The screws were finally tightened after releasing the traction. For PFNA2, a helical blade of proper size was impacted in an unlocked state, and compression of 5 mm was achieved after final positioning and releasing the traction. This principle helps to prevent the Z-effect or reverse Z-effect (if we do not release the traction before tightening the screws, on transfer from the fracture table, the screw will back out).

Distal locking was done as per the surgeon's choice (both static and dynamic versus only distal dynamic) with
4.9 mm locking screws (Figure 3). Usually, when the surgeon wants some micromotion on mobilization, only the distal dynamic option is selected.

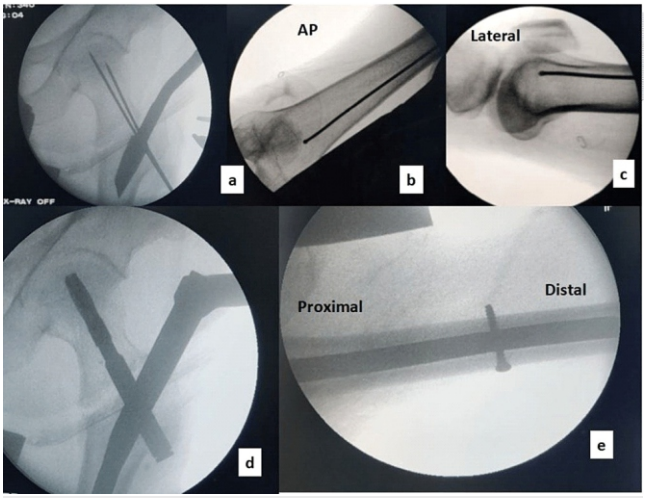


FIGURE 3: Steps of surgery (image intensifier television (IITV) screen images)

A: entry point, B: guide wire in the anteroposterior view, C: guide wire in the lateral view, D: nail and blade fixation, E: distal dynamic locking

Post-operative X-rays were taken for record purposes and to compare with the X-rays on further follow-ups.

Weight-bearing was allowed as per surgeon's discretion (depending upon the table stability of the fracture) and as per radiological assessment at follow-up. The dressing was checked by the operating surgeon on the third or fourth postoperative day. Intravenous (IV) antibiotics were given for 24-72 hours
(usually for 24 hours but extended in patients with diabetes) and intramuscular (IV/IM)/oral analgesics were given till discharge. Routine physiotherapy was given to strengthen the quadriceps muscle. The patient was discharged from the hospital once the wound condition was satisfactory and no clinical signs of infection were noted. Routine follow-up with radiographs was obtained at two, four, six, 12, and 24 weeks until a solid continuous callus formation was observed. Surgical and functional outcomes were assessed during the follow-up visits using the modified Harris hip score (HHS).

Results

Of the 30 patients operated on for IT femur fracture, we found that the maximum number of patients were in the age group of 51-70 years in both PFN and PFNA2, as shown in Table 1. The overall mean age was 62.84 years; 59 and 66.66 years for PFN and PFNA2, respectively. Age groups were defined as young age (18-30 years), middle age (31-50 years), elderly (51-70 years), and old age (>70 years) groups.

Age group (years)	Number of patients			
	Short PFN	Long PFN	Short PFNA2	Long PFNA2
18-30	0	2	0	0
31-50	3	0	2	0
51-70	2	5	6	3
>70	2	1	3	1
Total	7	8	11	4

TABLE 1: Age distribution
p-value = 0.0256

PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation

We observed male preponderance, and among them, the majority were operated with PFNA2, whereas females were operated with PFN, which was purely randomized and without any bias, as shown in Table 2

Gender	bĵ ▓ Ľ'ś'n¤ź ♫ĂĞŠ■Ċ	
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Female	9	4
Total	15	15

TABLE 2: Gender distribution
p-value = 0.1394

PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation

The majority of the patients were operated on with short nails (PFN and PFNA2), as shown in Table 3. All the patients were operated on with 130° nails. Most of the patients were operated on with 10 mm nail diameter (17/30 patients), 380 mm length (long-nail group) (five/11 patients), and 250 mm length (short-nail group).

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TABLE 3: Type of implant used
p-value = 0.4997
PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation

With the use of PFNA2, the overall duration of hospital stay was less. Only one patient of the PFN group required a longer hospital stay due to associated comorbidities, as shown in Table

Days	PFN	PFNA2
1-4	1	5
5-10	13	10
>10 days	1	0
Total	15	15

TABLE 4: Duration of hospital stay
p-value = 0.0256

PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation

The majority of the patients had associated comorbidity of hypertension (HTN), whereas only a few patients had diabetes mellitus (DM) alone or a combination of both of them, as shown in Table 5. One patient had chronic obstructive pulmonary disease (COPD).

