## *Editorial Board*

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Editorial

# Plaster of Paris – The fading art

Gohiya A.

The treatment of fractures has gone through a drastic change since it's inception. With development of modern orthopaedics and technological advancements, non-operative treatment is escaping out of armamentarium of orthopaedic surgeons. As the number of plaster of treatments have gone down drastically the residents in the teaching hospitals are not getting exposure to the art and science of plaster treatment.

One of the earliest descriptions of casting material was by Hippocrates in 350 BC. He wrote about wrapping injured limbs in bandages soaked in wax and resin [1]. Egyptians were using self-setting bandages, probably derived from those used by the embalmers [2]. Arab physician Rhazes Athuriscus. El Zahrawi (960-1013 AD), described the use of both clay gum mixtures and flour and egg white as casting materials. Starch based casts appear to have been the standard treatment with only minor changes until the beginning of the 19th century with only a few minor changes [3]. In the 18th century, Henri François Le Dran used to soak his bandages with egg white, vinegar and clay powder or plaster [4]. Larrey's modification was adopted from Don Eugenio de la Penna who bandaged the fracture with linen that had first been moistened with Camphor spirit, egg whites and lead-acetate [5]. Baron Louis Joseph G Seutin (1793-1862) became famous for inventing starch bandages known as "La Bandage Immobile" or "L'Appareil Amidonnee" that consisted of strips of linen or bandages and carton splints, soaked in starch and wrapped around the limb [5,6].

Plaster of Paris is produced by removing the impurities from the mined gypsum and then heating it under controlled conditions to reduce the amount of water of crystallization [7]. There are various accounts describing the origin for the name plaster of Paris. One account mentions King Henry III who visited Paris in 1254 and was so impressed by fine white walls that he introduced similar plastering in England where it became known as plaster of Paris. The first use of plaster of Paris as a cast for injured limbs took place through a technique known as plâtre coulé that became popular in Europe at the beginning of 19th century. This technique involved pouring plaster of Paris around injured limbs encased in a wooden construct. Due to the weight of the construct, the patient was largely confined to bed during the period of fracture healing [1].

In 1839, Lafargue of St. Emilion used fresh warm starch paste mixed with plaster of Paris powder applied to layers of linen strips. That dressing had the advantage of hardening much quicker, reducing setting time down to six hours [8].

The Dutch military surgeon Anthonius Mathijsen while working at the military hospital in Haarlem discovered that bandages soaked in water and plaster of Paris were becoming hard within minutes providing sufficient casting for injured limbs. He published his monograph in 1852 in a medical magazine called Repertorium. His plaster bandage was based on the principles of Seutin, who 10 years earlier introduced starched bandages known as bandage amidonnee [1, 8].

Nikolay Ivanovich Pirogov conceived his idea to use plaster splints around 1852 while observing the work of a sculptor who used strips of linen soaked in liquid plaster to make models. After the war he refined his method by cutting coarse sail cloth to a defined pattern shaped to fit a part of body and soaking it in plaster before application [2].

Use of plaster of Paris bandages for fracture casts became widespread after Mathijsen's death and replaced most other forms of splintage. Early plaster bandages used at hospitals were made by nursing staff. They were usually freshly made from plaster powder kept in air tight containers that was applied on to the woven bandage or strips of cloths. Care was required while soaking dry bandage in water to

prevent the plaster coming off the bandages and dissolving in water. In the early 1930's, the first commercially manufactured bandages were available in Germany. They were made by spreading plaster mixed with minute quantities of volatile liquids on soft cloth.

In 1906, Meisenbach outlined the four essential properties of plaster dressings to include strength, quick set, light weight and ventilation, summarizing that ideal plaster dressing should be thin and strong [9].

It usually sets in few minutes, but needs between 36-72 hours to completely dry. Leg plasters can bear weight after 48 hours. Completely dry casts when tapped with knuckles will sound crisp and clear whereas wet casts emit a dull sound. Cast should only be dried by natural methods. No artificially generated heat is recommended [10].

When plaster of Paris dries off it becomes porous which helps to maintain patient's skin free from moisture. It is radiolucent which makes X-ray examination possible. The strength of the plaster cast is determined by the quality of plaster, water to gypsum ratio, product age and storage conditions [11].

A fiberglass cast is a newer synthetic alternative to plaster of Paris. Fiberglass cast is a lightweight and extremely strong material. Fiberglass cast is used for fracture management but is not applied in the acute settings because it is less accommodating to swelling and does not allow moulding.

The success of non-operative treatment of fractures relies on a clear understanding of fracture healing and the proper use of stabilizing techniques, good knowledge of anatomy and pathology. Plaster of Paris is unique and remains the favoured casting material. It is cheap, non-toxic, and can easily be moulded to the desired shapes and contours of the body. Skin irritation and allergy is extremely rare.

Plaster of Paris has stood the test of time and is still commonly used.

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Original Article

# Prospective analysis of clinico-radiological efficacy of Trans-foraminal Lumbar Interbody Fusion (TLIF) in degenerative disc disease - Mid term follow up of 2 years

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## Abstract

**Background:** Low back pain as a result of degenerative disc disease (DDD) imparts a large socioeconomic impact on the health care system. Correct diagnosis and treatment of DDD is difficult and controversial. Whether inter-body fusion is the treatment of choice in DDD is still a dilemma. The Transforaminal interbody fusion (TLIF) developed by Harms is a modification of posterior lumbar interbody fusion(PLIF). Advantage of the TLIF over PLIF with lesser complications avoidance of epidural scarring, less intra-operative bleeding, and lesser chance of dural injury.

**Methods:** We evaluated 30 patients operated for DDD with TLIF between 2014 to 2017. Patients > 35 years, both sexes, two level or less involvement, degenerative spondylolisthesis (grade I, II), with predominantly low-back pain, with or without radiculopathy or claudication, disability to perform daily activities and not relived by non-operative treatment for at least 6 months were included. All other cases were excluded. Thorough clinical and radiological examination was done.

Patient was followed up at 1, 3, 6 and 9 months post-op for X-ray (to see for progress of union), VAS score and ODI index and complications. Bony fusion was assessed by a single radiologist on basis of X-ray only.

**Results:** 17 M 13 F patients with 19 patients having instability while 11 not, were evaluated. L4-5 was the most common level. Average pre-operative VAS score was 7.7667 (S.D 1.104) while at last follow-up was 2.133 (S.D 0.434). Average pre-operative ODI was 47.133 (S.D 8.215) while at last follow-up it was 25.533 (S.D 4.191) (Table-2). Mean operative time for one and two level was 97.3 minutes and 143.2 minutes respectively. Average blood loss was 465 ml (390- 580ml). 28 patients had bony fusion at last follow-up (93 %). Two patients who did not show bony fusion were asymptomatic. We encountered intra-operative violation of S1 pedicle in one case, dural puncture in three cases, contra-lateral radiculopathy in one case and asymptomatic adjacent segment disease in 4 cases at final follow-up.

**Conclusion:** We conclude from our study that TLIF is simpler, easier and safe procedure for Degenerative Disc Disease with good surgical, functional and radiological outcomes.

**Keywords**: Degenerative disc disease, Interbody Fusion, TLIF

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## Introduction

Low back pain as a result of degenerative disc disease (DDD) imparts a large socioeconomic impact on the health care system. Correct diagnosis and treatment of DDD is difficult and controversial. Patients with DDD and discogenic back pain presents with symptoms that range from

mild Low back pain (LBP) to excruciating back pain with lower extremity symptoms. Continued degeneration of the affected disc can lead to secondary problems such as degenerative spondyolisthesis, lumbar canal stenosis and facetal arthropathy. Moreover, diagnostic evaluation of chronic low back pain is complex because of multiple pain generators that are difficult to identify [1]. Various non-surgical and surgical modalities of treatment are available for management of DDD. Surgical interventions include fusions, nucleoplasty, disc arthroplasty and dynamic stabilization procedures. Whether inter body fusion is the treatment of choice in DDD is still a dilemma. Interbody arthrodesis may improve the clinical results by eliminating the disc as a potential pain generator, improving fusion rate and restoring intervertebral disc height and lumbar lordosis. Reconstruction of anterior column can be performed via anterior approach (trans-peritoneal, retro-peritoneal) posterior fusion and instrumentation to achieve 360-degree fusion. An alternative method to reconstruct anterior column is via posterior lumbar interbody fusion with lesser complications. The Transforaminal interbody fusion (TLIF) developed by Harms is a modification of posterior lumbar interbody fusion (PLIF). Advantage of the TLIF over PLIF with lesser complications avoidance of epidural scarring, less intraoperative bleeding, and lesser chance of dural injury [2]. Over past few years TLIF has gained popularity over ALIF and PLIF. Hence, we studied the clinical, functional and radiological outcomes of TLIF and complications associated with it.

## Materials and Methods

After obtaining permission from the Ethical Committee of the Institution, from 2014 to 2107, We studied thirty cases of degenerative disc disease at tertiary care hospital. Aim of the study was to evaluate the role of TLIF in alleviating chronic LBP and leg pain if present in cases of DDD. Patients with chronic LBA (more than 6 months), with failed conservative treatment, wit/without radiculopathy, with reduced inter-vertebral disc space on x-ray and MRI were considered as having DDD. Patient selection was on the basis of following criteria: Age > 35 years, both sexes, less than or equal to two level involvement, degenerative spondylolisthesis (grade I and II) and Patients with predominant symptoms of low-back pain with radicular pain to one or both lower limb or canal stenosis, disability to perform daily activities and not relived by non-operative treatment for at least 6 months. Patients excluded from the study were those with grade III and IV spondylolisthesis, Patients with infection, tumor or revision cases and patients with other co-morbidities making patient unfit for surgery. All patients underwent thorough clinical evaluation. On the basis of displacement in flexion and extension lateral views, grading of listhesis was done. Patient's pre-operative Visual Analogue Score (VAS) score and Oswestry Disability Index (ODI) were recorded for comparing them with post-operative results. After pre-anesthetic evaluation and obtaining patients consent, patients were posted for TLIF procedure.

Operative technique:

Under general anesthesia, in prone position the level/levels involved were confirmed under image intensifier. A midline incision was made and posterior elements down to the tips of transverse process were exposed sub-periostealy. Pedicle screws were placed bilaterally under fluoroscopic guidance. After interlaminar decompression, unilaterally, on the side of radicular pain, inferior facet of rostral vertebra and the superior facet of the caudal vertebra were resected to expose the disc after fixing a rod to the pedicle screw on the opposite side. Once the working window is created, the exiting and traversing nerve

roots were decompressed and protected. Complete disc along with the superior and inferior end plates were removed with straight and angled curettes. Disc space is increased by distracting the pedicle screws on the opposite side. After confirming the size of disc space with serial dilators and fluoroscopy, appropriate sized banana cage packed with bone graft obtained intra-operatively is inserted and placed antero-centrally. Area inside the annulus and around the cage is packed with remaining graft. Second connecting rod is connected and the level is compressed. After thorough wash, wound is closed over drain in layers and sterile dressing applied. After 48 hours drain is removed. Patient is mobilized out of bed after day 2 as pain tolerated. I.V antibiotics were given till fifth post-operative day. Post-operative x-rays were done and after suture removal patients were discharged.

Patient was followed up at 1,3, 6 and 9 months post-op. At follow-up, X-ray (to see for progress of union), VAS score and ODI index, complications if any were noted and treated and these variables were used to determine the surgical and functional efficacy of the treatment. Bony fusion was assessed by a single radiologist on basis of X-ray only.

## Results

We studied 17male and 13female patients with maximum age 66 years and minimum age 37 years (average: 49 years). Of 30 patients, 19 patients had degenerative disc disease with spondylolisthesis while 11 had only symptoms of degenerative disc disease and no listhesis. L3-L4 was involved in 4 patients, L4-L5 in 11 patients, L5-S1 in 9 patients and L4-L5-S1 in five patients and L3-L4-L5 in one patient (Table-1).

**Table-1: vertebral level**

| Level | | Frequency | Percent |
|---|---|---|---|
| Valid | L3-L4 | 4 | 13.3 |
| | L4-L5 | 11 | 36.7 |
| | L4-L5-S1 | 5 | 16.7 |
| | L5-S1 | 9 | 30.0 |
| | L3-L4-L5 | 1 | 3.3 |
| | Total | 30 | 100.0 |

Average pre-operative VAS score was 7.7667 (S.D 1.104), at 3 months post-op was 2.633 (S.D 0.764) while at last follow-up was 2.133 (S.D 0.434). Average pre-operative ODI was 47.133 (S.D 8.215), at 3 months post-op was 26.066 (S.D 5.394) while at last follow-up it was 25.533 (S.D 4.191) (Table-2). Mean operative time for one and two level was 97.3 minutes and 143.2 minutes respectively. Average blood loss was 465 ml (390- 580ml). As assessed by the radiologist, 28 patients had bony fusion at last follow-up (93 %). Two patients who did not show bony fusion were asymptomatic and hence not intervened. No implant loosening or cage migration was noted in any case. We encountered intraoperatively violation of S1 pedicle in one patient, so for salvage we put iliac screw on that side, Dural puncture was encountered in three cases, which was repaired with 5-0 proline and fat pad was placed over it. Air tight closure was done and post-operatively patient was put on oral Acetazolamide 250 mg BD for 5 days. 4 patients had superficial infection at operative side which was managed with regular dressings and oral antibiotics. One patient had symptoms of contra-lateral radiculopathy post-operatively which was managed conservatively. Adjacent segment DDD was noted in 4 cases radiologically but

not clinically. There was no case of cage subsidence till the last follow-up.

