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Editorial
Orthopaedics

What is new in Orthopaedics?

Singh V[1*]

[1*] Vivek Singh, Professor, Department of Orthopaedics, R D Gardi Medical College, Ujjain, Mp, India.

New technology in orthopedics, leading to innovative solutions and improved patient outcomes. Various cutting-edge technologies are revolutionizing orthopedic surgery ie. Smart Implants and Wearable Technology, 3D printing, telehealth, Artificial Intelligence, Digital Templating, Online-based Orthopedic Visits, Picture Archiving and Communication System (PACS), Computer-Assisted Surgery (CAS), Deep Learning and Generative AI, big data, Augmented Reality, ambulatory surgery centers (ASCs), Virtual Care Technology, robotics, Biological Treatments and Patient-Specific Implants.

Keywords: New in orthopaedics, artificial intelligence, Smart implants

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Innovative implants and wearable devices are new trends in orthopedics. These devices are equipped with sensors that can monitor patient movement, load distribution, and implant performance. Real-time data collected from these devices can help surgeons assess postoperative progress, optimize rehabilitation, and customize treatment plans to suit individual patients. (1)

The rise of telemedicine has also given a cutting edge in orthopedics. Online-based orthopedic visits allow patients to consult with orthopedic surgeons remotely, reducing the need for in-person appointments. Telemedicine can be particularly beneficial for follow-up visits, postoperative care, and initial consultations, making healthcare more accessible and convenient to the patients. (1)

Artificial intelligence (AI) is transforming various aspects of orthopedics care. AI algorithms can analyse large amount of patient data to identify patterns, predict outcomes, and assist in treatment decision-making. AI-powered tools can support preoperative planning, risk assessment, and personalized rehabilitation protocols, leading to improved patient outcomes and optimized resource utilization. (1)

Digital templating involves the use of advanced imaging technology and software to plan accurately and size orthopedic implants. This technology in prosthetics has greatly influenced the field of orthopedics, leading to innovative solutions and improved patient outcomes. (1)

PACS, or Picture Archiving and Communication System, is already a reality in many hospitals. It can quickly be resumed as a cloud-based solution, like Google Drive or iCloud. PACS connects imaging technologies and those who need to access the images collected. This makes it instant and eliminates the need for physical files. With PACS, orthopedics surgeons can quickly retrieve historical images, compare current and past scans, and make more informed decisions. This efficiency is crucial in time-sensitive situations, such as trauma cases, where rapid and accurate diagnoses are vital. PACS has several benefits for the institution and clinical communication. (2)

Computer Assisted Surgery, or CAS is a technology used to support a surgical procedure. This technology integrates computer algorithms with surgical instruments, offering guidance and feedback throughout the operation. From joint replacements to spinal surgeries, CAS enhances surgical precision, reducing the margin of error and improving overall outcomes. Surgeons receive continuous updates and recommendations based on real-time data, ensuring that each step aligns with the pre-operative plan. As a practical example, orthopedic surgeons might use navigation technologies during spine surgery to achieve precise viewing, tracking, and angling. A CAS might start even before entering the operations room, taking full advantage of imaging technologies and preoperative orthopedics technology. (2)

In the rapidly advancing field of orthopedics, the convergence of Deep Learning (DL) and Generative Artificial Intelligence (AI) is reshaping preoperative planning with its speed and accuracy.

This integration brings forth a shift in the way surgeons prepare for and execute orthopedic surgeries, leveraging the capabilities of AI to enhance precision and tailor interventions to individual patients. DL plays a pivotal role in preoperative planning by revolutionizing the analysis of medical imaging. Trained on extensive datasets of orthopedic images, DL algorithms excel in recognizing subtle anomalies, fractures, and intricate structural variations. This empowers surgeons with a deeper understanding of a patient's musculoskeletal condition, enabling more accurate preoperative assessments. Generative AI takes personalization in preoperative planning to a new level. By analyzing a patient's unique anatomical features, movement patterns, and medical history, Generative AI algorithms can generate simulations predicting the outcomes of different surgical approaches. Surgeons can then explore various scenarios and craft a surgical plan that aligns with the individual characteristics of the patient. (2)

In the landscape of orthopedic technology, Big Data plays a pivotal role in driving evidence-based decision-making. Often synonymous with Data Science, Big Data empowers orthopedics professionals by providing comprehensive and actionable insights. Big Data supports various orthopedics technologies discussed earlier, including Deep Learning e Generative AI, and Augmented Reality. Big Data can analyze vast datasets to uncover valuable insights. Orthopedic professionals can analyze trends, treatment outcomes, and patient demographics, leading to more personalized and effective interventions. Moreover, the integration of Big Data in orthopedics enables predictive analytics, helping healthcare providers anticipate potential complications, optimize resource allocation, and streamline workflow efficiency. This proactive approach contributes to the overall improvement of patient care and the effectiveness of orthopedic interventions. (2)