Co-morbidity	No. of patients
HTN	12
DM	2
HTN+DM	2
Others (COPD)	1
Total	17

TABLE 5: Comorbidities
HTN: hypertension; DM: diabetes mellitus; COPD: chronic obstructive pulmonary disease

The majority of the patients suffered from fractures due to falls or slippage on level ground (trivial trauma), as shown in Table 6.

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Total	30

TABLE 6: Mode of trauma

The overall operative time (incision to wound closure) with the use of short PFNA2 was lesser than that with the use of other designs due to the use of the zig for distal screws, as shown in Table 7. The overall operative time was 77.65 minutes. In the case of PFN, it was 93 minutes, with 89.2 minutes for short PFN and 105 minutes for long PFN. In the case of PFNA2, it was 74 minutes, with 77 minutes for short PFNA2 and 85 minutes for long PFNA2

Minutes (mins.)	Short PFN	Long PFN	Short PFNA2	Long PFNA2
60 mins	1	0	4	0
60-75 mins	2	0	6	1
75-90 mins	2	5	1	3
90-120 mins	2	2	0	0
>120 mins	0	1	0	0
Total	7	8	11	4

TABLE 7: Operative time
p-value = 0.6664

PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation

The use of static versus dynamic locking is shown in Table

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TABLE 8: Static vs. dynamic locking
p-value = 0.0256

PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation

Few of the patients had the below-mentioned post-operative complications found during subsequent follow- ups, as shown in Table 9 (Figure 4). Deep vein thrombosis (DVT) and fat embolism were noted in the first week. The reverse Z-effect, screw back-out, and superior screw cut-out were noted in the first eight weeks.

Type of complication	No. of cases
Reverse Z-effect/screw back-out	2
Superior screw cut-out	1
Deep vein thrombosis	1
Fat embolism	1
Total	5

TABLE 9: Complications

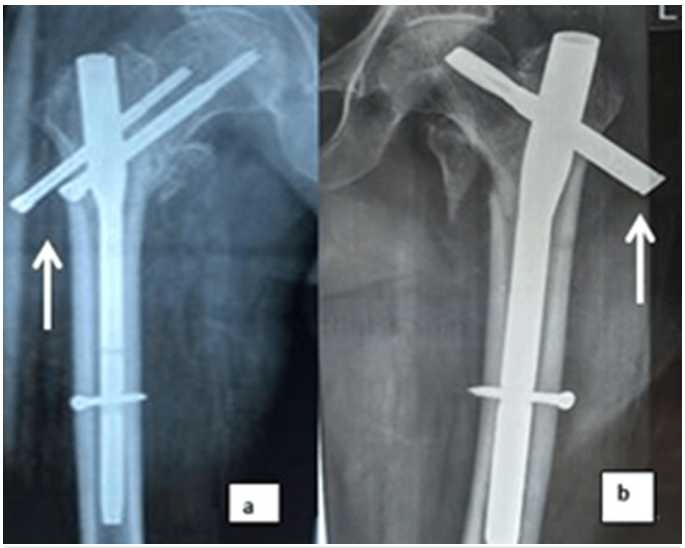


FIGURE 4: Complications

A: reverse Z-effect, B: blade back-out

Not maintaining the temporary anchorage device (TAD) was the reason for the reverse Z-effect in two cases. However, it cannot be added to the demerits of the implant. In one case, the distal dynamic screw could not be passed (due to the zig mismatch and inability to lock with a free hand despite repeated attempts), so only the static distal locking screw was fixed, which may be a cause for a superior screw cut-out. DVT can be due to a delay in surgery due to comorbidities in one case. The reason for the fat embolism could not be found in one case, but the patient survived.

The union time was nearly the same in the majority of the patients, with an early union seen with the use of PFNA2 nails, as shown in Table 10. The mean union time was 14.2 weeks. In the case of PFN, it was 14.8 weeks, with 13 weeks for short PFN and 16.5 weeks for long PFN. In the case of PFNA2, it was 13.6 weeks, with 14 weeks for short PFNA2 and 12.5 weeks for long PFNA2.

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Ü♫Ġ و Ŏśś╫ℓ	و	ڤ	ى	و	ي □ى ڤ□
و-16 weeks	4	6	7	2	19 (63.33%)
>16 weeks	1	2	1	0	4 (13.33%)
Total	7	8	11	4	30

TABLE 10: Union time
p-value = 0.0256

PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation

As per Boyd and Griffin's classification, the majority of our patients had type II fractures, as shown in Table 11.