**Table -2: Paired Samples Statistics**

| Mean | N | Std. Deviation | t | P |
|---|---|---|---|---|
| | | | | |
| 47.1333 | 30 | 8.21577 | 17.665 | 0.000 |
| 21.5333 | 30 | 4.19140 | | |
| 7.7667 | 30 | 1.10433 | 25.349 | 0.000 |
| 2.1333 | 30 | 0.43417 | | |

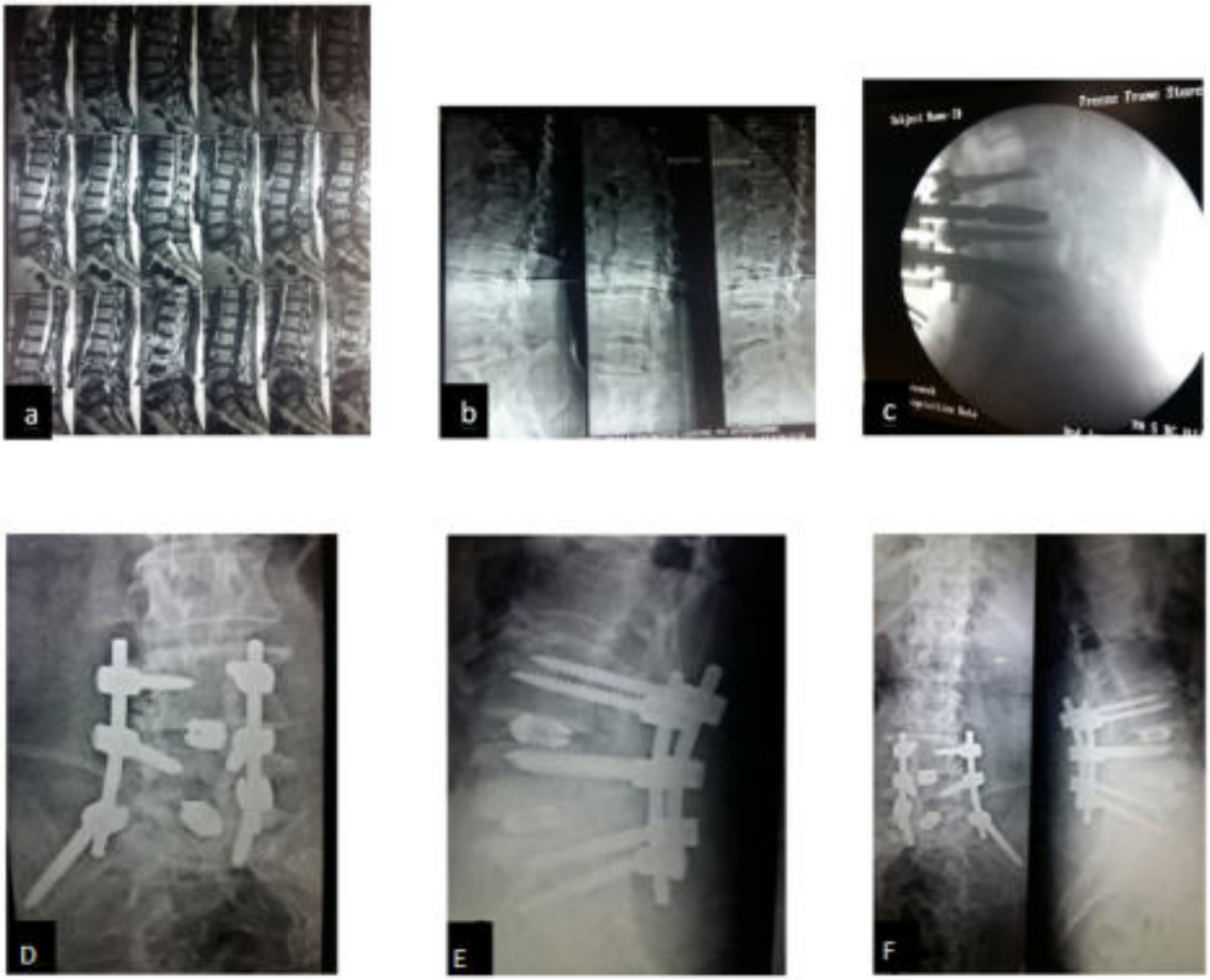


**Figure 1.**

(a) MRI image of 60 yr female with degenerated disc L4-L5-S1. (b) X-ray of LS spine flexion extension view showing degenerative listhesis. (c) intraoperative C-arm image showing fixation. (d-e) Post-operative images showing interbody fusion at L4-L5-S1 level. (f)one year follow up X-ray showing consolidation

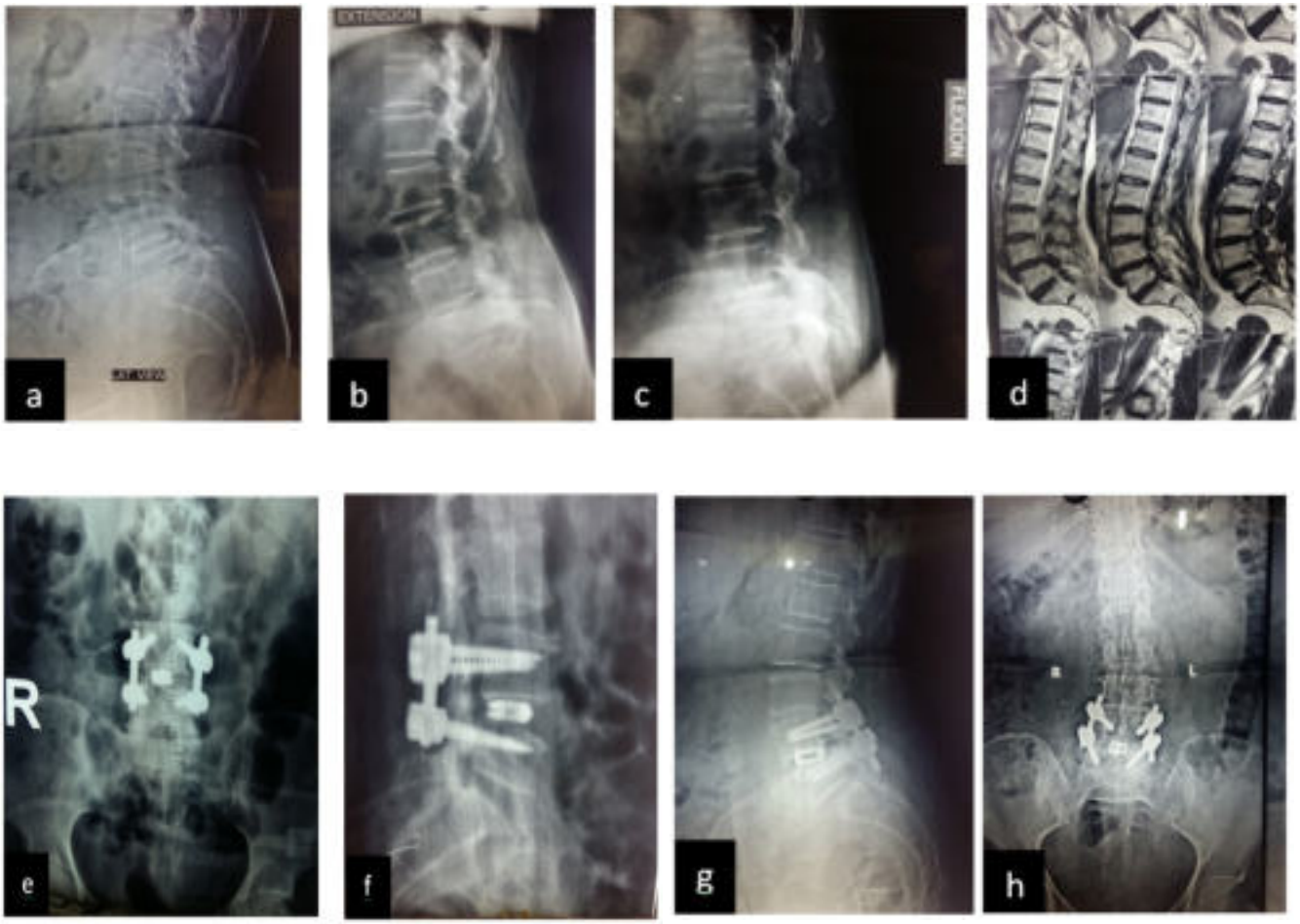


**Figure 2.**

(abc) X-ray images of 45/F lateral, flexion and extension views showing instability at L4-L5 level. (d)MRI image. (e-f) Post-operative images showing interbody fusion at L4-L5 Level. (g-h) Two year follow up images showing fusion.

## Discussion

The most common symptom with which patients with DDD present is low back pain, although radicular pain and neurogenic symptoms may occur secondary to neural compression. Two major pain generating structures in DDD include Inter Vertebral Disc and facet joint. Back pain arising from spinal IVD is called discogenic pain [3]. Conservative therapy and needle based treatment i.e. injections and rhizotomy, are highly effective in treating back pain from arthritic facets but discogenic pain does not responds well to it [4-7]. Studies in literature conclude that discogenic pain of DDD can be successfully alleviated by surgical intervention in form of fusion, arthroplasty or disc repair [8-10]. In our study of 30 cases of DDD treated with TLIF + Posterior Spinal Fusion we achieved significant improvement in patient's daily chronic low-back pain. Deng-Lu Yan et al also found that lumbar pain improved in 83.5% of patients in their study [11].

In cases of degenerative listhesis, goal of surgery is stabilization of motion segment by fusion and decompression of neural elements. Interbody fusion by restoring the discs space height indirectly decompresses the neural foramen. As compared to postero-lateral fusion in which the graft is under tensile stress, in interbody fusion the graft is under compression and hence the chances of fusion are increased. Various

approaches for lumbar fusion are advocated in literature, TLIF technique has become increasingly popular since introduce by Harms in 1982 and now being in current trend. Humphreys made a comparative study of PLIF with TILF 34 and 40 cases respectively. The authors conclude that the TLIF showed to be good alternative to PLIF with relatively less risk of complications. As compared to PLIF in TILF chances of injury due to retraction of neural elements are minimal, less operating time as well less significant reduction in blood loss. PLIF is limited to levels L3 to S1 since excessive retraction of thecal sac at higher level may cause neurological damage. TLIF can be performed safely from posterior and unilateral approach and hence contralateral side available for revision. Complications like injury to iliac vessels, hypogastric plexus and greater blood loss seen in ALIF are avoided with TLIF [9].

Zhang kai et al (2014) in their study found the mean post-operative VAS score 2.3+0.7 which correlates with our mean post-operative VAS score [10]. In our study we found significant improvement in the VAS and ODI postoperatively which supports the utility of TLIF in DDD as concluded by other studies [12-15].

Lowe and Tahernia in their study on 40 patients underwent TILF surgery reported fusion rate radiologically was 95% of cases [16]. Zhang kai et al (2014) reported solid fusion in 90.29% [10]. Fusion rates in our study 93% are comparable to other studies (89% to 100 %) although criteria of defining fusion may be different [17-19]. France et al looked at instrumented vs un-instrumented fusion in a prospective study and found that instrumentation improved the fusion rate but it did not correlate with clinical outcome [20]. Kanyana et al assessed instrumented and un instrumented lumbar fusion and found that instrumentation resulted in higher fusion rates at 8 weeks compared to the uninstrumented group but at 16 weeks the fusion rates were the same in both groups [21].

We encountered 3 cases of dural puncture intra-operatively which we repaired. Rosenberg and Maummaeni (2001) reported incidental dural tear in one patient that repaired but needed revision surgery for post-operative dural leak [22]. McAfee et al (2005) found 7 cases of dural tear (120 patients) during cage insertion and nerve root decompression [23]. 4 had superficial infection at operative side which was managed with regular dressings and oral antibiotics. One patient had symptoms of contra-lateral radiculopathy post-operatively which was managed conservatively [24]. Adjacent segment DDD was noted in 4 cases radiologically but not clinically. There were no cases of cage subsidence or implant loosening till last follow-up. Adjacent segment DDD was noted in 4 cases radiologically but not clinically. Adjacent segment disease is a known complication occurring in the level above the fused vertebra due to increased stress and hypermobility. It causes facetal and ligamentum flavum hypertrophy leading to canal and foraminal stenosis at a later stage [25]. The incidence of postoperative Adjacent Segment Disease (up to 30%) is greater following either open or Minimally Invasive Surgery instrumented lumbar fusions (e.g., TLIF/PLIF), while decompressions with non-instrumented fusions led to a much smaller 5.6% risk of ASD [26-27]. In our series, the rate of asymptomatic ASD was 13 %.