One steadily increasing trend in orthopedics is the use of augmented reality (AR). AR helps surgeons get more information pre-op and post-op, helping surgeons make more informed decisions. AR is already in use in many places across the country for total hip, knee and shoulder replacements, as well as certain spinal procedures. (3)

Recent years have seen an overall trend towards higher utilization of ambulatory surgery centers (ASCs), and migrating more approved procedures to them. In fact, a study recently published in the Journal of Bone and Joint Surgery found an 8.8% increase in annual procedure volume for orthopedic procedures performed at ASCs in the Medicare population from 2012–17. ASCs provided a cost-effective alternative for orthopedic procedures. Certain subspecialties became more comfortable performing procedures in ASC settings out of necessity. After hospitals banned elective inpatient procedures, spine surgeons at one ASC in New York3 tried procedures such as single-level discs and laminectomies in outpatient settings for the first time and indicated they would be comfortable doing so again without a mandatory 23-hour stay. (4)

Patient interest and expectations will be key factors for practices to consider when deciding whether to continue offering virtual care options after the national emergency.

Patients from geographically isolated areas, where there are fewer care options, may benefit long-term from telehealth availability. One study conducted on search volume determined that patient interest in orthopedic telehealth services was already growing prior to the pandemic, and that "interest appears to be on track to remain elevated for years to come." (3)

According to the providers surveyed, most responded that virtual care options were here to stay and planned to incorporate them into their practices moving forward. In fact, some orthopedic surgeons are now of the opinion that digital transformations in healthcare now make outpatient procedures preferable. However, uncertainty regarding virtual care reimbursement policies creates a challenge in terms of confidently developing a longer-term plan for overall financial wellness. (4)

The integration of robotics and navigation systems in orthopedic surgery has elevated precision and accuracy to unprecedented levels. Robotic-assisted procedures enable surgeons to create personalized surgical plans based on a patient's unique anatomy, leading to more tailored and effective treatments. These robotic systems assist surgeons in performing complex tasks with enhanced control and dexterity, reducing the risk of errors and optimizing implant placement in joint replacement surgeries. Navigation technology, on the other hand, provides real-time, 3D imaging during surgery, aiding surgeons in making informed decisions and achieving better outcomes. (5)

Biological treatments, such as platelet-rich plasma (PRP) and stem cell therapies, have gained popularity in orthopedic surgery. PRP, derived from a patient's blood, contains growth factors that promote tissue healing and regeneration. Stem cell therapies use the body's own cells to stimulate tissue repair, particularly in conditions like osteoarthritis and soft tissue injuries. These regenerative approaches offer a more natural and potentially longer-lasting solution for orthopedic conditions, reducing the need for invasive procedures and enhancing the body's own healing capacity.

Patient-Specific Implants-Orthopedic surgeons can now utilize patient-specific implants (PSIs) that are tailor-made for an individual's unique anatomy. Advanced imaging and computer-assisted design allow for the creation of implants that fit the patient's joint or bone precisely. PSIs provide better stability, reduce the risk of implant-related complications, and result in improved post-operative function and comfort. The recent advancements in orthopedic surgery have reached in a new era of personalized and precise care for patients with musculoskeletal conditions. From minimally invasive techniques to robotics, 3D printing, and biological treatments, orthopedic surgeons now have multiple tools to enhance patient outcomes and improve quality of life. As technology continues to evolve, we can look forward to further innovations in orthopedics, ensuring that patients receive the best possible care and regain their mobility and independence with greater ease than ever before. (5)

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Problems Encountered in Uncemented THR in AVN of Hip Patients

Singh V[1], Jain S[2*], Gupta N[3], Patidar A[4], Rathore SS[5], Jain A[6], Bhinde S[7], Agrawal A[8], Jain P[9]

[1] Vivek Singh, Study performed at Department of Orthopaedics, R D Gardi Medical College C R G Hospital and Associated Charitable Hospital, Ujjain, Madhya Pradesh, India.

[2*] Sarvagya Jain, Resident, Study performed at Department of Orthopaedics, R D Gardi Medical College C R G Hospital and Associated Charitable Hospital, Ujjain, Madhya Pradesh, India.

[3] N Gupta, Study performed at Department of Orthopaedics, R D Gardi Medical College C R G Hospital and Associated Charitable Hospital, Ujjain, Madhya Pradesh, India.

[4] A Patidar, Study performed at Department of Orthopaedics, R D Gardi Medical College C R G Hospital and Associated Charitable Hospital, Ujjain, Madhya Pradesh, India.

[5] S S Rathore, Study performed at Department of Orthopaedics, R D Gardi Medical College C R G Hospital and Associated Charitable Hospital, Ujjain, Madhya Pradesh, India.

[6] A Jain, Study performed at Department of Orthopaedics, R D Gardi Medical College C R G Hospital and Associated Charitable Hospital, Ujjain, Madhya Pradesh, India.

[7] S Bhinde, Study performed at Department of Orthopaedics, R D Gardi Medical College C R G Hospital and Associated Charitable Hospital, Ujjain, Madhya Pradesh, India.