Type	Number of patients				Total (%)
	Short PFN	Long PFN	Short PFNA2	Long PFNA2	
I	2	1	3	2	8 (26.66%)
II	3	1	8	1	13 (43.33%)
III	1	3	0	0	4 (13.33%)
IV	1	3	0	1	5 (16.66%)
Total	7	8	11	4	30

TABLE 11: Fracture pattern as per Boyd and Griffin's classification
p-value = 0.4625

PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation

The majority had a union time between 10 and 16 weeks with an average of 14.2 weeks. Most of them were operated with short PFNA2. The overall modified HHS at the final follow-up was nearly the same with slightly better results with the use of PFNA2, as shown in Table 12 (p-value = 0.0077, signifying that PFNA2 is statistically better than conventional PFN).

Implant	! õś'nĂ┼ś ▒ ¤ŕ ╨Ž╚ŕ I I {	
	{ ╚¤'ŕĈ	[¤■┼
t Cb	82.38	83.5
PFNA2	84.7	83.4

TABLE 12: Modified Harris hip score at the final follow-up
p-value=0.0077 (comparing PFN vs. PFNA2)

PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation; HHS: Harris hip score

We also found good results when using short PFNA2 as compared to other nail designs, as shown in Table 13. We had excellent results in seven patients and good results in 14 patients (Figure 5).

Interpretation	bĵ ▒ Ľś'n¤ź ♫ĂĞŠ■Ċ				Total (%)
	{ ╚¤'ŕĈt Cb	[¤■┼t Cb	{ ╚¤'ŕĈt Cb ! و	[¤■┼t Cb A2	
9 ŝĺ ś▄é■Ċ	1	2	3	1	7 (23.33%)
Good	3	3	6	2	14 (46.66%)
Fair	3	3	2	1	9 (30%)
Total	7	8	11	4	30

TABLE 13: Interpretation of the modified Harris hip score at the final follow-up
PFN: proximal femoral nail; PFNA2: proximal femoral nail anti-rotation

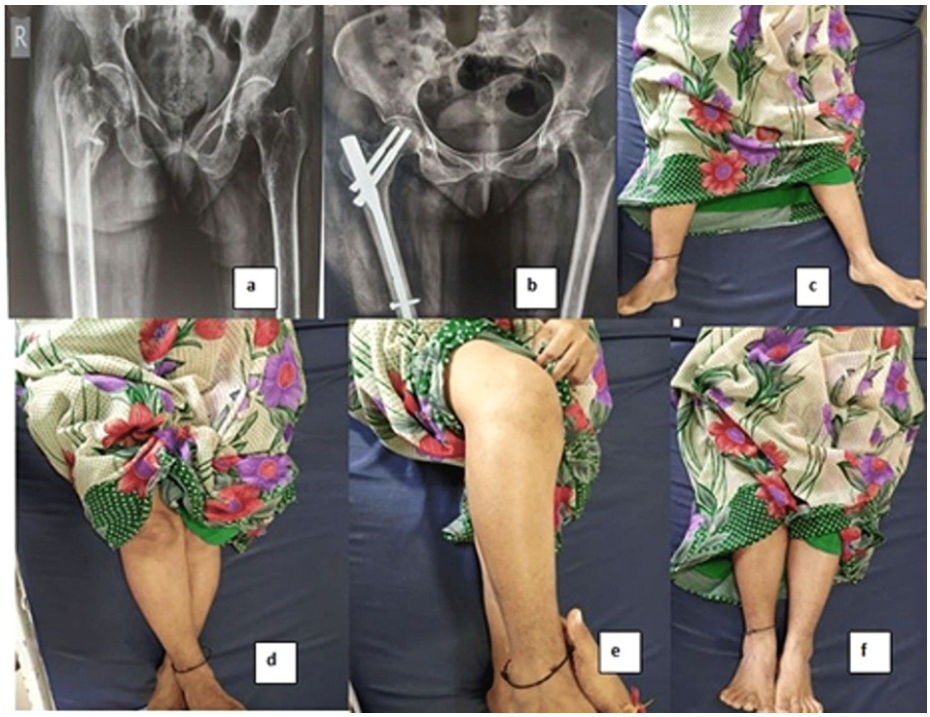


FIGURE 5: Images of patients showing excellent results

A: trauma radiograph, B: union radiograph, C: abduction, D: adduction, E: flexion, F: no limb length discrepancy (pelvis squared)

All the patients were operated with closed reduction except one (due to soft tissue interposition). The average blood loss was 100-120 ml when the patient was operated on with short PFN/PFNA2, and it was 180- 200 ml when the patient was operated on with long PFN/PFNA2. Blood loss was measured as per weight and the area of the mop soaked during the surgery. The drain amount was calculated too.

The average fluoroscopy time in the short PFN/PFNA2 was 80-100 seconds, which was lower compared to the long PFN/PFNA2 with an average of 140-160 seconds. None of the patients operated on with short PFN/PFNA2 experienced anterior thigh pain. All the patients were satisfied and returned to their preoperative job. None of them needed reoperation for the same injury.