## Conclusion

We conclude from our study that TLIF is simpler, easier and safe procedure for DDD with good surgical and functional outcomes.

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Original Article

# A comparative study of intramedullary and extramedullary fixation devices in type two unstable trochanteric fractures

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**Abstract**

**Background***:* For many years, the sliding hip screw and plate had been the gold standard in treating pertrochanteric fractures. Nowadays, there is an increasing interest in intramedullary nailing. Intramedullary devices, although technically difficult seems to have a biomechanical advantage over laterally fixed side plates2.Literature is full of articles categorizing DHS in stable Trochanteric fractures, (31-A1.1, A1.2, A1.3 and 31-A2.1) and use of intramedullary devices PFN as implant of choice in unstable trochanteric, sub trochanteric fractures and particularly in reverse oblique (all A 31.3). But there is always a grey zone of decision of implant to be applied in unstable type A2.2 and A2.3 fractures.

This study was designed to compare functional outcome and complications of the PFN device with those of a traditional extramedullary device, the Dynamic hip screw (DHS), inpatients with unstable type 2 trochanteric fracture. (AO/ASIF Classification 31-A2.2 & 31-A2.3)

**Method***:* In this Randomised control prospectively, designed study 60 consecutive patients having Fracture according to AO/ASIF classification 31-A2.2 and 31-A2.3 are included and randomized to either PFN or DHS group. The functional outcome and clinical results of the patients was evaluated and graded using HARRIS HIP SCORE system.

**Results***:* The average blood loss in PFN was 88.3ml while in DHS it was 318.33ml. Hospital stay after surgery in PFN was average days 4.13 DHS was average days 5.63. Harris hip score in PFN 22 (73.33%) were good, 06 (20%) were fair and 02 (6.66%) while with DHS 12 (40%)were good, 12(40%) were fair and 06 (20%).Average time of union in PFN was 13.4 weeks in DHS was 15.1 weeks.

**Conclusion**: In Type 2 unstable trochanteric fractures PFN gives advantage of lesser blood loss, shorter operating time, faster union, better functional outcome with low complication rate as compared to DHS.
**Keywords**: Unstable trochanteric fracture, PFN, DHS

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## Introduction

Unstable trochanteric fractures are a growing concern for the orthopaedic surgeons all over the world. Sliding devices like the Dynamic Hip Screw (DHS) and Intramedullary devices like the proximal femoral nail (PFN) have their own advantages & disadvantages and various meta-analysis conducted so far have come out with conflicting results regarding superiority of PFN over DHS [1].

For many years, the sliding hip screw and plate had been the gold standard in treating

pertrochanteric fractures. Nowadays, there is an increasing interest in intramedullary nailing. Intramedullary devices, although technically difficult seems to have a biomechanical advantage over laterally fixed side plates [2]. Literature is full of articles categorizing DHS in stable Trochanteric fractures, (31-A1.1, A1.2, A1.3 and 31-A2.1) and use of intramedullary devices PFN as implant of choice in unstable trochanteric, subtrochanteric fractures and particularly in reverse oblique (all A 31.3) [3]. But there is always a grey zone of decision of implant to be applied in unstable type A2.2 and A2.3 fractures. This study was designed to compare functional outcome and complications of the PFN device with those of a traditional extramedullary device, the Dynamic hip screw (DHS), inpatients with type2 trochanteric fracture. (AO/ASIF Classification 31-A2.2 & 31-A2.3)

## Materials and Methods

In this prospective study from September 2014 to august 2016, 60 consecutive patients with trochanteric femoral fractures having an unstable pattern, of either sex were randomized by computer generated tables to undergo fixation with either PFN (PROXIMAL FEMORAL NAIL) or DHS (DYNAMIC HIP SCREW). A detailed history and clinical examination was done in a systemic manner and noted on a specially designed proforma. Plain radiographs were obtained on admission and all fractures categorized according to AO/ASIF classification, patients having Fracture classification 31-A2.2 and 31-A2.3 were included and randomized for the study.

Exclusion criteria -

- AO/ASIF type other than 31-A2.2 and 31-A2.3.
- Pathological /Compound fracture
- Patient with other fracture in the same limb

Patients of respective groups underwent DHS or PFN using standard operating technique.

Patient were followed up fortnightly in the first month, then monthly until 6 months or till clinical and radiological union is achieved. X-ray of the involved hip with femur was done to assess union.

The functional outcome of the patients was evaluated and graded using HARRIS HIP SCORE system [4]

| **Harris Hip Score** | **RESULT** |
|---|---|
| 90 – 100 | EXCELLENT |
| 80 – 89 | GOOD |
| 70 – 79 | FAIR |
| o <70 | POOR |

## Results

The following observations were made from the data collected duringthis comparative study of proximal femoral nail and dynamic hip screw in treatment of trochanteric fractures of 60 cases. 30 cases were operated for PFN and 30 cases were operated for DHS.

In our study, age of patients ranged from 24 - 90 years with fracture more common in 6$^{th}$ decade of life. 42 (70%) patients were male and 18 (30%) were female. In PFN group 22 (73%) patients were male and 8 (26.6%) female. In DHS group 20(66.6%) patients were male and 10 (33.3%) female.

Out of 60 patients, 37 (61.6%) have AO Type Fracture 31-A2.2 and 23 (38.3%) patients have AO Type Fracture 31-A2.3. $X^2$ = 0.2, OR=0.65 (0.23-1.86)

Table No. 1- AO Type Fracture

| Type | PFN | DHS | Total |
|---|---|---|---|
| 31.A2.2 | 17<br>56.6%) | 20<br>(63.4%) | 37<br>(61.6%) |
| 31.A2.3 | 13<br>(43.3%) | 10<br>(33.3%) | 23<br>(38.3%) |

The average time for PFN surgery was 44.83 minutes, standard deviation (SD) = ± 4.83 and average time for DHS surgery was 60.16 minutes, standard deviation (SD) = ± 5.16 Student- t Test T=11.88 p value =<0.05 (Highly significant).

The average blood loss in PFN was 88.3ml, standard deviation (SD) = ± 12.88 and average blood loss in DHS was 318.33ml, standard deviation (SD) = ± 24.50, Student-t-Test T=45.22 p value =<0.05 (Highly significant).

Hospital stay after surgery in PFN was average days 4.13 AND in DHS was days 5.63 standard deviation (SD)= +0.49 p value =<0.05 (Highly significant)

Table No. 2 Harris Hip Score

| Score of Patients | PFN | DHS |
|---|---|---|
| Good(80-89) | 22 (73.33%) | 12 (40%) |
| Fair (70-79) | 06 (20%) | 12(40%) |
| Poor (<70) | 02 (6.66%) | 06 (20%) |

$x^2$=6.94 p value = 0.03( <0.05 significant)

Table No. 3 Intra Operative complication PFN

| Complication | No. | % |
|---|---|---|
| 1. Failure to achieve closed reduction | 01 | 3.3% |
| 2. Fracture of Lateral Cortex | 03 | 10% |
| 3. Varus Malrotation | 02 | 6.6% |
| 4. Fracture displacement by Nail insertion | 01 | 3.3% |

Table No. 4 Intra Operative complication DHS

| Complication | No. | % |
|---|---|---|
| 1. Improper insertion of compression screw | 02 | 6.6% |
| 2. Medial Displacement of Distal fragment | 04 | 13.3 % |

Table No. 5 Infection

| No. of Patients | PFN | | DHS | |
|---|---|---|---|---|
| Infection | 01 | (3.03%) | 02 | (6.66%) |
| Normal | 29 | (96.7%) | 28 | (93.33%) |

$x^2$=0.87 OR(95%CI)=0.22 (0.02=2.14)

Table No. 6 Implant Failure

| Implant | No. Of Patients | Percentage |
|---|---|---|
| PFN | 0 | 0 |
| DHS | 1 | 3.3% |

Average time to union in PFN was 13.4 weeks standard deviation (SD) ±1.19 ,and average time to union in DHS was 15.1 weeks standard deviation ± 0.93, p value= 0.000001( significant)

## Discussion

Fractures of intertrochanteric femur have been recognized as a major challenge by the Orthopaedic community, not solely for achieving fractures union, but for restoration of optimal function in the shortest possible time that to with minimal complications. The aim of management accordingly has drifted to achieving early mobilization, rapid rehabilitation and quick return of individuals to pre-injury state. Operative treatment in the form of internal fixation permits early rehabilitation and offers the best chance of functional recovery, and hence has become the treatment of choice for virtually allfractures in the trochanteric region. Literature so far does not support any treatment DHS or PFN as an exclusive option for unstable type II fracture.

In this study an attempt was made to evaluate our success in the management of such individuals by using Proximal femoral nail (PFN) and Dynamic Hip Screw (DHS) implants and compare the result in these two groups.

Ujjal Bhakat et al in his study on 60 patients, reported average operating time for the patients treated with PFN - 45 min as compared to 70 min in patients treated with DHS [5]. In 2016, Neritan Myderrizi, conducted study on 63 patients, average operating time for the patients treated with PFN was 49.3 min as compared to 72.3 min in patients treated with DHS [6]. Ujjal Bhakat reported average blood loss 100 ml in PFN surgery and 250 ml in DHS surgery. This study shows similar results for duration of surgery and blood loss.

In 2011 Richard Armelin Borger, conducted study on 70 patients of trochantric fracture. 40 patients underwent osteosynthesis by PFN with unstable trochantric fracture. The Harris Hip score one year after the operation in 16% of the patients was excellent, 19% good, 28% reasonable and 38% poor [7]. In 2015, S.K. Venkatesh Gupta, Conducted study on 400 patients in group 1 (240 patients treated with DHS) excellent result was observed in 37.5 %contrast to 66.2% in group 2 (160 patients treated with PFN). In this study functional outcome was better in PFN group (good result in 73.3 % in PFN Vs 40% in DHS group) [8].

Umesh M. Shivanna, conducted study on 30 patients of trochanteric fracture. All the fractured united at a mean of 12 weeks [9]. In 2015, Hemant Sharma reported no significant difference in time to union between the two groups (mean 16.71 vs. 17.27 weeks) $P > 0.05$ [10]. In our study average time to union in PFN group was 13.4 weeks as compared to 15.1 weeks in DHS group, this difference was statistically significant (p value= 0.000001).

## Conclusion

In Type 2 unstable trochanteric fractures PFN gives advantage of lesser blood loss, shorter operating time, faster union, better functional outcome with low complication rate as compared to DHS.

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Original Article

# A midterm analysis of Tibial plateau fractures: functional outcome and incidence of osteoarthritis in 240 cases

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*Investigation performed at department of orthopedics, Sri Aurbindo Medical College, Indore, Madhya Pradesh, India*

## Abstract

**Background:** Tibial plateau fractures are a risk to the functional integrity of the knee. They are the result of axial compressive forces alone or combined with Varus or valgus stress on the knee joint. Post-traumatic osteoarthritis occurs after traumatic injury to the joint. The presence of residual incongruity at the time of fracture healing could lead to joint stiffness and long-term morbidity, studies have established the restoration of articular congruity as the key principle on the management of these injuries. Despite anatomical joint reconstruction, development of osteoarthritis may still take place secondary to the initial articular cartilage injury. This prospective study evaluates the functional and radiological outcome of surgically managed tibial plateau fractures and incidence of osteoarthritis.

**Methods:** In this prospective study 240 patients with tibial plateau fractures managed by different modalities were included. Patients were evaluated by Rasmussen criteria clinically and radiologically by Kellgren & Lawrence grading for development of osteoarthritis at 6 weeks, 3 months, 6 months, 1 year and then subsequent follow-ups.

**Results:** Rasmussen clinical scoring system showed excellent results in around 34% (82) of the patients, 53% (127) had good,9% (22) fair and 4% (9) poor results. Out of 240 patients 78 (32.5%) developed OA knee (including Kellgren and Lawrence grade 1) which is a significant number of patients. With increase in schatzker type & amount of articular depression the number of patients developing Osteoarthritis increased, schatzker Type I -16 % vs schatzker Type VI - 54% and no articular depression 9.5% vs > 5mm articular depression 46 %.

**Conclusion:** With increase in schatzker type & amount of articular depression the chance of patient developing Osteoarthritis significantly increases and thus excellent anatomical reduction with restored articular congruity rigid fixation is required to facilitate early knee motion and reduces chances of post-traumatic osteoarthritis.