[8] A Agrawal, Study performed at Department of Orthopaedics, R D Gardi Medical College C R G Hospital and Associated Charitable Hospital, Ujjain, Madhya Pradesh, India.

[9] P Jain, Study performed at Department of Orthopaedics, R D Gardi Medical College C R G Hospital and Associated Charitable Hospital, Ujjain, Madhya Pradesh, India.

Background: Avascular necrosis of femoral head is a common problem. It mostly affects the femoral head (hip joint). Its management can be conservative or invasive. Total hip arthroplasty is the treatment of choice for third and fourth stage avascular necrosis. Problems and complications are associated with every surgery. Here, we will see the common problems and complications encountered in uncemented total hip replacement in avascular necrosis of hip patients.

Material and Method: Fifty patients of Avascular necrosis of femoral head of stage III and IV are operated in last three years by uncemented total hip arthroplasty and their results were assessed by Harris hip score. There are some problems which we encountered in preoperative, intraoperative and post operative period. Their assessment and solution are done in this study.

Results: The mean Harris hip score during preoperative stage was 52 and during postoperative stage was 94. Excellent results are seen in 43 patients, good results are seen in 6 patients and poor results are seen in one patient. Preoperative problems like protrusio acetabuli was seen in 5 hips and fixed flexion deformity is seen two patients. Intraoperative problem like periprosthetic fracture was seen in one patient. Postoperative complication like limb length discrepancy was seen in 6 patients, foot drop in one patient, posterior dislocation of hip in one patient, superficial infection in 3 patients, deep infection in one patient and periprosthetic fracture in one patient.

Conclusion: Problems and complications are the part and parcel of any surgery. we should not get panic and try to treat the problems and complications encountered in uncemented THR. If, properly treated any problem of the uncemented THR can be managed. Long learning curve and lot of patience is required to produce long term good results in uncemented THR in AVN of hip patients.

Keywords: Uncemented THR, AVN of hip, Problems

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Introduction

Avascular necrosis (AVN) of the femoral head is one of the common causes of painful hip in a young adult. The natural course of this disease is one of relentless progression with eventual collapse of the femoral head, followed by secondary osteoarthritic changes in the hip.[1]

The disease occurrence is more in men than in women. Most studies have attributed the disease process to the combined effects of genetic predisposition, metabolic factors, corticosteroid and excessive alcohol intake and local factors affecting blood supply such as vascular damage, increased intraosseous pressure, and mechanical stress.[2,3] This results in bone ischemia and infarction leading to bone death. Lastly, direct cellular insult may result from irradiation, chemotherapy, or oxidative stress may lead to AVN.

Total hip arthroplasty is the only effective treatment of AVN of the femoral head when the disease process has reached Ficat and Arlet stage 3 and 4. The primary indication for Total Hip Replacement in AVN is severe pain and the limitation in activities of daily living that it causes. To warrant doing total hip replacement, pain must be refractory to conservative measures such as oral nonsteroidal anti-inflammatory medication, weight reduction, activity restriction, and the use of supports such as a cane. Uncemented implants are most frequently used in young patients with high physical demands, where a revision surgical procedure in the future will be more likely.

Material and methods

The study was carried out on 50 hips of AVN Hip patients operated by uncemented total hip replacement in the Department of Orthopaedics, R.D. Gardi Medical College, Ujjain from August 2020 to August 2023. Information on the patients was compiled from clinical details, case files and operation theatre records. This is a prospective study. Patient follow up was for a minimum of 6 months to a maximum of 30 months (2 and a half years). Inclusion criteria was all the patients of Stage 3 and 4 of avascular necrosis of femoral head, patients in the age group more than 20 years and less than 70 years, patients willing to give informed consent and exclusion criteria was patients who had deformities or pathologies of other joints of the lower limb, which may have had an adverse bearing on the functional outcome of the surgery, the patients with systemic and local infections, patients who are not medically fit for surgery and patients not willing to give consent. Clinical presentation of osteonecrosis typically is asymptomatic in early stages, although patients may develop groin pain that can radiate to the knee or ipsilateral buttock. On physical examination, patients usually present with a limited range of motion at the hip and complain of pain particularly with forced internal and external rotation. A Thorough pre operative assessment like history, clinical and radiological examination and routine investigations of the patient done. Pre operative modified harris hip score was also evaluated. Current diagnosis is dependent upon plain AP and lateral radiographs of the hip, followed by MRI.

Figure 1: Pre Operative Xray

Figure 2: Post operative X ray

Figure 3 and 4: Follow up of patient

The AP radiographs will usually demonstrate the primary area of involvement, once changes can be viewed. Generally, the first radiographic changes seen by radiograph will be cystic and sclerotic changes in the femoral head. Early delamination of the cartilage from the underlying bone will most likely be demonstrated by the crescent sign[5].

All Total Hip Arthroplasty were performed under spinal anaesthesia. In all cases, the posterior approach (Southern or moore approach) was used, with the patient placed on the contralateral side.