Discussion

Operative treatment in the form of intramedullary fixation permits early rehabilitation and functional recovery, and hence it has become the treatment of choice for most cases of IT fracture. Among the various types of nails available, PFN is the most commonly used, but recently the use of PFN with a helical anti- rotation blade (PFNA2) has gained popularity. Both nail designs are available in short and long options.

There are no scientific studies that show clinical and functional outcomes comparing all four options. Thus, we studied clinical and functional outcomes comparing both nail designs (PFN and PFNA2) and both sizes (short and long). We prospectively studied all four variants of the nails avoiding selection bias.

Li et al. [9] in their study on a clinical evaluation of PFNA2 for the treatment of IT fractures

showed that it had the advantages of a simple operation, few complications, and good clinical efficacy for the treatment of IT fractures. However, the evaluation of its long-term efficacy and risk of other complications requires a large-sample, multi-centric observational study.

Kashid et al. [10] in their comparative study on the management of unstable trochanteric fractures showed that PFNA significantly reduces the operative time, amount of blood loss, and fluoroscopic imaging time as compared to PFN. However, PFNA had no significant benefits over PFN in terms of post-operative functional recovery or complications.

Gururagavendra et al. [11] in their study of the management of unstable IT fracture concluded that the mean time for radiological union and functional outcome was comparable in both groups. The mean operative time and blood loss were lesser in the case of PFNA2. Their study concluded that both implants have comparable radiological and functional outcomes for unstable IT fracture except for less surgical time and blood loss in PFNA2. Complications, such as proximal migration of the spiral blade into the hip joint and lateral thigh pain, were not seen in this study.

Singh and Bhartiya [12] in their study showed equally good functional outcomes following the fixation of unstable trochanteric fractures. PFNA offered no significant benefits over PFN in terms of postoperative complications.

Gardenbroek et al. [13] in their study on PFNA found that the union with PFNA does not improve the position of the implant in the femoral head compared with PFN. However, the risk of secondary complications and the need for reoperation is significantly higher in patients who were treated with PFN.

Our study was comparable to the above-mentioned studies in terms of demographic details showing male preponderance and the occurrence of the fracture in the elderly age group. Other studies had also taken an equal number of cases of each of the nail types as in our study. Trivial trauma was the most common mode of occurrence. The type of implant chosen was random without any confounding factors or biases comparable to other studies.

Our study matches with previous studies in terms of lesser operative time, lesser complications, and lesser hospitalization using PFNA2 nail design. There was no major difference in terms of intraoperative blood loss as compared to previous studies. In our study, the average fluoroscopy time was greater compared to other studies. The average number and type of complications in our study were similar to most other studies. Ours is a tertiary care setup, so we got patients from other states. Such patients preferred to get discharged after suture removal to avoid to-and-fro expenses for dressing. This may be one of the reasons for longer hospital stays. The use of a distal dynamic locking screw in the majority of the patients can get better compression at the fracture site once the patient starts weight bearing and decrease the chances of the Z-effect, reverse Z- effect, screw back-out, and screw cut-out.

There was no major difference in the average follow-up period as compared to other studies. The mode of classification of fracture pattern and the union time matched most of the studies. No one from our study required reoperation due to post-operative complications as was the case in some of the previous studies. Our study's interpretation using the modified HHS matched previous studies, and we had significant similarities in terms of the percentage of patients with excellent and good results.

The randomized selection of implant design and prospective nature are strengths of our study. Randomized patient selection irrespective of fracture type avoids confounders. Our study was unique, as very less studies are reported in the literature, which compared short

and long nails in PFN and PFNA2. It was also unique in terms of comparing outcomes and advantages of only distal dynamic screws over static locking or the use of both static and dynamic screws.

A relatively small sample size, shorter follow-up period, and single-center study can be considered our limitations. A larger sample size with a longer follow-up with a multicentric study would have made a better assessment of the long-term outcomes of such a problem.

Conclusions

PFNA2 is the implant of choice in elderly patients with osteoporotic bone. It has less operative time, which is required in such patients with medical comorbidities; hence, it has marginal superiority over PFN. Short- nail design results in less operative time and less blood loss. Complications are relatively less with PFNA2. Following all surgical steps systematically avoids complications in both groups.

Only distal dynamic locking allows fracture collapse, better compliance, and early union of the fracture.There is no difference in the union time between short and long nail designs. Clinical and functional outcomes do not change at the final follow-up with the use of PFN or PFNA2.