**Keywords**: Tibial Plateau fracture, post-traumatic arthritis, Proximal tibia Fracture.

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## Introduction

When treating intra-articular fractures such as Tibial Plateau fractures, the goal is to obtain a stable joint permitting early range of motion for cartilage nourishment and preservation [1]. Various treatment modalities have been used over the years, with mixed results. These include traction or closed treatment with cast bracing. Surgical procedures including circular frames [1], percutaneous screw fixation, open reduction/internal fixation (ORIF) and

arthroplasty have also been advocated. More recent techniques such as the use of fixed angle devices, arthroscopically-assisted reduction and the use of novel grafting methods to address articular depression, constantly gain popularity amongst orthopaedic surgeons. Post-traumatic osteoarthritis occurs after traumatic injury to the joint, most commonly following injuries that disrupt the articular surface, or injuries that lead to joint instability [2].

The clinical observation that the presence of residual incongruity at the time of fracture healing could lead to joint stiffness and long-term morbidity [3] has established the restoration of articular congruity as the key principle on the management of these injuries.[4]

Despite anatomical joint reconstruction, development of osteoarthritis may still occur secondary to the initial articular cartilage and meniscal injury [5,6]. In young patients this could be detrimental as it can lead to total knee replacement at an early age. In addition, these fractures may have significant socio-economic influence. In order to assess the effect of these injuries on functional outcome and development of OA, we started a prospective study in 2007 and reviewed its mid-term results of tibial plateau fractures treated in our institution.

**Materials and Methods**

From May 2007 to May 2017, 267 adult patients with tibial plateau fractures underwent surgical treatment at our center. 27 patients were lost to follow-up and were excluded from the final analysis. Thus, 240 patients (174 males, 66 females, mean age 48 [range 21–69 years) form the basis of this report.

Out of 240 patients 31 patients were treated with Percutaneous cancellous screw fixation method, 21with ORIF with cancellous screws, 98 with ORIF with buttress plate, 90 with Locking compression plate.

Inclusion Criteria of our study were

1.All the fractures of the tibia plateau with intra articular extension.

2.Closed fractures, open grade I and open grade II fractures were included.

Exclusion Criteria of our study were

1.Pathological fractures

2.Fractures in children ( < 18 years)

3.Old neglected fractures

4.All open grade III fractures

5.Previously operated Fractures

6.Fractures with neurovascular deficit

The patients were evaluated and were taken for surgery at the earliest possible time depending on their medical condition, skin condition and the amount of swelling. All surgeries were done under C-arm image intensifier control. Fractures were fixed either with percutaneous technique or by open reduction and internal fixation. The fixation devices consisted of T Buttress plate, L Buttress plates, Locking compression plate, 4.5 mm Cortical screws and 6.5 mm Cannulated. Bone grafts, Bone graft substitutes were used in depressed and comminuted fractures. The source of bone graft was ipsilateral iliac crest. Postoperatively patients were immobilized with an above knee posterior slab or a compression bandage for 3 weeks. The sutures were removed on the 12th postoperative day. Antibiotics were given till suture removal by 5 days of intravenous and 7 days of oral. The patients were advised static quadriceps exercises for initial 3 weeks followed by passive range of motion with protected knee brace and non-weight bearing crutch walking up to 6 weeks. After 6 weeks knee mobilization and weight bearing crutch walking was advocated. An immediate postoperative X-ray was also

done, later on repeated at 6 weeks, 3 months and 6 months and at latest follow-up. The patients were then followed up at 6 months and then last follow up (at mid term assessment), during which time the anatomic and functional evaluation was done using the modified Rasmussen clinical and radiological criteria.

## Results

Average time for union was 12 weeks (9-20 weeks) We had no case of non-union in our series.Mean duration of follow up was 8.4 years (6.2-9.7 years). 67 patients under went fixation with bone grafting after elevation of articular depression. Out of 240 patients 78 (32.5%) developed OA knee.

**Table 1:** Type of fracture

| SCHATZKER TYPE OF FRACTURE | NO. OF CASES | PERCENTAGE |
|---|---|---|
| TYPE I | 12 | 5 |
| TYPE II | 27 | 11 |
| TYPE III | 82 | 34 |
| TYPE I | 62 | 26 |
| TYPE V | 33 | 14 |
| TYPE VI | 24 | 10 |

**Table 2:** Age In year

| Age In year | Number of cases | Percentage |
|---|---|---|
| 21-30 | 44 | 18 |
| 31-40 | 94 | 39 |
| 41-50 | 62 | 26 |
| 51-60 | 29 | 12 |
| 61-70 | 11 | 5 |

**Table 3:** Amount of Articular Depression

| Articular Depression | Patients | Percentage (%) |
|---|---|---|
| None | 42 | 18 |
| <2mm | 115 | 48 |
| 2-5mm | 51 | 21 |
| >5mm | 32 | 13 |
| Total | 240 | 100 |

**Table 4:** Frequency of method of treatment

| Type of Fixation | No. of Cases |
|---|---|
| Percutaneous cancellous screw fixation | 31 |
| ORIF with cancellous screws | 21 |
| ORIF with buttress plate | 98 |
| ORIF with locking compresion plate | 90 |
| Total | 240 |

**Table 5 :** Rasmussen Clinical Assessment at final follow-up

| CLINICAL RESULT | NO. OF CASES | PERCENTAGE |
|---|---|---|
| EXCELLENT | 82 | 34 |
| GOOD | 127 | 53 |
| FAIR | 22 | 9 |
| POOR | 9 | 4 |

**Table 6 :** Rasmussen Radiological Assessment at final follow-up

| RADIOLOGICAL EVALUATION | NO. OF CASES | PERCENTAGE |
|---|---|---|
| EXCELLENT | 48 | 20 |
| GOOD | 141 | 59 |
| FAIR | 39 | 16 |
| POOR | 10 | 4 |

**Table 7:** Distribution of patients developing OA knee according to Schatzker classification at final follow-up

| Schatzker classification Type | Total no. Of Cases | Kellgren & Lawrence grade 1 | Kellgren & L awrence grade >1 | No. Of Cases who developed OA knee | % |
|---|---|---|---|---|---|
| I | 12 | 2 | - | 2 | 16 |
| II | 27 | 5 | 2 | 7 | 26 |
| III | 82 | 19 | 3 | 22 | 27 |
| IV | 62 | 14 | 4 | 18 | 29 |
| V | 33 | 10 | 6 | 16 | 48 |
| VI | 24 | 9 | 4 | 13 | 54 |
| Total | 240 | 59 | 19 | 78 | |

**Table 8:** Distribution of patients developing OA knee according to amount of articular depression at final follow-up

| Amount of articular depression | Total No. Of Cases | Kellgren and Lawrence grade 1 | Kellgren and Lawrence grade >1 | No. Of Cases who developed OA knee | % |
|---|---|---|---|---|---|
| None | 42 | 4 | Nil | 4 | 9.5 |
| <2mm | 115 | 26 | 11 | 37 | 32 |
| 2-5mm | 51 | 15 | 7 | 22 | 43 |
| >5mm | 32 | 7 | 8 | 15 | 46 |
| Total | 240 | 52 | 26 | 78 | |

**Table 9:** Distribution of patients developing OA knee according to type of fixation method

| Type of Fixation | Kellgren and Lawrence grade 1 | Kellgren and Lawrence grade >1 |
|---|---|---|
| Percutaneous cancellous screw fixation | 8 | 3 |
| ORIF with cancellous screws | 6 | 2 |
| ORIF with buttress plate | 21 | 14 |
| ORIF with locking compression plate | 13 | 11 |
| Total | 48 | 30 |

**Table 10:** Complications

| Complication | Patients | Percentage (%) |
|---|---|---|
| Infection (Superficial) | 21 | 9 |
| Infection (deep) | 8 | 3 |
| Knee joint stiffness | 27 | 11 |
| Implant Failure | None | 0 |
| Varus deformity | 11 | 5 |
| None | 173 | 72 |
| Total | 240 | 100 |

## Discussion

The management of tibial plateau fractures is a challenging task for the surgeon, as they are often associated with a number of complications [7]. It has been well documented that instability due to articular incongruity predisposes to uneven loading and early Osteoarthritis [1,8]. It is not surprising therefore that minimally displaced tibial plateau fractures had the best results when open or closed methods of reduction were used, followed by early range of knee motion.

Rademakers and colleagues evaluated 109 patients with tibia plateau fractures who had an average follow-up period of 14 years to determine the long-term functional outcome of operatively treated tibia plateau fractures [9]. The authors also reported complications, one of which was secondary osteoarthritis. They reported a 5% incidence of secondary osteoarthritis that necessitated reconstructive surgery (total knee arthroplasty, realignment osteotomy, knee arthrodesis).

our study consisted of 240 patients (174 males & 66 females). Mean age was 48 years (21-69 years). Mean duration of follow up was 8.4 years (6.2-9.7 years). Out of 240 patients 31 patients were treated with Percutaneous cancellous screw fixation

method, 21with ORIF with cancellous screws, 98 with ORIF with buttress plate & 90 with ORIF with Locking compression plate. 67 patients under went fixation with bone grafting after elevation of articular depression. 182 patients (76%) had right sided tibial plateau fracture whereas 58 patients (24%) had left side affected. Average time for union was 12 weeks (9-20 weeks).

In our study Rasmussen clinical scoring system showed excellent results in around 34% (82) of the patients, 53% (127) had good,9% (22) fair and 4% (9) poor results. Out of 240 patients 78 (32.5%) developed OA knee (including Kellgren and Lawrence grade 1) which is a significant number of patients.

36% of patients treated with Cannulated Cancellous Screw developed OA knee, 35.7% of patients treated with buttress plate developed OA knee and 26.6% of patients treated with Locking compression plate developed OA knee. This difference may be due to superiority of LCP in maintaining reduction till osteosynthesis because of its angular locking capability.

With increase in schatzker type & amount of articular depression the number of patients developing Osteo arthritis increased, schatzker Type I 16 % vs schatzker Type VI 54% and no articular depression 9.5% vs > 5mm articular depression 46 %.

The limitations of this study is that we did not compare the x-ray of normal knee with the operated knee to confirm if the osteoarthritis is post traumatic or senile.

## Conclusion

With increase in schatzker type & amount of articular depression the chance of patient developing Osteoarthritis significantly increases and thus excellent anatomical reduction with restored articular congruity rigid fixation is required to facilitate early knee motion and reduces chances of post-traumatic osteoarthritis.

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Original Article

# Prospective comparative study of local steroid and autologous blood injection in the treatment of lateral epicondylitis

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**Abstract**

**Background:** Tennis elbow (Lateral epicondylitis) frequently encountered myotendinosis affecting around 3 -5 % of population. It's an ECRB insertion overuse injury at the lateral epicondyle of humerus affecting dominant arm. Non-operative treatment is successful in 80% of patients with tennis elbow. Recent research papers indicate autologous blood injection at the insertion of ECRB proved to be effective in decreasing pain in intermediate and long-term period

**Methods:** This was a randomized control study done in Rajarajeshwari medical college and hospital, Bengaluru to compare the effectiveness of steroid and autologous blood local injection in terms of controlling pain and disability in short term. Total no. of 40 patients, divided in to 2 groups. One group injected at the site of lateral epicondyle with steroid (methyl prednisolone acetate-40mg) and another group with autologous blood (2ml of venous blood). Patients were followed up at 1st, 4th, and 12th week, pain and disability assessed with visual analogue scale (VAS) and Nirschl staging.

**Results:** At 1st week corticosteroid injection group (Group I) recorded a statistically significant decrease in pain (VAS Score) compared to autologous blood injection group. At 4th week both group patients had decrease in pain and disability but statistically not significant when compared to each other. At 12th week review, autologous blood injection group (Group II) recorded statistically significant decrease in pain (P-0.0146) and disability (P-0.0001) compared to corticosteroid injection group.

**Conclusion:** Since autologous blood injection at the lateral epicondyle on OPD basis showed significant improvement in pain and disability, we recommend using same for the treatment of tennis elbow.

**Keywords**: tennis elbow, elbow pain, tendinopathy.

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## Introduction

Tennis elbow (Lateral epicondylitis) frequently encountered myotendinosis affecting around 3 -5 % of population [1]. It's an Extensor Carpi Radialis Brevis (ECRB) insertion overuse injury at the lateral epicondyle of humerus affecting dominant arm. Pathogenesis involves angiofibroblastic hyperplasia or non-inflammatory degeneration of (ECRB) or common extensor origin [2]. Patient presents with pain at the lateral aspect of elbow, decreased grip strength due to pain, tenderness at the lateral epicondyle, Mill's and Cozen's test will be positive. Non-operative treatment is successful in 80% of patients with tennis elbow [3]. Treatment involves activity modification, rest, stretching

exercises, NSAID, steroid injection [4], extracorporeal shock wave therapy [5], laser treatment [6], botulinum injection [7], arthroscopic debridement [8], acupuncture therapy.

Recent research papers indicate autologous blood injection at the insertion of ECRB proved to be effective in decreasing pain in intermediate and long-term period. The Platelet derived growth factor and transforming growth factor present in blood induce fibroblastic mitosis, trigger stem cells and angiogenesis, probably stimulate production of collagen by tendon sheath fibroblasts [9]. Autologous blood injection is minimal invasive, can be done as outpatient procedure, it has no potential complications like skin atrophy and tendon tears associated with corticosteroid injection [1]. Our purpose is to study the role and efficacy of autologous blood injection in tennis elbow comparing to corticosteroid injection.