Post Operative Protocol: The hip is positioned in approximately 15 degrees of abduction while the patient is recovering from the anesthesia using a triangular pillow to maintain abduction and long knee brace to prevent extremes of flexion. First post op day, check X-rays are taken. The patient is taught static quadriceps exercises, knee and ankle mobilization exercises and made to sit. On Second post op day drain was removed and dressing done and physiotherapy started. IV antibiotics were given for 48 hours later switched over to oral antibiotics for further 5 days more. On 13th post op day sutures are removed and patient was discharged from the hospital to be reviewed after 4 weeks. At the time of discharge, they were advised to not to squat, not to sit cross legged, not to use Indian toilets, and to not to cross the lower limb across the midline. The patients were followed up at 6 weeks, 3 months, 6 months, 1 year and at yearly intervals. Patient follow up was for a minimum of 6 months to a maximum of 30 months (2 and a half years). The clinical and functional outcomes were evaluated by modified harris hip score. Based on a total of 100 points possible, each question is awarded a certain number of points. Questions are further grouped into categories. The score is reported as 90-100 for excellent results, 80-90 being good, 70-79 fair, 60-69 poor, and below 60 a failed result. A radiograph was taken at the end of the procedure and during follow up visits. The standard radiograph was an anteroposterior view of pelvis including both hips and sufficient length of femur. The radiological assessment included positioning and alignment of the acetabular and femoral components and complications such as periprosthetic fractures, loosening, osteolysis, dislocation, subsidence and heterotrophic ossification.

Preoperative problems like protrusio acetabuli was seen in 5 hips and fixed flexion deformity is seen two patients. Intraoperative problem like periprosthetic fracture was seen in one patient. Postoperative complication like limb length discrepancy was seen in 6 patients, foot drop in one patient, posterior dislocation of hip in one patient, superficial infection in 2 patients, deep infection in one patient and periprosthetic fracture in one patient. Protrusio acetabuli is a central acetabular defect resulting from migration of femoral head medially. This results in medialization of the center of rotation of the hip. Primary uncemented total hip replacement (THR) in such situations can be technically demanding due to associated significant medial and proximal migration of the center of the joint, deficient bone medially and reduced bony support to the acetabular component peripherally. Cemented total hip arthroplasty resulted in promoting bone lysis and implant loosening.

However, uncemented total hip arthroplasty with impacted morselized autograft with a porous coated cementless acetabular component provided a biological solution to bone deficiency and long-term fixation in arthritic hips with protrusio. After neck osteotomy, dislocated femoral head was cut into slices with a power saw. The bone slices were then morselized into 8mm-10mm sized pieces using a bone cutter. Acetabular floor prepared while avoiding penetration of a soft, deficient medial wall until a bleeding bony surface was obtained. Acetabular periphery reamed using large sized reamers initially, and graft placed.

Pre operative problem like fixed flexion deformity of hip is seen in 2 patients. Management of fixed flexion deformity of hip is done by removal of all the osteophytes from anterior side of acetabulum, release of the pericapsular adhesions of hip joint, elongation of Iliopsos tendon by sequential cutting, release of TFL distally from Gluteus Medius insertion and adductor tenotomy, rectus femoris release and sartorius tenotomy may needed in extreme cases.

Periprosthetic fracture may occur with aggressive rasping or mismatch of implant and rasp. It happened in one of our cases. We used stainless steel wire to do the cerclage wiring for proximal femoral fractures. For middle region and distal region fractures, longer stem prosthesis or internal fixation with plates can be used. Distal tip of stem must bypass distal extent of fracture. Distal tip fracture happened in one of our patients. We treated him conservatively by long term immobilization.

Figure 5: Protrusio Acebuli in bilateral hip

Figure 6: Post op xray

Postoperative complication like limb length discrepancy was seen in 6 patients. Over lengthening of 1 cm is seen in 6 bilateral THR cases and a lengthened limb is more poorly tolerated.

Limb-length discrepancy can result from a poor preoperative patient evaluation as well as intraoperative technical errors with regard to the level of resection of the femoral neck, the prosthetic neck length, or the failure to restore offset. Up to one centimeter shortening or lengthening can be compensated by pelvis. More than 1 cm discrepancy can be treated by shoe raise on other side.

Sciatic nerve palsy in form of EHL weakness/ foot drop was seen in one patient. The patient recovered in 6 months; all is needed that reassurance. Nerve conduction studies and EMG are needed, if there is no recovery in 6 months. In certain cases, early surgical exploration and release of nerve is indicated.

Figure 7: Periprosthetic fracture treated by SS wiring

Figure 8: Distal femur peri prosthetic fracture treated by long term immobilization

Figure 9: Posterior dislocation of hip treated by close reduction

Figure 10: Superficial wound infection treated by DAIR

Posterior dislocation of hip was seen in 1 patient. Fortunately, we were able to reduce it conservatively by close reduction. Reasons can be advanced age of patient, neurological disease, impaired compliance, suboptimal implant position improper soft tissue tension. Treatment can be conservative or operative.