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4. EXTENSOR TENDON DISLOCATION AT MP JOINT - FINGER

Dr Raju Shah,
Dr Kushal Parikh

A b s t r a c t

The extensor tendon dislocation usually cause pain, sense of discomfort and difficulty in doing various activities with hand. Sometimes they may present with triggering of the finger which may be confused with Triggering due to flexor tenon problem. Here, we report a case of extensor tendon subluxation with triggering of the Right little finger. We aim to bring to notice pseudo triggering due to tendon dislocation. Reconstruction performed by Elson's technique using Extensor Digiti Minimi (EDM) / Extensor Digitorum Communis (EDC) tendon slip which is passed beneath the deep transverse intermetacarpal ligament is a successful choice of treatment for these patients.

Introduction

In this study, we report a case of extensor tendon dislocation over MP joint with pseudo triggering of the Right little finger.

Five etiological factors are reported to be involved in extensor tendon subluxation/dislocation of the extensor tendons namely Rheumatoid (most common),traumatic (due to sagittal band rupture), congenital, spontaneous and degenerative. The patients with extensor tendon dislocations usually complain of discomfort and snapping/pseudo triggering with finger flexion.

Case

A 76 year old male (retired professor) presented with a complaint of discomfort and triggering of his Right little finger for about 4-5 months. The little finger used to stick out in abduction with activities of hand involving flexion of fingers (FIG 1, Video 1 https://youtu.be/XVdq-waZZ28).

He was able to extend it without help of the other hand. Once extended he was able to maintain this position actively(FIG 2). The little finger was pseudo triggering due to falling of the extensor tendon beyond the axis of rotation of the MP joint. During flexion, the extensor tendon could be seen to slip medially across the ulnar side of the head of the fifth metacarpal ((FIG 3) with some local discomfort. There were no signs of rheumatoid arthritis. The blood investigations were normal. X-ray of the hand shoed no abnormality.

Surgical Technique: (Elson's Technique)

A Surgical reconstruction was advised and planned.Under regional anaesthesia a longitudinal incision was made over the dorsal aspect of the right fifth MP joint. The whole extensor apparatus was exposed. The clinical findings were confirmed, with flexion of the finger the tendons dislocated on ulnar side (Fig 4-,5)

The slip from the extensor digitorum communis tendon to the little finger was well developed: no evidence of a tear in the radial side of the extensor hood nor the dorsal capsular ligament of the MP joint could be found. The tissues here were lax and thin, so that ulnar dislocation occurred with ease.

The EDM tendon was cut to create 4cm long distally based slip for reconstruction. The proximal end of the cut EDM tendon was sutured with EDC to Little finger to maintain strength of extension. The distal tendon slip was passed under the intact EDC to little finger radially and then was looped deep transverse intermetacarpal ligament between 4th and 5th metacarpal heads and returned to the EDC tendon (FIG 6, Schematic Representation of method).The free end of tendon slip was then sutured after adjusting appropriate tension (with wrist and MP joint in extension and IP joints in flexion) holding the tendon centralized, using Pulvertuft technique(Fig. 7). It was confirmed with passive flexion and extension of the MP joint that the tendon remained centralized over MP joint with motion.

The fingers & wrist were immobilized in extension for 2 days, followed by splint to keep the wrist and MP joint in extension, allowing active movements at IP joints for 2weeks. At 2 weeks the splint was removed intermittently several times a day for mobilization of finger.
The patient gained full range of motion at about four weeks. The splint was continued for total of 6 weeks after surgery.

At last follow up at about 48 months postoperatively, he had full range of motion and had no dislocation or subluxation of the extensor tendons of the fifth finger(Fig8,9 Video 2). https://youtu.be/A_nlLA537Mk).

We did not see any complication related to surgery.

Discussion:
Dislocation or subluxation of the extensor tendons of the digits may be due to various etiology namely Rheumatoid Arthritis, traumatic, congenital, spontaneous and degenerative. It is caused by the defect in the primary and secondary stabilizing structures of the EDC. The sagittal band which tightens with flexion and fixes the tendon over the MP joint is the primary stabilizing structure. The intertendinous fascia and junctura tendinies behave as secondary stabilizers of the extensor tendons.

In literature, the symptoms of extensor tendon subluxation dislocation are reported as pain, swelling, discomfort and difficulty in writing and forceful flexion. However, pseudo triggering may also occur in little finger which has more than one extensor tendon. In this digit located at the edge of the hand, complete dislocation of the tendon behind the axis of flexion extension motion of the MP joint can be more painful and can cause more discomfort. Sometimes pseudo triggering of the finger, may be misdiagnosed as nerve entrapment syndrome or trigger finger problem resulting in erroneous surgical intervention.

In review of the literature, we found that various techniques are reported for surgical stabilization of the extensor tendons. Most use local tissue or nearby tendon slips for tendon realignment, with or without soft tissue release and imbrication.