## Materials and Methods

This was prospective study done from February 2015 to March 2017, involving total 40 (22 male and 18 female) patients of age 21- 39 years. The written informed consent from the patients and institute ethics committee approval taken for the study. All patients who complain of lateral elbow pain with tenderness on lateral epicondyle of humerus and positive Mill's and cozen's test enrolled in the study. The detailed history regarding pain, restriction of daily activities, standard elbow antero-posterior and lateral X rays obtained to rule out other pathologies. Patients with typical symptoms of tennis elbow with no previous treatment and normal X ray are included in the study.

Patients were divided in to two groups and patients were allotted to the groups on computer generated table basis.

Group I - methyl prednisolone acetate (40mg) was used along with 1ml of 2% lignocaine solution.

Group II- 2 ml of venous blood, drawn from the contralateral upper limb and was injected locally after mixing with 1 ml of 2% lignocaine solution.

The procedure was done at outpatient department under all aseptic precautions by the same author. Lateral epicondyle was palpated, needle was introduced just proximal and injected in to the undersurface of the extensor carpi radialis group of muscles. Patients were prescribed commercially available tennis elbow brace and advised to restrict activities involving repetitive movements of the wrist and elbow during first 4 weeks after injection. As the pain permitted, passive stretching exercises of extensor muscles started.

Patients were followed up at 1, 4 and 12 weeks, assessed with Visual Analogue scale (VAS) for the pain and by Nirschl staging for the disability [10]. Paired t test was used for serial analysis in both groups and unpaired t test for comparison between the two groups. The chi-squared test was used to compare categorical variables between the groups. A p-value $< 0.05$ is considered statistical significance.

## Results

In our study total 40 patients, divided in to two groups on alternative basis were evaluated. A baseline VAS scores and Nirschl staging of the pain at lateral epicondyle was recorded. Group I patients assigned as control, were treated with local corticosteroid injection and group II patients with autologous blood injection. Both patients were prescribed tennis elbow brace and advised to wear it day time and remove at night for 4 weeks. Patients were advised to report immediately if any increase in pain and were followed up at 1 week, 4 weeks, 12 weeks interval after the intervention.

Analgesics were prescribed for pain and advised to take only if there is severe pain. In group I, one patient lost follow up after 1 week and in group II, 2 patients were lost to follow up, one after 4th week and one after 12th week.

Comparison of clinical and demographic data done (Table 1). The two groups were demographically comparable.

Table 1. Base line demographic data

| | **Group I** | **Group II** | **P value** |
|---|---|---|---|
| Mean age | 36.4 (4.2) | 35.2 (3.8) | 0.3494 (NS) |
| Sex Ratio M/F | 11/9 | 11/9 | 1.0000 (NS) |
| Laterality (R\L) | 15/5 | 16/4 | 1.0000 (NS) |
| Mean duration of symptoms (weeks) | 6.2 (2.6) | 6.8 (2.1) | 0.4270 (NS) |
| Mean VAS score (Pre-treatment) | 6.1 (1.5) | 6.4 (1.6) | 0.5444 (NS) |
| Mean Nirschl stage (Pre-treatment) | 4.5 (1.2) | 4.7 ( 1.3) | 0.6161 (NS) |

NS- Not significant

In group I, pre-injection phase mean VAS score was 6.1± 1.5. The pain decreased to a mean VAS of 3.4 ± 0.9 after 4th weeks of steroid injection. The mean VAS at 12 weeks of follow up was 2.1 ± 0.8. Similarly, the Nirschl stage before administration of steroid in Group I was 4.5 ± 1.2. The mean Nirschl stage at 4th week and 12th week follow up was 2.40 ± 0.9 and 1.80 ± 0.6 respectively. (Table 2)

Table 2: Mean VAS score at baseline, 1 week, 4th week and 12th week follow up

| | **Group I** | | | **Group II** | | | **P value** |
|---|---|---|---|---|---|---|---|
| **Follow up** | Number | Mean VAS | SD | Number | Mean VAS | SD | |
| **pre injection** | 20 | 6.1 | 1.5 | 20 | 6.4 | 1.6 | 0.5444 (NS) |
| **1 st week** | 19 | 5 | 1.1 | 20 | 5.9 | 1.2 | 0.0197 (S) |
| **4th week** | 19 | 3.4 | 0.9 | 19 | 3.8 | 0.8 | 0.1563 (NS) |
| **12th week** | 19 | 2.1 | 0.8 | 18 | 1.5 | 0.6 | 0.0146 (S) |

NS- Not significant, S- Significant

In group II the mean VAS scores in the pre-injection phase was 6.4± 1.6. The pain decreased to a mean VAS of 4.8 ± 0.8 after 4th weeks of autologous blood injection. The mean VAS at 12 weeks of review was 1.5 ± 0.6. Similarly, the Nirschl stage in Group II was 4.7 ± 1.1 before the use of corticosteroid injection. The mean Nirschl stage at 4th week and 12th week follow up was 2.2 ± 0.6 and 0.9 ± 0.4 respectively.

There is significant difference in P value at 12 weeks between group I and II in both VAS score and Nirschl stage. (Table 2 &3).

Table 3: Mean Nirschl stage at baseline, 1 week, 4th week and 12th week follow up

| | **Group I** | | | **Group II** | | | **P value** |
|---|---|---|---|---|---|---|---|
| **Follow up** | Number | Mean Nirschl | SD | Number | Mean Nirschl | SD | |
| **Pre injection** | 20 | 4.5 | 1.2 | 20 | 4.7 | 1.3 | 0.6161 (NS) |
| **1 st week** | 19 | 3.6 | 1.0 | 20 | 3.9 | 0.9 | 0.3307 (NS) |
| **4th week** | 19 | 2.4 | 0.9 | 19 | 2.2 | 0.6 | 0.4738 (NS) |
| **12th week** | 19 | 1.8 | 0.6 | 18 | 0.9 | 0.4 | 0.0001 (S) |

NS- Not significant, S- Significant

## Discussion

Lateral epicondylitis was first described by Runge in 1873 [11]. In a study done by Bishai S.K.et al 5- 10% of tennis players present with lateral epicondylitis [12]. In our series, 56% cases were manual workers, 26% were house wives and 18 % in others mostly in teachers.

In spite of various modalities there is no optimal treatment protocol for lateral epicondylitis. Most of the patients (70-80%) get relieved of symptoms within one year, with or without treatment [3]. First line of treatment usually is conservative like activity modification, rest, non-steroidal anti-inflammatory drugs, if conservative line of management fails corticosteroid local injection is commonly followed. However, Bisset et al studied that corticosteroid in effective only in short term, in long term follow up this treatment yielded poorer results than physiotherapy [13]. Another study done by Plazcek et al showed that Botulinum A toxin injection offered significant pain relief, but few patients had weakness in fingers as a complication [7]. Pulsed low intensity ultrasound therapy trial done by D'Vaz concluded that no significant benefit comparing to placebo [14].

Recent trials have documented that use of autologous blood or platelet concentrates as a local injection has beneficial role in the treatment probably by the effect of growth factors present in platelets. Mishra and colleagues conducted a study using platelet rich plasma and reported significant improvement in pain in patients with complaints less than 6 weeks [15]. Similar study conducted by Edwards et. al documented relief in symptoms using autologous blood in 28 patients [9]. Same treatment methods used in other tendinopathy like plantar fasciitis showed autologous blood injection has limited application [16,17]. The difference in results may be due to change in the mechanical and healing properties of non-weight bearing and weight bearing tendons.

Comparison between the steroid and autologous blood groups in our study showed that not much difference in both pain (VAS score) and disability (Nirschl stage) at 4 weeks, but there was a significant difference in both values at 12 weeks of follow up. In our short-term study statistical analysis ($p < 0.0001$) showed that autologous blood was better than local corticosteroid injection in the follow up of tennis elbow patients. Study done by Edwards et al reported maximal pain relief after injection of autologous blood was achieved at 3 weeks [9]. Kazemi et al also reported in their trial, that autologous blood injection is more beneficial comparing to local corticosteroid injection [18].

The exact mechanism of action of both autologous blood and platelet rich plasma is not known but there are theories attributed to platelets releasing growth factors like transforming growth factor β, platelet derived growth factor, epithelial growth factor, vascular derived endothelial growth factor, hepatocyte growth factor and insulin like growth factor which play a role in tissue healing, neovascularization and regeneration [19]. Platelets concentration varies from 2.5 to 5 times more compared to blood in platelet rich plasma (PRP). Logically PRP is more effective than blood due to higher concentration of growth factors per unit volume and also been proved in one clinical trial to be better than autologous blood. Disparity in the efficacy of autologous blood and corticosteroid attributed to the relative difference in the quantity of growth factors delivered to the degenerated tendon However PRP preparation requires specialized equipment which is both expensive and time consuming. Autologous blood injection is easy, does not use any specialized

expensive equipment and it can be done on OPD basis.

The mechanism of action of steroid remains unknown. Balasubramaniam et al postulated that the beneficial effects of steroid injection result from the bleeding caused by forcing fluid through tissue planes at high pressures [20].

## Conclusion

This study concludes that in treatment of lateral epicondylitis steroid injection gives faster control of pain whereas autologous blood injection gives good long-lasting pain control and improved function. Research with large sample size and longer follow up is required to recommend superiority of autologous blood in treatment of Lateral epicondylitis.

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Original Article

# Outcome of Close reduction and K Wire Fixation in Patients with Supracondylar humerus fracture presenting late

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## Abstract

**Background:** 36 patients of supracondylar humerus were treated by closed reduction and cross K wire fixation. Fifteen patients had Gartland type II injuries and Twenty-one patients with Gartland type III fracture displacement. There were 28 boys and 08 girls. The average age was 8 years (2–14 years) and the average time of presentation was 30 h (3–96 hour). Patients were followed up on 1st week and 3rd week and then every 2nd week till fully functional recovery achieved. The mean immobilisation time in the present study was 4.5 weeks (3–5) weeks. The mean follow-up period was 7.4 weeks (5–20). Outcome was assessed using clinically and radiologically. According to Flynn's criteria used for assessment of result, all patients had satisfactory results. One patient had ulnar nerve palsy after operation. Closed reduction and cross k wire fixation for superacondylar humerus fracture is a safe, closed procedure with satisfactory outcome.

**Methods:** During the period from 2014 to 2016, 40 cases of supracondylar fracture of the humerus with late presentation were treated at our institute. Inclusion criteria was Gartland type 2 and 3 fractures, duration of injury 5 – 15 days, Exclusion criteria were open fractures, fractures that required open reduction, neurological or vascular injuries found on presentation, previous ipsilateral elbow fracture, presence of any concomitant fractures in the ipsilateral limb and loss to follow-up. We reviewed preoperative clinical examinations, time from injury to surgery, operative notes, postoperative evaluations, duration of immobilisation, time of pin removal, presence of complications, need for further surgery and clinical assessment at final follow-up visit

**Results:** Sixteen patients with Gartland grade II and twenty four patients with grade III fracture managed with close reduction fixation with K wire were included in the study. The average time of presentation was 7.6 days (range 5 – 15 days). The mean follow-up period was 7.4 (5–20) weeks. Based on Flynn's criteria, 34 patients (95%) had excellent outcome.

**Conclusion:** Closed reduction with percutaneous pin fixation is viable option for displaced supracondylar fractures of the humerus with late presentation.

**Keywords**: Close pinning, supracondylar humerus late presentation, flynn's criteria.

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## Introduction

Supracondylar fractures are the commonest fractures around the elbow in children. Conservative management is recommended for undisplaced fractures but conservative management of the severely displaced supracondylar fracture is associated with an unacceptable cubitus Varus deformity.

Closed reduction and percutaneous pin fixation provides the best cosmetic and functional outcome and overcome the problem of malunion and deformity. Closed reduction with percutaneous pin fixation has become the treatment of choice for displaced supracondylar fractures of the humerus in children [1]. Complications includes ulnar nerve injury, redisplacement and malunion but are rare and can be avoided by correct technique. It is not uncommon to encounter patients with supracondylar humerus presenting late in this part of the world. In patients presenting later than 2 weeks accepting the deformity and planning corrective osteotomy later is usually followed. However, in patients presenting within two weeks the dilemma still exists to go for close or open reduction with K wire fixation. However, some fractures are irreducible by closed means Open reduction is recommended for their reduction. In this study we have discussed supracondylar humerus fractures in paediatric age group presenting late treated with closed reduction and percutaneous pinning.

**Materials and Methods**

During the period from 2014 to 2016, 40 cases of supracondylar fracture of the humerus with late presentation were treated at our institute. Inclusion criteria was Gartland type 2 and 3 fractures, duration of injury 5 – 15 days, Exclusion criteria were open fractures, fractures that required open reduction, neurological or vascular injuries found on presentation, previous ipsilateral elbow fracture, presence of any concomitant fractures in the ipsilateral limb and loss to follow-up...