Superficial infection is seen in 3 patients & deep infection is seen in one patient. Pus, culture and sensitivity, antibiotics according to pus culture and sensitivity is done followed by debridement and re-suturing. Debridement, antibiotics, implant retention ("DAIR") can be considered in deep infection. Kuiper*et al*. (33) found that 66% of their patient group were infection free at their 2 years follow up following DAIR for infection. Two stage revision with spacer is gold standard, if infection persists. In a study by Meek RM, Garbuz DS [23], intraoperative fracture was observed in 4.3% of hips, sciatic nerve palsy was observed in 1.1%, and 14% of the cases were revised because of aseptic loosening. In a study by Learmonth ID showed periprosthetic fracture in 8.6% cases. [32]

Observations and results

Table 1: Age distribution of the cases

Age Groups	Frequency	Percent
<= 30 Years	14	28.0 %
31 - 40 Years	19	38.0 %
41 - 50 Years	09	18.0 %
>50 Years	08	16.0 %
Total	50	100.0 %

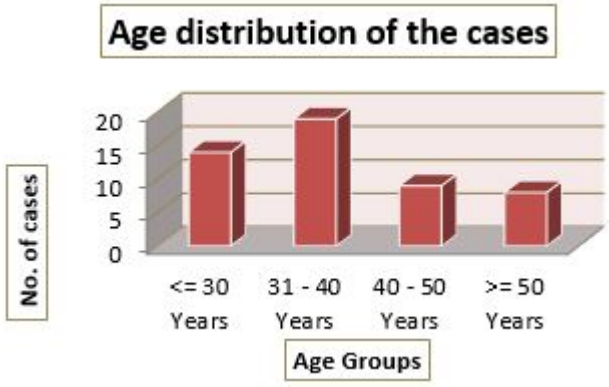

Figure 11: Age distribution of the cases

Table 2: FICAT and ARLET Classification type

FICAT AND ARLET CLASSIFICATION TYPE	Frequency	Percent
I	00	00%
II	00	00 %
III	26	52.0 %
IV	24	48.0 %
Total	50	100.0 %

Table 3: Cause of AVN distribution of the cases

CAUSE OF AVN	Frequency	Percent
Idiopathic	43	86.0 %
Steroid Induced	05	10.0 %
Traumatic	02	4.0 %
Total	50	100.0 %

Table 4: Pre operative problems

Preoperative problem	Frequency	Percent
Protrusio Acetabuli	05	10 %
Fixed flexion deformity of hip	02	4%

Table 5: Intra operative complications

Intra operative complications	Frequency	Percent
Fracture Proximal femur- periprosthetic	01	2.0 %
Peri prosthetic Fracture shaft femur	01	2.0 %
No Complication	48	96.0 %
Total	50	100.0 %

Out of 50 cases, in one case develop Fracture Proximal femur-periprosthetic, in one case develop peri prosthetic Fracture shaft femur and 48(96.0%) had no intra operative complications

Table 6: Post operative complications distribution of the cases

Post operative complications	Frequency	Percent
Anterior thigh pain	01	2.0 %
Superficial infection	03	6.0 %
Deep infection	01	2.0 %
EHL weakness/Foot drop	01	2.0 %
Limb length discrepancy	06	12.0 %
Peri-prosthetic fracture	01	2.0 %
No Complication	37	74.0 %
Total	50	100.0 %

Out of 50 cases, 6(12.0%) cases had limb length discrepancy post operative complication, 3(6.0%) had superficial infection, 1(2.0%) Anterior thigh pain, 1(2.0%) Deep infection, 1(2.0%) EHL weakness, 1(2.0%) Peri-prosthetic fracture and in 37(74.0%) cases no post operative complications.

Table 7: Pre and post operative mean scores comparison

		N	Mean	SD	T	p
Pain	Pre op	50	13.40	4.79	33.994	0.000
	Post op	50	41.48	4.71		
Function-Gait	Pre op	50	22.56	3.48	18.416	0.000
	Post op	50	30.74	2.16		
Function-Activity	Pre op	50	9.52	1.83	15.825	0.000
	Post op	50	13.00	1.01		
Absence of deformity	Pre op	50	3.76	0.96	1.769	0.083
	Post op	50	4.00	0.00		
ROM Score	Pre op	50	3.79	0.41	19.762	0.000
	Post op	50	4.91	0.27		
Total Score	Pre op	50	52.84	6.67	38.576	0.000
	Post op	50	94.09	4.89		

Table indicate that, post operative mean pain score 41.48±4.71 was significantly higher as compare to pre-operative pain score 13.40±4.79 with $p<0.05$. Post operative mean Function-Gait score 30.74±2.16 was significantly higher as compare to pre-operative Function-Gait score 22.56±3.48 with $p<0.05$.