Direct repair of the sagittal band, use of Junctura tendini or slip of extensor tendons are reported in both traumatic and spontaneous dislocations all with successful results.

The Elson technique involves rigid reconstruction for the treatment of extemor tendon dislocation. It uses slip of EDC tendon (harvested from radial/central/ulnar side) or EDM tendon for little finger or EIP tendon for index finger. Various studies report this technique remains symptom-free with no recurrent dislocation of the tendon or other complications.
We therefore, considered, Elson technique was suitable for this case. Long term follow up has confirmed our belief in this case.

We believe that, reconstruction performed by a slip of tendon passed beneath the deep intermetacarpal ligament is a good surgical technique which can be used successfully in extensor tendon dislocations.

Conclusion
We would like to underline that, dislocation of the
extensor tendons can cause pseudo triggering of the digits and can be misdiagnosed as nerve entrapment or trigger finger Elson's Techinque resulting in unnecessary surgical interventions. Surgical reconstruction performed by Elson's technique results in successful treatment with full range of motion, complete resolution of symptoms and without any complications.

Fig 1



Fig 2



Fig 3



Fig 4



Fig 5



Fig 6

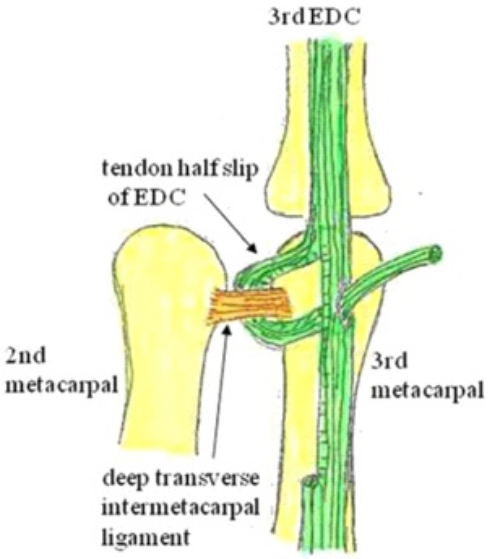


Fig 7



Fig 8

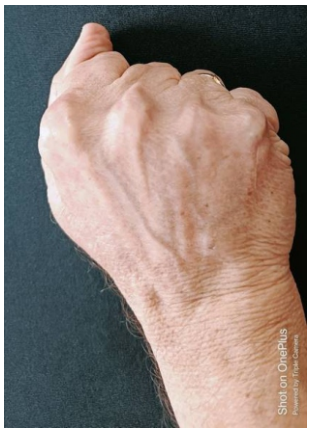


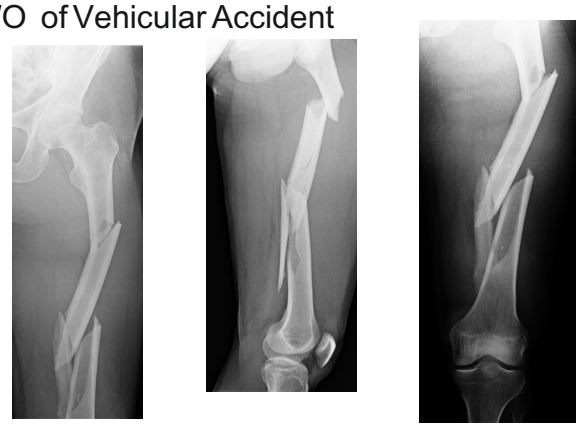
Fig 9



5. Comminuted Fractures - A Multiciase Series treated using MIPPO

Dr Samir Shah, Baroda

Case 1 : M/65yrs Old – H/O of Vehicular Accident



What are the problems involved in treatment of this case?

1. Rotation
2. Allignment
3. Achieving Length

Immediate Post - Op

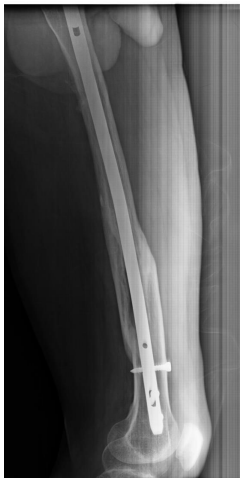


9 months Post Surgery



24 Months Post Surgery





Indications For Technique











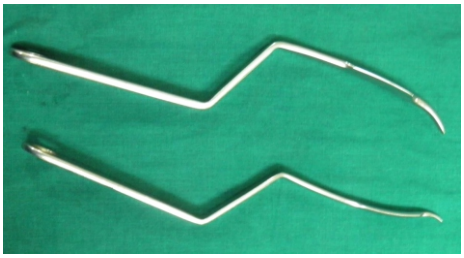
Instruments Helpful To achieve Reduction in MIPPO Technique