We reviewed preoperative clinical examinations, time from injury to surgery, operative notes, postoperative evaluations, duration of immobilisation, time of pin removal, presence of complications, need for further surgery and clinical assessment at final follow-up visit.

All patients underwent closed reduction and percutaneous pinning. Lateral pin was inserted without any incision and medial pin was inserted after giving 0.5- 1 cm incision and gentle soft tissue retraction. The surgeon selected the pin size to be used according to the age of the child and the size of the arm (usually 1.6 mm for younger children and 1.8–2.0 mm for older children). Reduction and fracture stability was assessed intraoperatively in both anteroposterior and lateral planes with the image intensifier. The pin ends were bent outside the skin, and a long arm posterior slab was applied with approximately 90 degree of elbow flexion and neutral forearm rotation. The children were discharged home when comfortable (usually after 1–2 days) and were seen in the clinic one week after surgery. Radiographs were obtained in both anteroposterior and lateral planes. Patients were followed up at regular intervals, pins were removed after healing and physiotherapy begun. Postoperative radiographs were examined to determine Baumann's angle, humerocapitellar angle and lateral rotational percentage (the percentage of displacement of the proximal humeral metaphysis at the fracture site in relation to the width of the distal humerus just distal to the fracture site as measured on the lateral radiograph) were assessed [2,3]. The clinical and radiological assessments were reviewed at the final visit. Clinical assessment included range of motion, carrying angle, neurological and vascular examination, return to full function and need for reoperation. Radiological assessment was made by comparing Baumann's angle. A change in Baumann's angle of more than 12◦ was defined as a major loss of reduction; a change from 6◦ to 12◦ as mild displacement; and a change of less than 6◦ as no displacement In the initial

postoperative and final follow-up radiographs [4]. Outcome was graded according to Flynn's criteria [5].

## Results

Sixteen patients with Gartland grade II and twenty four patients with grade III fracture managed with close reduction fixation with K wire were included in the study. Out of these 40 patients, 2 patients of Gartland type 3 injury required open reduction. 2 patients (1 Gartland type 2 and 1 Gartland type 3) lost to follow up so total 36 patients ( 21 Gartland type 3 and 15 Gartland type 2) considered for final evaluation.

There were 28 boys and 08 girls. The average age was 8 years (2–12 years) and the average time of presentation was 7.6 days (range 5 – 15 days). The mean follow-up period was 7.4 (5–20) weeks.

The displacement was postero-medial in 22 patients, posterior in 10 and postero-lateral in four patients. Post-operatively one child had ulnar nerve palsy which recovered within 2 months of surgery. There were no cases of deep infection. The range of movement was restricted in two patients, both had extension lag of $10^0$ which was regained by formal physiotherapy. No case of cubitus varus was seen. results of treatment based on Flynn's criteria are depicted in table 4. According to these criteria, 34 patients (95%) had excellent outcome.

**TABLE-1** : Distribution of respondents by Baumann angle size

| Baumann's angle | No of patients | Percentage |
|---|---|---|
| <65 | 00 | 0% |
| 65-70 | 01 | 2.78% |
| 70-75 | 25 | 69.44% |
| 75-80 | 08 | 22.22% |
| >80 | 02 | 5.56% |

**TABLE-2** : Distribution of respondents by Humerocaptellar angle

| Humerocaptellar angle | No of patients | Percentage |
|---|---|---|
| <25 | 00 | 0% |
| 25-30 | 02 | 5.56% |
| 30-35 | 14 | 38.89% |
| 35-40 | 19 | 52.78% |
| >40 | 01 | 2.78% |

**TABLE-3** : Flynn's criteria for grading of outcome

| Result | Rating | Cosmetic factor loss of carrying angle (◦) | Functional factor loss of motion (◦) | No of patients |
|---|---|---|---|---|
| Satisfactory | Excellent | 0–5 | 0–5 | 34 |
| | Good | 6–10 | 6–10 | 2 |
| | Fair | 11–15 | 11–15 | 0 |
| Unsatisfactory | Poor | >15 | >15 | o |

There was lateral rotation of 10% seen in one patient in post-operative radiograph. 33 patients had Baumann's angle between $70^0$-$80^0$ (mean $73.5^0$). 30 patients had humerocapitellar angle between $30^0$-$40^0$. Among all the children treated with percutaneous pinning only one patient had deformity which was evident by decrease in carrying angle ($5^0$)

## Discussion

In our study of 36 patients of supracondylar humerus fracture with late presentation treated with closed reduction and percutaneous k wire fixation, we found all patients had satisfactory results including 34 patients had excellent results as evaluated by flynn's criteria.

Pirone et al. reviewed 230 patients of supracondylar humerus in pediatric age group and found that The highest percentages of excellent results were achieved by percutaneous Kirschner-wire fixation (78%), Closed reduction and application of a cast was associated with a significantly lower percentage of early and late complications, including Volkmann ischemic contracture and cubitus varus. So he advocated Percutaneous Kirschner-wire fixation as the method of choice for the majority of displaced fractures [6].

Cheng et al. in his study showed that cross or lateral percutaneous pinning was found to be effective in the treatment of Gartland type III extension fractures with a high success rate and minimal complications [7[.

In our study one patient had ulnar nerve palsy which recovered within 2 months. Which is comparable to the study of Lyons et. Al who showed that ulnar nerve palsies occurring due to percutaneous pinning are usually recoverable [8].

In our study method used was cross percutaneous pinning which gives more stability than two parallel lateral pins while equal stability as given by 2 divergent pins [9]. There is risk of ulnar nerve palsy with cross pins which can be minimized by giving small incision and gentle soft tissue retraction as used in our study.

Devnani in his study of late presentation used gradual traction later unacceptable deformity were corrected by an osteotomy in 28 children, with an average age of 7 years 6 months, who presented after an average delay of 5.6 days. Their stay in the hospital was 14 days on average. At follow-up (average, 24 months), five children (18%) who had cubitus varus greater than 10 degrees had corrective osteotomy [10].

Tiwari et al in his study of 40 patients with mean age of 7 years reported mean delay in presentation 4 days. No patients presenting more than 7 days after injury had the fracture reduced by closed manipulation. The mean hospital stay was 41 hours. At the final follow-up (mean, 18 months), 88% of the patients had a satisfactory result, according to Flynn's criteria. They concluded that operative treatment for late presentation of supracondylar humeral fractures in children is effective. It minimises the risk of complications and the need for continuous traction or corrective osteotomy [11].

In our study mean post reduction Baumann's angle was $73.4^0$. which is as compared to the study of Dahal et. Al. who showed mean normal baumann's angle 74.4± 4.14 [12].

## Conclusion

Closed reduction with percutaneous pin fixation is viable option for displaced supracondylar fractures of the humerus with late presentation. Complications include ulnar nerve injury which is recoverable.

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Original Article

# Assessment of impact of patient's age at presentation and Pirani score on treatment duration in clubfoot

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**Abstract**

**Background:** Delayed presentation of clubfoot is the primary problem in developing nations like India. The purpose of this study was to find out whether the delay in presentation of club feet and its initial Pirani score in infants adversely affect treatment course in terms of number of plaster casts required to achieve complete correction.

**Methods:** We retrospectively studied 2 years record of infants with idiopathic clubfoot treated with the Ponseti method. Karl Pearson correlation coefficient (r) was used to find out correlation of patient`s age in months with number of casts required to achieve full correction. We also used this correlation coefficient to find out correlation between severity score of foot and number of casts needed. Correlation was considered statistically significant if $P < 0.05$.

**Results:** There was a positive and strong correlation between severity score of foot and number of plaster casts required to achieve full correction and it was statistically significant. We also found a positive but weak correlation between patient`s age in months and number of casts required and the correlation was not found statistically significant.

**Conclusion:** The number of casts required for correction in idiopathic clubfoot in infant was significantly influenced by its initial Pirani score. However, Age at presentation does not have statistically significant impact on number of Ponseti cast required for correction.

**Keywords**: CTEV, Ponseti Cast, clubfoot.

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## Introduction

Talipes equinovarus or clubfoot is one of the most common congenital deformities of the lower limb with an incidence of about 1 in 1000 live births [1]. There are four major clinical components of the deformity, that is, equinus, varus, adductus and cavus. When untreated, children with clubfoot walk on the sides and/or tops of their feet, resulting in callus formation, potential skin and bone infections, inability to wear standard shoes, and substantial limitations in mobility and employment opportunities. Although clubfoot is recognizable at birth, the severity of the deformity can vary from mild to an extremely rigid foot that is resistant to manipulation. Pirani classification system is widely used in the initial evaluation of clubfoot deformities [2]. In recent years, the non-invasive treatment of clubfoot, developed by Dr. Ignacio Ponseti, has been shown to have a success rate above 95% and the best longterm outcomes [3-10]. Therefore, the

Ponseti method is fast becoming the gold standard for clubfoot treatment and is currently being implemented all over the world. The "golden period" for commencement of treatment is three weeks after birth, since up to the age of less than three weeks ligaments in the feet are still pliable so that they can be manipulated. As the patient`s age advances foot is supposed to become more rigid for manipulative correction and thus expected to require greater number of casts and duration to achieve full correction. India is the second most-populous country in the world with 25% of its people (about 375 million) living below the poverty line. Approximately 25,000 children are estimated to be born with idiopathic clubfoot every year in India. Delayed treatment of clubfoot is the primary problem in developing nations, where social stigma, lack of education, poverty and lack of proper health services hinder the early presentation and treatment of a child with clubfoot. The deformity becomes worse by walking as the weight bearing takes place on the side or dorsum of the foot, causing further contracture of the medial soft tissues and plastic deformation of bones [11]. The purpose of the study is to find out whether the delay in presentation of club feet and its initial Pirani score in infants adversely affect treatment course in terms of number of plaster casts required to achieve complete correction.

## Materials and Methods

We retrospectively studied records of infants with clubfoot treated with the Ponseti method from July 2015 to June 2017 at club foot clinic in association with CURE India, of department of Orthopaedics, Shyam Shah Medical College, Rewa, Madhya Pradesh, India. We included patients with idiopathic club foot deformity who were presented after birth and up to 1 year of age. Non-idiopathic cases, cases who had previously received treatment in the form of plaster somewhere else and patients with residual deformity after surgery were excluded from the study. From the patient`s records information of patients collected including age, sex, number and side of feet affected, family history of clubfoot in first-degree relatives, maternal history of tobacco and alcohol consumption during pregnancy, any complication during pregnancy and birth, history of previous treatment, severity of deformity by Pirani score, number and duration of plaster cast treatment and any surgical treatment needed to achieve complete correction. Karl Pearson correlation coefficient (r) was used to find out correlation of patient`s age in months with number of casts required to achieve full correction. We also used this correlation coefficient to find out correlation between severity score of foot and number of casts needed to achieve full correction. Correlation was considered statistically significant if $P < 0.05$.

## Results

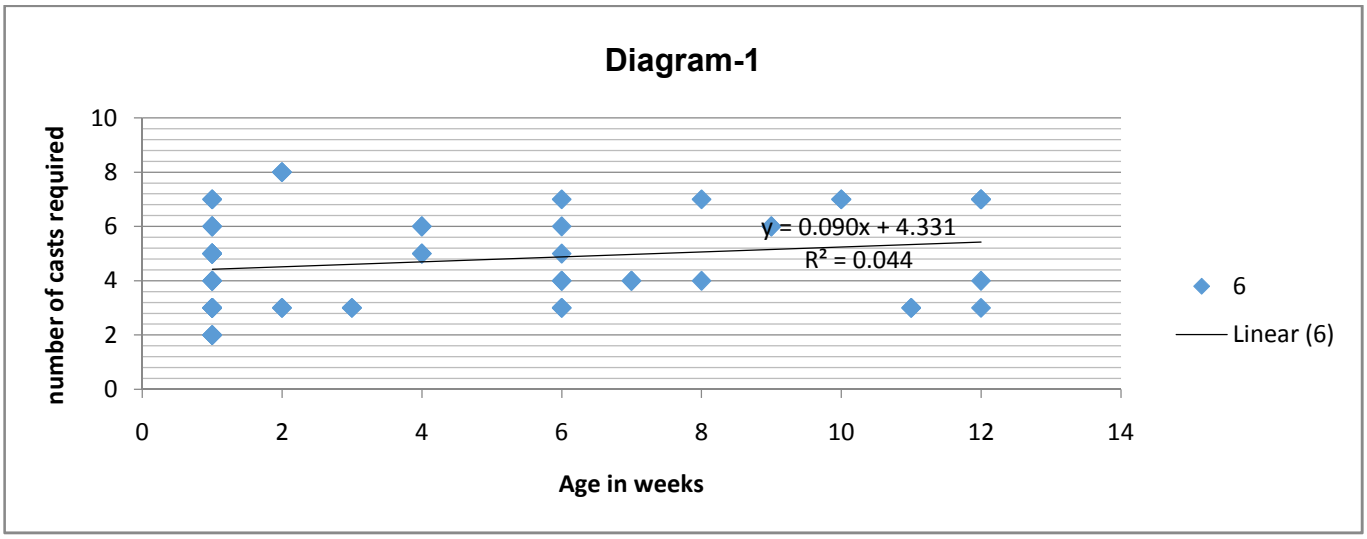
55 feet of 37 patients were selected in this retrospective study. Patient`s age ranged from 1 to 12 months and 29% of all presented in their 1st month of age (Table - 1). There were 30 male and 7 female patients.