Post operative mean Function-Activity score 13.00±1.01 was significantly higher as compare to pre-operative Function-Activity score 9.52±1.83 with $p<0.05$. Post operative mean Absence of deformity score 4.00±0.00 was higher as compare to pre-operative Absence of deformity score 3.76±0.96 with $p>0.05$. Post operative mean ROM score 4.91±0.27 was significantly higher as compare to pre-operative ROM score 3.79±0.491 with $p<0.05$. Post operative mean total score 94.09±4.89 was significantly higher as compare to pre-operative total score 52.84±6.67 with $p<0.05$.

Table 8: Post operative total score

Post op total score	Frequency	Percent
Excellent	43	86.0 %
Good	06	12.0 %
Fair	01	2.0 %
Total	50	100.0 %

Table 9: Comparison with Other Studies distribution

Study	Cemented/ Cementless THR	Follow-up in years	Number of cases	Revision Rate %
Kim et al(26)	Cementless	7.2	78	21.8
Piston et al(27)	Cementless	7.5	35	6
Lins et al(28)	Cementless	5	37	8.1
Salvati et al(25)	Cemented	8	28	37
Our study	Cementless	2	50	0

On comparing with other studies, Salvati et al had 28 cases with 8 years follow-up with revision rate of 37%, Kim et al had 78 cases with 7.2 years follow-up with 21.8% revision rate, Piston et al had 35 cases with 7.5 years follow-up with 6% revision rate, Lins et al had 37 cases with 5 years follow-up with 8.1% revision rate and our study has 50 cases with 2 years follow-up with 0% revision rate.

Discussion

Total hip replacement is a well-documented surgical procedure (6). It improves the quality of life by relieving pain and functional disability experienced by patients with moderate to severe arthritis of the hip. The study was carried out on 50 hips of AVN patients who underwent uncemented total hip eplacement. In western literature, as per Harkness (6), Charney (8), Eftekhar (7) total hip arthroplasty has primarily been described for patients in older age group of sixty and above. In our study, 16% of the patients were found to be in the 50 and above age group, with age ranging from 20 to 70 years and a mean age of 39.14 years. Majority, 19 (38%) patients of the avascular necrosis of head of femur in our study group belonged to 31-40 years age group. In contrary to these findings, a multivariate analysis identified young age at onset of avascular necrosis (9,10,11). Other studies like Tofferi JK, Gilliland W, also found young age of onset of avascular necrosis between 3rd and 5th decade of life (11,12).

In our Study majority, 45 (90%) were males and 5 (10%) were females. A study by Diana Kamal et al , also found that aseptic necrosis of femoral head affects men 4 times more than women(13). In a study by Dr. M Rama Subba Reddy et al, Males are affected more than female with a M: F ratio of 3:1, which is similar to our study (14).

In the study by Kakaria et al, there were 20 patients and out of which there were 16 males and 4 females. The overall male to female ratio was 4:1. Majority of patients were between 31-40 years (45%) and 41-50 years (25%), which had similar distribution of age groups like our study (15). In our study the analysis of patients for the etiology of AVN showed that in 43 (86%) of the patients developed AVN oh hip joint the cause was idiopathic, 5 (10%) of patients developed AVN secondary to corticosteroid use, and secondary to post trauma 2 (4%) patients developed AVN of the hip joint. In a study by Koo and Kim et al showed 65% of AVN due to idiopathic cause and 10% to 30% cases due to corticosteroid therapy which is quite similar to our study (16). The Harris hip score is the most commonly used scoring system for evaluating hip replacement. We used Harris hip score to assess the functional outcome in our study. Excellent results are seen in 43 (86%) cases, good results are seen in 6(12%) cases, Fair result is seen in 1 (2%) case and poor results are seen in none case. The mean Harris Hip Score during preoperative period was 52.84 and during post operative stage was 94.09. Almost similar results are seen in other studies (11-14,16,17,18). Bourne et al (19), in a study of 101 total hip replacements with the uncemented (porous-coated anatomic) prosthesis, reported an average Harris hip score of 96 points, but only patients who were free of pain were evaluated. When patients who had pain were included, the overall average score was 90 points. Heekin et al (20) reported an average score of 93 points after a minimum of five years of follow-up of 91 hips that had been treated with the non-cemented prosthesis. In a study by Katz et al(21), the results of 14 arthroplasties, in which the stem had been fixed without cement, the hip score averaged 84 points at forty-six months. Barrack and Lebar (22) reported an average Harris hip score of 93 points after 49 arthroplasties in which the Uncemented prosthesis had been used.