T ECHNICAL TIPS

Ø DO NOT ADDUCT THE LIMB

Ø DO NOT GIVE EXCESSIVE TRACTION

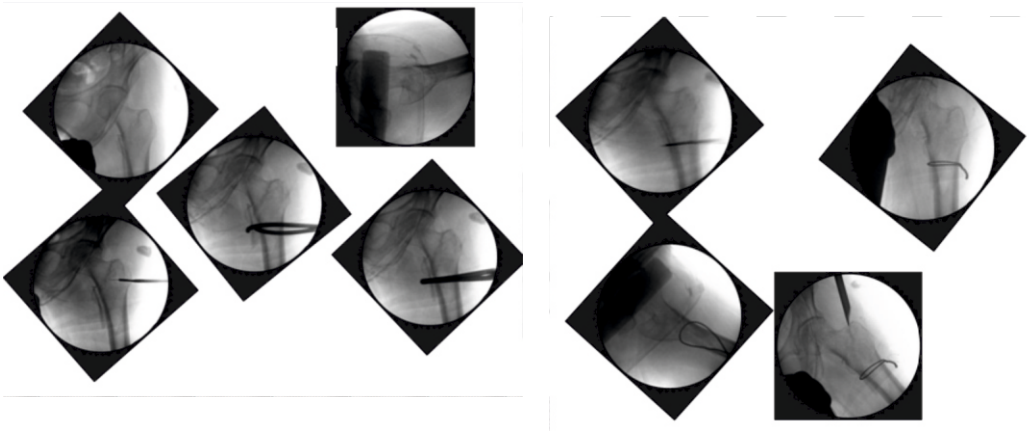
Ø REVIEW THE DISPLACEMENTS OF FRAGMENTS

Ø REVIEW THE ROTATIONS OF THE FRAGMENTS

Case 2 : F/80 YRS



INTRA OP

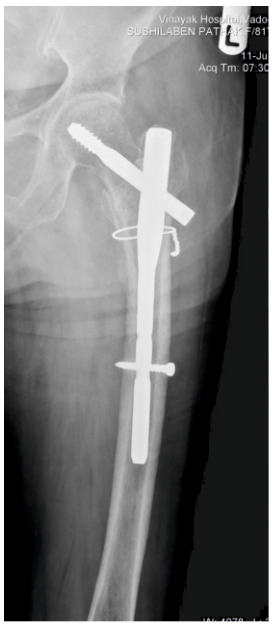


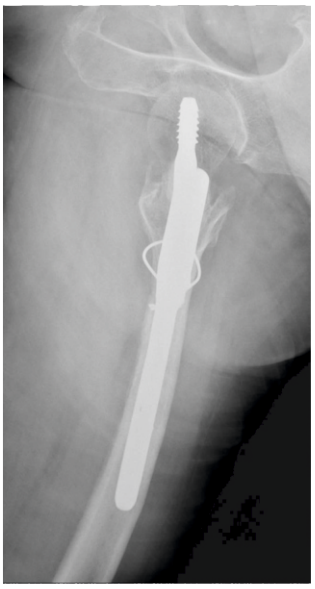
POST OPERATIVE





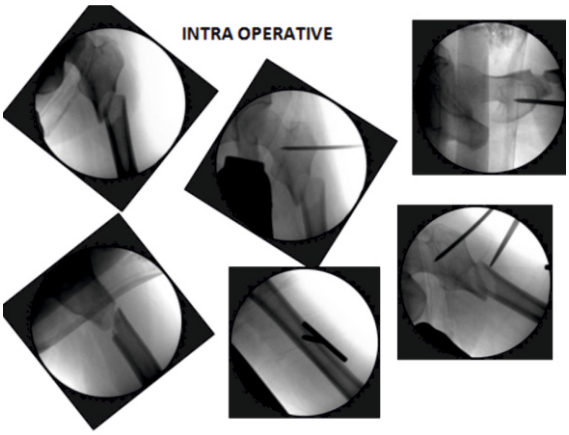
12 WEEKS POST SURGERY

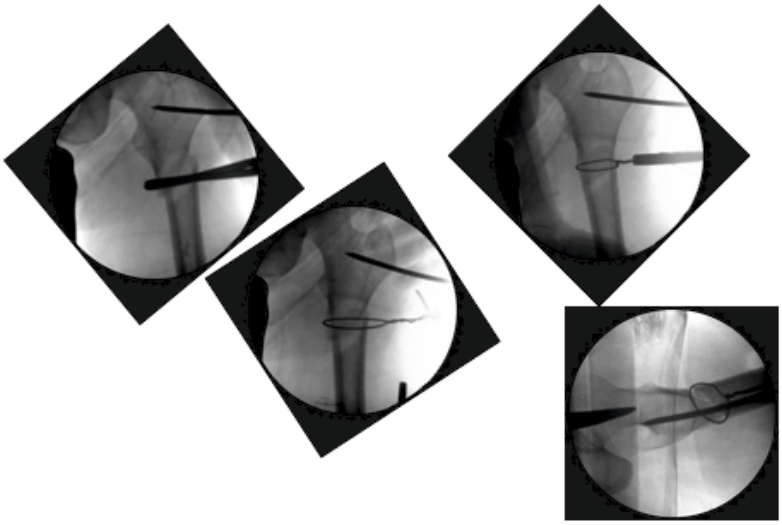




Case 3 : M/29YRS

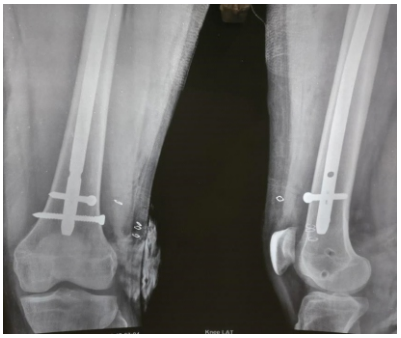




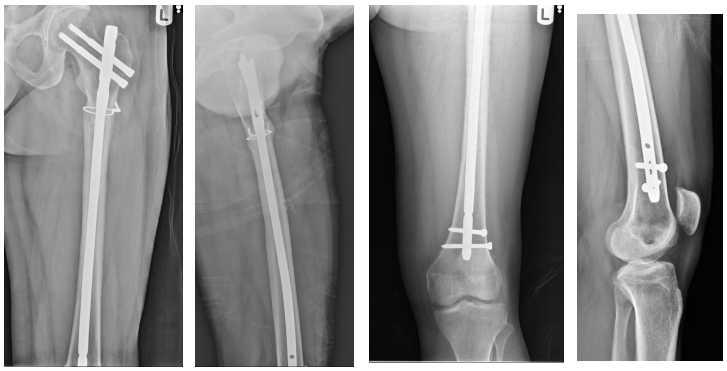


POST FIXATION

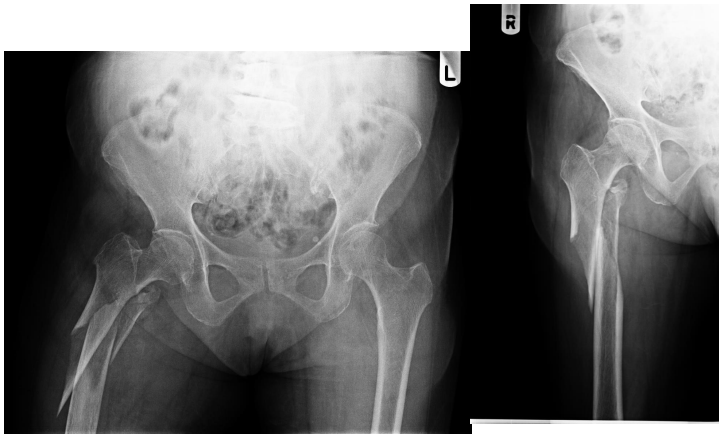




20 WEEKS



Case 4 : F/90 Yrs





TAKE HOME MESSAGE

Ø MIPO IS NOT MALREDUCTION

Ø IF YOU ARE NOT GETTING REDUCTION DO NOT HESITATE IN OPEN REDUCTION

Ø RESPECT BIOLOGY BUT NOT AT THE COST OF REDUCTION

Upcoming Conferences

06-10-2023	Ilizarov Basic Masters Class	Panjab
6-10-2023	MP - IOACON 2023	Shivpuri
7-10-2023	Trauma Conclave	Corbett National
7-10-2023	Basic Ilizarov Hands - on ASSAMI	Jaipur
8-10-2023	Elbow Injuries GOA mid Year Meet	Rajkot
8-10-2023	HIP Presevahion : Techniques & Advancements	Patna
13-10-2023	IAACON 2023	Chandigarh
14-10-2023	PG Teaching Coures 2023	SCB MC Cattack
14-10-2023	Basic Ilizarov Wboa	Kolkata
21-09-2023	OTTSCON 2023	Ahmedabad
22-10-2023	Ilizarov Deformity Correction	Delhi
27-10-2023	GOSICON 2023	Jalgaon
27-10-2023	DOACON 2023	Jaipur
27-10-2023	Sesicon 2023 Shonlder & Elbow Socity of India	Hyderabad
28-10-2023	Mastering the an ot manuecript Conversion	Webinar
29-10-2023	JESS Fixator Basic Techinque	Tangi
03-11-2023	DOACON 2023	Delhi
24-11-2023	OASCON 2023 Odisha Arthroscopy Society	Bhubaneshwar

Humour in Orthopaedics