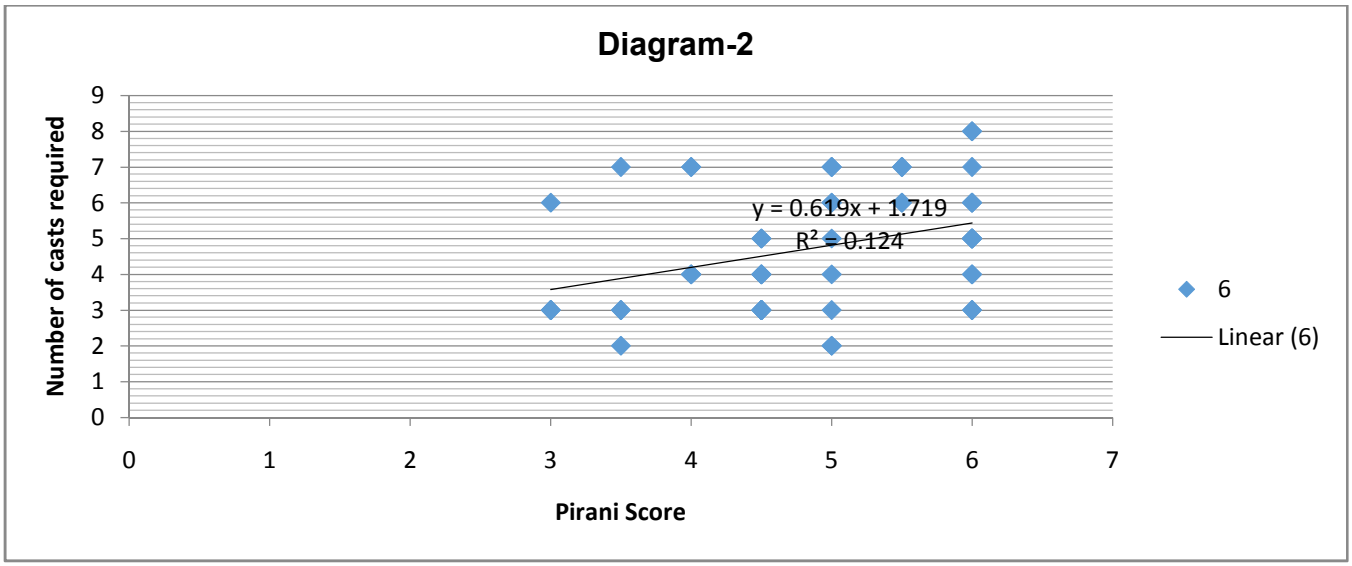
Table-1:Distribution of Clubfoot by age at first presentation to hospital

| Age group (in month) | Number of patients |
|---|---|
| 1 | 16 |
| 2 | 2 |
| 3 | 2 |
| 4 | 3 |
| 5 | 0 |

| | |
|---|---|
| 6 | 4 |
| 7 | 1 |
| 8 | 2 |
| 9 | 1 |
| 10 | 1 |
| 11 | 1 |
| 12 | 4 |

Nineteen patients had unilateral deformity, whereas 18 had bilateral deformity. We found a positive correlation (r= +0.19) between patient`s age in months and number of casts required to achieve full correction (diagram-1) though the correlation was not found statistically significant (P=0.15).




There was also a positive correlation (r= +0.35) between severity score of foot and number of plaster casts required to achieve full correction (diagram-2) but the correlation was found to be statistically significant (P=0.008).

The mean Pirani score at the beginning of treatment for all subjects was 4 with a minimum of 1 and maximum of 6. The average number of casts applied to achieve complete correction of all clubfoot deformities was 4.5.

## Discussion

The Ponseti method has become the gold standard for clubfoot treatment and the success of treatment depends on strict adherence of patients with the treatment protocol [3-10]. Early initiation of treatment has shown to have superior results. However, overall outcome and success depends greatly on compliance to bracing, which is more difficult in older children [12, 13]. In our study we investigated the influence of severity of clubfoot and age at initial manipulation and casting on the total number of castings required. Finding of study showed that the number of casts required has a stronger and significantly positive correlation with initial Pirani score of feet whereas it has a weekly positive correlation with age of the patients. Mazlina Awang and Abdul Razak Sulaiman [14] conducted a prospective study on 38 idiopathic clubfoot patients undergoing Ponseti casting with objectives to investigate whether the severity of clubfoot, age, and weight of the patients at initial manipulation and casting influence the total number of castings required. Results showed that the Pirani score was the only significant predictor for the total number of castings required. Similar results came in a study by Anil Agarwal & Neeraj Gupta in which they investigated the correlation of the number of casts before tenotomy with the age and initial Pirani score among 297 children (442 feet) with idiopathic club foot up to ten years of age [15]. The regression analysis showed both Pirani and age had positive correlation with number of casts, although weak (r2=0.05–0.20). The initial Pirani scoring correlated ten times more than age (in months) to the number of casts. Dyer and Davis in their study found that found that foot scoring 4 and above will likely require four or more times as many castings as feet scoring less than 4 [16]. This information can be useful while counselling the caregivers about treatment plan to ensure good compliance.

## Conclusion

The number of casts required for correction in idiopathic clubfoot in infant was significantly influenced by its initial Pirani score. However, Age at presentation does not have statistically significant impact on number of Ponseti cast required for correction.

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Case Report

# Role of Self Help in traumatic dorsolumber spinal cord injury: A case report.

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**Abstract**

**Introduction:** Post traumatic dorsolumbar fractures with spinal cord injuries are always considered a challenging task for any orthopaedician. The degree of functional impairment and health related quality of life (HRQL) depend upon level and completeness of lesion. Physiotherapy and rehabilitation are the keys to make the patient return back to pre-injury status

**Case Report:** Two patients of Dorsolumber spinal injury with almost similar lesion were operated on same day with contrasting outcome.

**Conclusion:** Role of physiotherapy and rehabilitation cannot be ignored, but a very important aspect of success was self-help.

**Keywords**: Paraplegia, Spinal Injury, Physiotherapy

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## Introduction

Post traumatic dorsolumber fractures with spinal cord injuries are always considered a challenging task for any orthopaedician. The degree of functional impairment and health related quality of life (HRQL) depend upon level and completeness of lesion. Physiotherapy and rehabilitation are the keys to make the patient return back to pre-injury status [1]. Loss of muscle power due to disuse is a serious detrimental factor that impairs the functional capacity [2]. In spinal cord injury (SCI) patients besides damaging independence and physical function, also include neurogenic bladder and bowel, urinary tract infections, pressure ulcers, orthostatic hypotension, deep vein thrombosis and depressive disorders [3].

## Case Report

Two patients presented to Hamidia Hospital with traumatic compression fractures involving the dorso lumbar junction on the same day, were operated on the same day by same surgeon, discharged on the same day however the recovery and success story is far from similar. Patient A, an18 year old female, with burst compression # L 1 vertebrae with incomplete paraplegia and bowel and bladder involvement (ASIA Grade A) (Fig1) and Patient B, a 16-year-old female with wedge compression # D 12 vertebrae with paraparesis and intact bowel and bladder (ASIA Grade B) (Fig 2).

Figure 1: Pre-op and Post Op X ray of Patient A

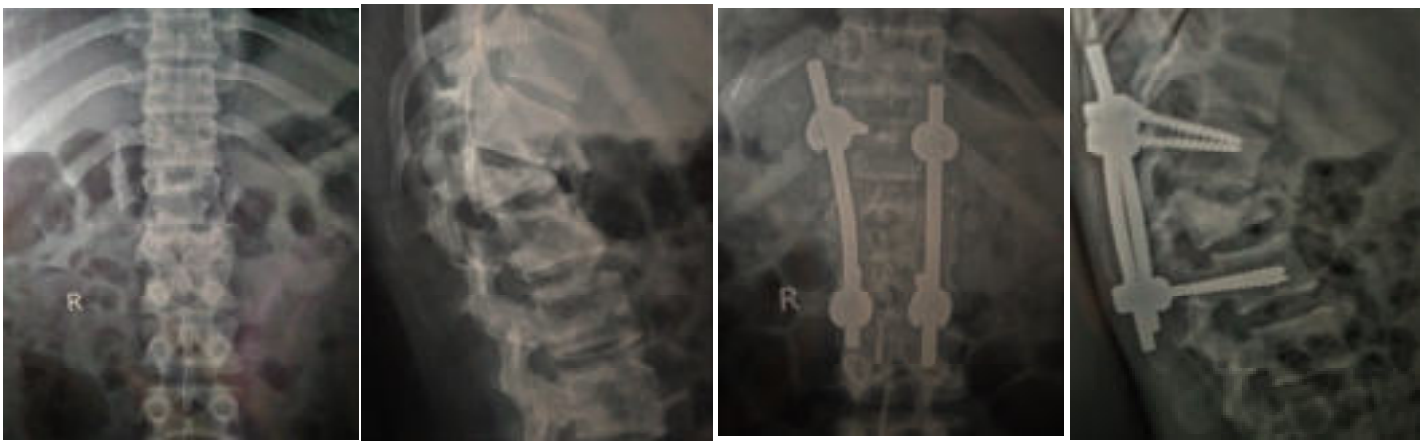
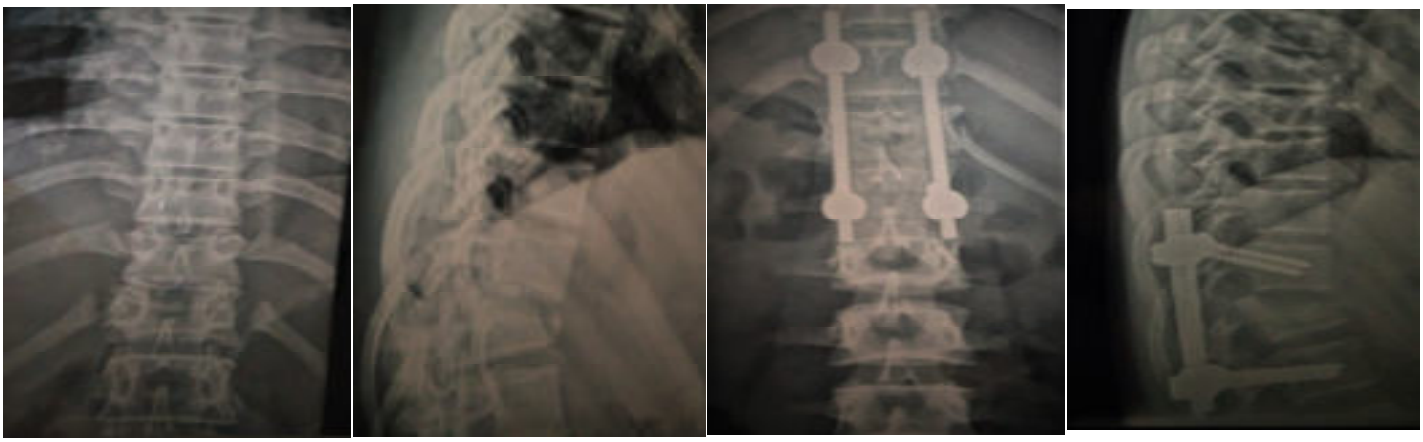


Figure 2: Pre-op and Post Op X ray of Patient B



Both presented with a history of fall, Patient A 13 hours from trauma, while patient B 20 hours. Patients were posted 6 days after admission, treated using polyaxially pedicle screw fixation via posterior midline approach, on principles of indirect decompression using ligamentotaxis, with an uneventful operation [4,5].

**Discussion**

Often patients with dorsolumber fractures with spinal cord injury present late to tertiary setups [6]. With little left to amend, the treatment is far from magical. Prognosis being explained goes well before shifting toward or operation theatre. In our case Post operatively both patients were provided Taylor's brace and mobilised with assisted sit ups the next day [7]. Patients were discharged on request 6 days following operative treatment with regular follow ups every 2 weeks. Taylor's Brace was continued protectively, along with antibiotics, pain killers and methylcobalamine.

Studies on accessibility and a supportive network that act as a motivating factor to participate in rehabilitation following spinal cord injury have been studied [8]. However, our report emphasises on the self-help which patient A clearly had. While initial follow ups both patient A and B reported. Patient B was lost to follow up after 2 visits. Patient A was regular in follow ups and progress gradually made from sit ups to walk with the help of aid to unaided walking over a period of 5 months.