The study by Mullaji et al (29) suggests that the use of impacted morsellised autograft in conjunction with porous coated cementless acetabular component restored hip biomechanics after an intermediate duration follow up. 30 primary THR's were conducted with a 4.2 year follow up which showed excellent outcome in 90% patients, fair in 7 % patients and poor in 3% patients. A study by Mohanty et al (30) showed that using only cement for acetabular reconstruction in protrusio acetabuli has had unacceptably high rates of recurrence, with components migration into the acetabulum and occurrence of thermal necrosis of the thinned out medial wall due to heat polymerisation of the cement. Uncemented THR with morsellised autograft in Protrusio acetabuli with AVN hip produces good results. It helps in restoring biomechanics of hip joint and preventing recurrence of protrusio. There was no evidence of progression of protrusio or socket loosening or osteolysis in any of our cases. Our results are comparable to the results of other studies. But a larger sample size and a longer follow up is required to ascertain this fact. Pre operative problem like fixed flexion deformity of hip is seen in 2 patients. Management of fixed flexion deformity of hip is done by removal of all the osteophytes from anterior side of acetabulum, release of the pericapsular adhesions of hip joint, elongation of Iliopsos tendon by sequential cutting, release of TFL distally from Gluteus Medius insertion and adductor tenotomy, Rectus femoris release and sartorius tenotomy may needed in extreme cases. (31)

Intra operative peri-prosthetic femoral fractures are becoming increasingly common and are a major complication of total hip replacement (THR). The largest study of intraoperative femoral fractures at the time of revision total hip arthroplasty was reported by Meek et al (23). Of 211 consecutive patients, 64 (30%) sustained an intraoperative femoral fracture and 147 did not sustain a fracture. In a study by Meek RM, Garbuz DS (23), intraoperative fracture was observed in 4.3% of hips, sciatic nerve palsy was observed in 1.1 %, 14% of the cases were revised because of aseptic loosening. In a study by Learnmonth ID showed periprosthetic fracture in 8.6% cases. In our study during the procedure, 2 patients (4%) had periprosthetic fracture, one had Type A2 Vancover fracture of the proximal femur which was fixed with SS wire cerclage, which united as documented by the follow up X rays and other had Type A3 Vancouver fracture of femur shaft for which patient was kept non weight wearing on operated limb for 6 weeks postoperatiely. We had a similar rate of periprosthetic fracture when compared to other studies. Though an overall better outcome score was seen in patients with no fracture, patients with periprosthetic fracture had no a statistical significance between the pre operative and post operative outcome score in our study.

The Swedish hip joint Replacement Register (24) found that revision rate of cemented fixation was lower (5.7%) than cementless fixation (5.9%) and the percentage of cementless stems was 20.9% in 2014 and most of them were performed in young patients less than 60 years old. The latest annual report of The Norwegian Joint Replacement Register was published in 2015, with 190,962 THAs. In accordance with the global trend, cementless prostheses have been more frequently used than previously, even in elderly patients and cementless fixation showed no obvious difference when performed in any age groups, they found that cementless fixation has lower risk of revision in male patients over 75 years and female patients less than 65 years. In 12th annual report of The National Joint Registry (NJR) for England, Wales, Northern Ireland and Isle of man, the popularity of cemented fixation decreased steadily from around 60% in 2003 to 36% in 2014, while cementless fixation increased from less than 20% to 40% (24). The New Zealand Joint Registry showed that after stratifying by age, cementless and hybrid fixation had a significantly lower revision rate than cemented ones in patient younger than 55 years (24). In our study till now there is 0 % revision rate in all the patients treated with cementless total hip replacement. Thus, our study matches with various studies as outcome cemented versus uncemented THR remains similar. There remain merits and demerits with both modalities. Hence there is need for further evidence-based studies.

Conclusion

Total hip arthroplasty is a well-documented surgical procedure for AVN hip. It relieves pain and functional disability of patients with arthritis of the hip secondary to AVN and improving their quality of life.

The outcome of THR of hip joint is determined by the design of component, the selection of the patients, and the operative technique.

The outcome of the THR is determined by the design of component, the selection of the patients, and the operative technique. The results of the procedure needs long term studies for evaluating the complete effect. Current generation of uncemented implants provide satisfactory clinical and radiographic outcomes in intermediate duration of follow up. Even though the procedure is not free of complications, the overall functional and clinical outcome had shown good to excellent result. In future, cases of AVN hip may increase because of excessive use of steroids in covid 19 treatment.

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Research Article
Missed Monteggia fracture

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Missed Monteggia fracture in children- A case series

Khare A[1*], Mandlecha P[2]

[1*] Ajay Khare, Director, Global Hospital, Ujjain, Madhya Pradesh, India.
[2] P Mandlecha, Global Hospital, Ujjain, Madhya Pradesh, India.

Background: Missed Monteggia fractures in children may cause pain, deformity, decreased range of motion, and neurological symptoms. Various surgical techniques have been advised to reconstruct long-standing Monteggia injuries to get long-term upper limb function. The purpose of this study was to assess the clinical and radiographic results of surgical technique for missed Monteggia fracture-dislocations.

Material and method: A prospective evaluation of 5 patients who underwent surgical reconstruction of missed Monteggia fracture-dislocations was performed. The median patient age at the time of surgery was 10 years, and the median time from injury to surgery was 13 weeks. Median clinical and radiographic follow-up was one year.