Patient A was on regular visits from a local physiotherapist who provided isometric exercises and progressive weight bearing, followed by gait balancing. At the end of 3 months patient's lower limb powers were

improved to a scale of ASIA C, at the end of 4 months improved to ASIA D. It was not surprising when the patient walked exactly 6 months from the day of surgery with good gait balance. On examination patient had improved to ASIA E with bowel movements periodically every 48 hours and voiding of urine was done with self-CIS. While Patient B returned to follow up at 6 months with ASIA grade B, with involvement of bowel evacuation by manual extraction, still on use of indwelling catheter. Patient had also had multiple depressive episodes, bed sores and recurrent urinary tract infections.

In other studies role of web based physiotherapy has also been evaluated but in both the patients the feasibility of setup had allowed us to call both patients for follow up [9]. Since both the patients had been subjected to similar operations by same surgeon, with requests for follow up on same time the work to be done further at our end was limited. It was only then left for patient A to realize that the role of self-help had to step in.

Evaluation of return to preinjury status was further analysed in patient A and B [10]. As much to the surprise it added that both patients had accepted the status but patient A had developed self-dependence, skills and psychological strength due to the patient's own help.

## Conclusion

Role of physiotherapy and rehabilitation cannot be ignored, but a very important aspect of success story is self-help.

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Case Report

# Neck of femur fracture secondary to bone infarcts of proximal femur- A rare case report

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**Abstract**

Bone infarction is a term, referred for osteonecrosis of bone involving its metaphysis or diaphysis. Neck of femur fracture secondary to bone infarction of proximal femur is a very rare entity. A bone infarct may mimic a bone tumour on imaging. Therefore accurate pre-operative assessment plays a significant role in its diagnosis. We are reporting a rare case of fracture neck femur, which has occurred secondary to bone infarcts of proximal femur in a 50-year-old male, which was successfully treated with cemented bipolar hemiarthroplasty after a careful diagnosis.

**Keywords**: Bone infarction , osteonecrosis, hemiarthroplasty, cemented

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## Introduction

Bone infarction is a term, referred for osteonecrosis of bone involving its metaphysis or diaphysis. Necrosis is an irreversible cell injury leading to death of cellular elements of bone and marrow, which can be recognized by microscopic alterations in the cytoplasm (becomes eosinophilic) as well in nucleus as, swelling, pyknosis, karyorrhexis, karyolysis. Bone infarction results from ischemia due to any cause, which can lead to destruction of bony architecture, pain and loss of function [1]. Bone infarctions may have numerous causes and have fairly distinctive imaging features on conventional radiography, CT and MRI.

We have treated a case of fracture neck of femur secondary to bone infarction of left proximal femur, in a 52-year male patient, by bipolar hemiarthroplasty, with a good clinical and functional outcome. The excised head was sent for biopsy and histopathological examination.

## Case Report

A 55-year-old male patient presented to us with complaints of pain in left hip since 3 and half months and inability to walk for 1 month. The pain was insidious in onset, continuous and dull-aching in nature. There was no radiculopathy, no associated fever or other constitutional symptoms. He hadn't taken any treatment for that. After a couple of months, once while getting off from bed,

he felt a jerk at left hip, following which the pain increased in severity and patients wasn't able to stand or walk without support. The patient continued with this disability for a month, before coming to our, outpatient department.

General and systemic examinations were normal. Local examination revealed diffuse mild deep tenderness over anterior and lateral aspect of left hip with no signs of external injury. No skin changes were noted. Range of motion of the hip was terminally painful and restricted. Routine AP and lateral radiographs of hip joint and AP radiograph of pelvis with both hips (Fig 1) revealed fracture neck of femur which was subcapital type, with some subchondral sclerosis and abnormal radio-opaque lesions in the neck and inter trochanteric area.

As there was no history of any high energy trauma, a pathological fracture was suspected, which needed a Magnetic resonance imaging (MRI) of both hips for further evaluation. MRI (Fig 2) showed a geographical T1 hyperintense, STIR hypointense lesions with peripheral hypointense T1 rim, in the visualized upper/mid shaft of both femurs, intramedullary in location and most likely representing bone infarcts. There was transverse pathological neck fracture of left femur without any soft tissue association. Rest of the bony skeleton, including articular margins of both hips was normal.

Cemented bipolar hemi arthroplasty was planned for fracture neck femur. A standard posterior approach to hip was used, hip dislocated posteriorly and head removed using the corkscrew. Preparation of adequate calcar (approximately 1 cm above the lesser trochanter) was done using the nibbler, instead of osteotome as the bone was very brittle. Femoral canal was prepared using canal opener and box chisel. The prepared medullary cavity was filled from bottom to top with a cement using cement gun. The prosthesis of appropriate sized head was inserted before cement got hardened, with correct rotation and valgus alignment. The hip was then reduced after the cement got set. Complete reduction, stability, and range of motion was then confirmed. The head was removed completely as a sole mass and sent for histopathological examination. Post-operative x-rays (Fig 3) confirmed proper placement of the prosthesis within the acetabular cavity.

Histopathological examination (Fig 4) of femoral head showed fragments of cortical and trabecular bone. Non-viable necrosed bone with osteoid formation, fibrosis and vascular congestion with inflammatory granulation tissue was seen at places. There was no evidence of tumorous growth. The findings were consistent with a diagnosis of bone infarct in femoral head.

The patient was advised abduction pillow support for post-operative period. Partial weight bearing walking with support was started after day 5. The pain was relieved, and complete range of motion of the joint was achieved within a month. There were no symptoms of sciatic neuropathy. At the last follow-up at one and half year, the patient remained free of symptoms and was satisfied with the outcome of the surgery.

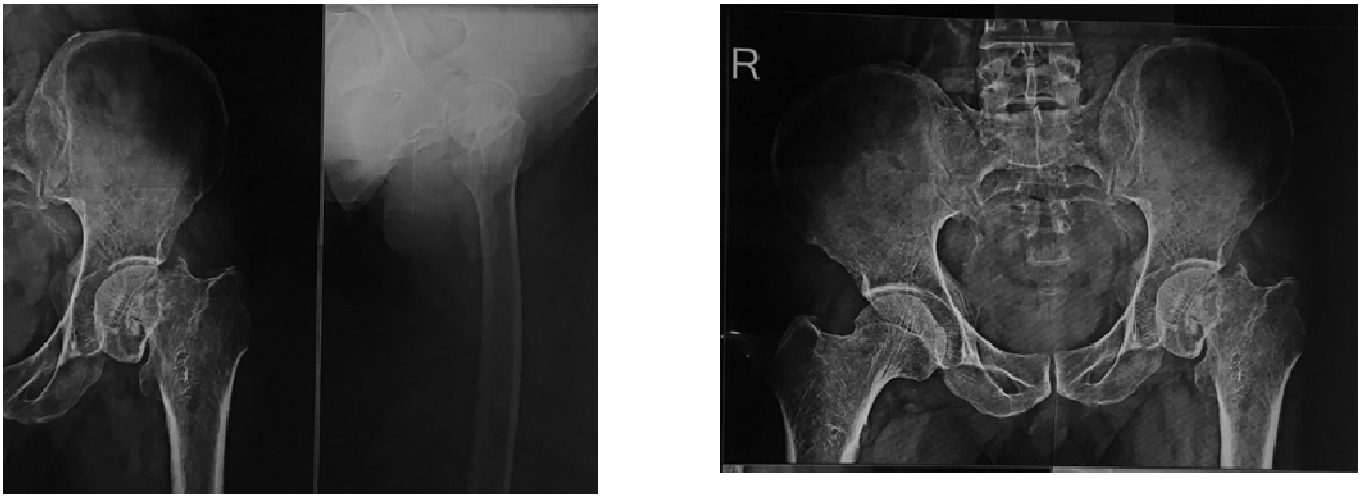


**Figure 1 (Radiographs)**

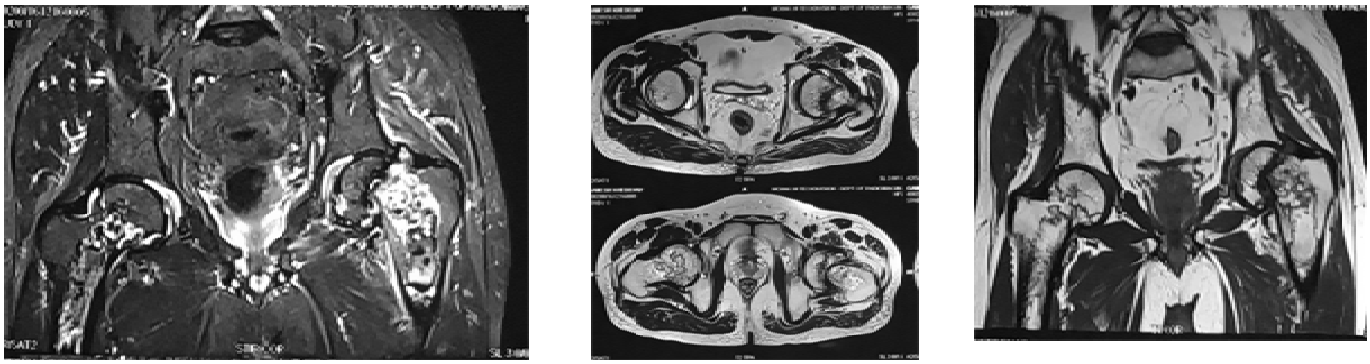

**Figure 2 (MRI)**

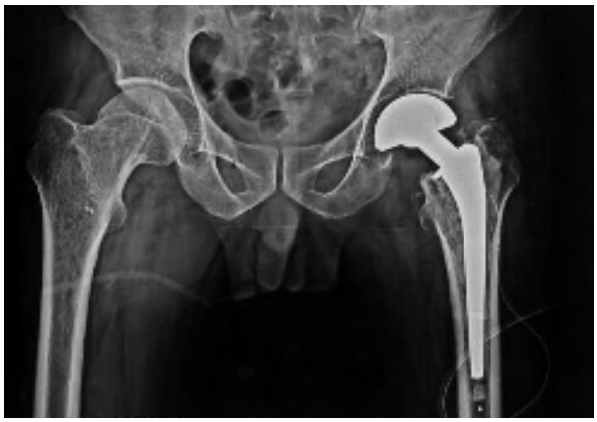

**Figure 3 (Post op X ray)**

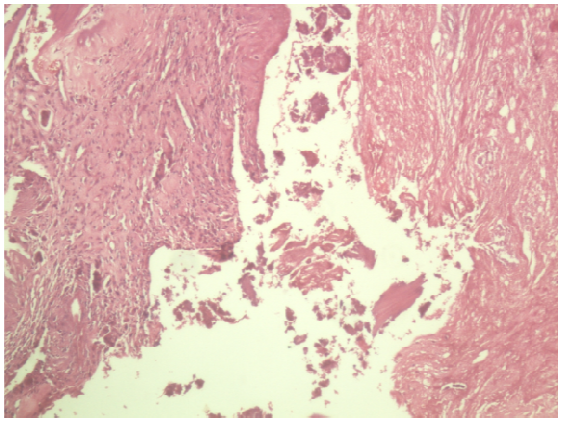

**Figure 4 (Histopathology)**

## Discussion

Bone infarcts of proximal femur is a rare entity, and fracture following it, is even rarer. Not enough data is available in the literature on fracture neck femur secondary to bone infarcts.

Lagier R in his study of a 47-year-old ununited intracapsular fracture of the hip, found that the head contained a zone of osteomedullary necrosis in the form of a bone infarct [2]. Yüksel HY reported a case of Bilateral simultaneous femoral neck fractures secondary to a post-infarct generalized tonic-clonic seizure [3].

Vaidyanathan, Singaravadivelu, Yuvaraja Murugan, and Kingsly Paulraj reported a case of fracture of femoral head occurring in the setting of underlying osteonecrosis following a low-energy trauma in a middle-aged male [4].

In general, bone infarct refers to lesions occurring in the metaphysis and diaphysis of bone. The usual sites are distal femur, proximal tibia and proximal humerus. Most common cause is idiopathic, though they are frequently seen in patients with a history of corticosteroid use, alcoholism, sickle cell anemia, gaucher disease.

A variety of pathologies may mimic bone infarction, including stress fractures, infections, inflammations, and metabolic and neoplastic processes. A bone infarct may mimic a bone tumour on imaging. However, when the global picture is considered, including the history, clinical findings, and course of events, the diagnosis can be achieved with the help of imaging in most patients [5].

No radiologic findings are specific for bone infarction. They are well defined metaphyseal lesions, with irregular borders. The periphery of the lesion is calcified, in contrast to chondroid lesions, which are calcified thoroughout [6].

Thus, a careful radiological and histological examination is necessary for an accurate diagnosis.

## Conclusion

In conclusion, we present a rare complication of rare non-neoplastic condition of long bones- bone infarct, involving a rare site- the proximal femur. Accurate pre-operative assessment helped in planning the treatment and achieving a satisfactory outcome.

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