Results: The median elbow range of motion improved from 90 degrees of flexion and 5 degrees short of full extension preoperatively to 120 degrees of flexion and full extension postoperatively. Forearm range of motion also improved from a median of 80 degrees of pronation and 60 degrees of supination preoperatively to 80 degrees of pronation and 80 degrees of supination postoperatively. Congruent radiocapitellar alignment was maintained in 4 patients. One patient had redislocation of the radiocapitellar joint, and 1 patients had radiographic re-subluxation. One of the 5 patients who experienced redislocation underwent early revision and achieved uncomplicated long term result.

Conclusion: Good improvements in elbow motion and radiocapitellar stability can be safely achieved in the majority of children following surgical reconstruction of missed Monteggia lesions.

Keywords: Khare et al. Missed Monteggia fracture in children

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Introduction

Monteggia fracture, characterized by proximal one third of ulna shaft fracture combined with radial head dislocation, was first described by Monteggia et al. in 1814, while recent studies included fracture of the olecranon (1). With an incidence of less than 2% of forearm injuries in children and adults, this rare combination injury could eventually lead to forearm deformities and dysfunction, if not diagnosed at an early stage, resulting in neglected Monteggia fracture (NMF) (1).

Though Monteggia fracture is well defined as radial head dislocation combined with proximal ulna fracture, the exact time point to consider a chronic phase Monteggia fracture is controversial. Recent studies recommended over 4 weeks after injury as the dividing line for Neglected Monteggia Fracture, as malunion of the ulna had already formed. If not diagnosed at an early stage, these lesions can gradually lead to forearm deformities and dysfunction, finally resulting in neglected Monteggia fracture. When the radial head is not reduced, several deformities develop at the humeroradial joint, including cubitus valgus and osteoarthritis. Adequate radiographs are crucial when the surgeons deal with forearm injuries. Opening-wedge osteotomy of the ulna restores normal ulnar length and corrects the angulation of the ulna in patients with chronic Monteggia fracture-dislocations. In addition, this eases the reduction of the radial head. Morbidity caused by annular ligament reconstruction surgery can be prevented by preserving the intact annular ligament. After dilatation and mobilization of the annular ligament, reduction of the radial head can be accomplished. Patients who receive repair of the native annular ligament were more likely to achieve lasting radiocapitellar joint stability when compared with patients who received annular ligament reconstruction or if the annular ligament was not addressed. (2) This study evaluated the effectiveness of corrective opening-wedge ulnar osteotomy and radial head relocation into the intact annular ligament in the treatment of pediatric chronic Monteggia fracture-dislocation. (4)

Our patients functionally benefited from the procedure with significant improvement in elbow pain and stability, as well as improved flexion of the elbow with stable radial head reduction. Fracture dislocations are classified according to the Bado radiological classifications. (5)

Type	Radial head dislocation	Ulnar fracture	Pediatric proportion (%)
Bado I	Anterior	Anterior angulation	70
Bado II	Posterior/posterolateral	Posterior angulation	6
Bado III	Lateral/anterolateral	Metaphyseal fracture	23
Bado IV	Anterior	Concomitant radial fracture	1

Figure 1: Bado classification of Monteggia fractures and characteristics.

Material and method

We prospectively studied the clinical and radiographic outcomes for five children with a missed Monteggia fracture. The study group included three boys and two girls who had a mean age of ten years (range, four years to sixteen years) at the time of open reduction.

Each patient had been managed with open reduction of the radial head combined with a posterior bending elongation ulnar osteotomy and without annular ligament reconstruction. Clinical and radiographic outcomes were reviewed over a mean duration of follow-up of one year.

Case 1:

Figure 2: Missed Monteggia in 5 yr old girl

Figure 3: Elbow hyperextension

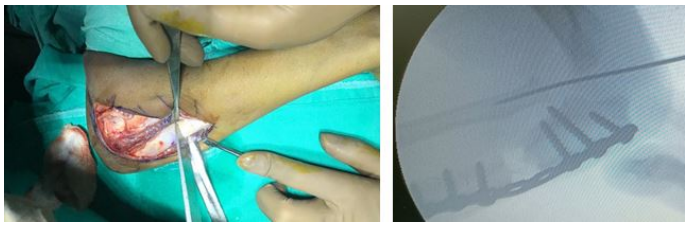

Figure 4 and 5: Intra operative pictures

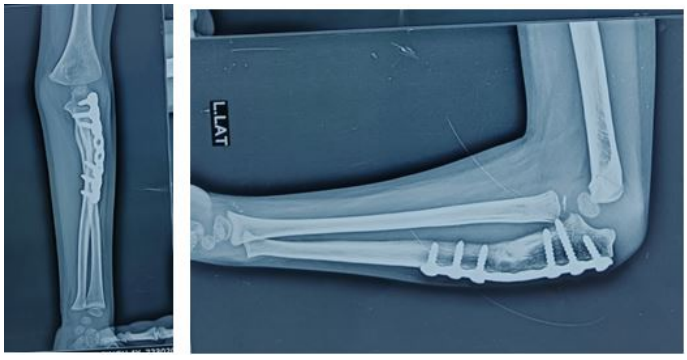

Figure 6 and 7: Follow up xray


Figure 8 and 9: Follow up clinical pictures

Case 2:

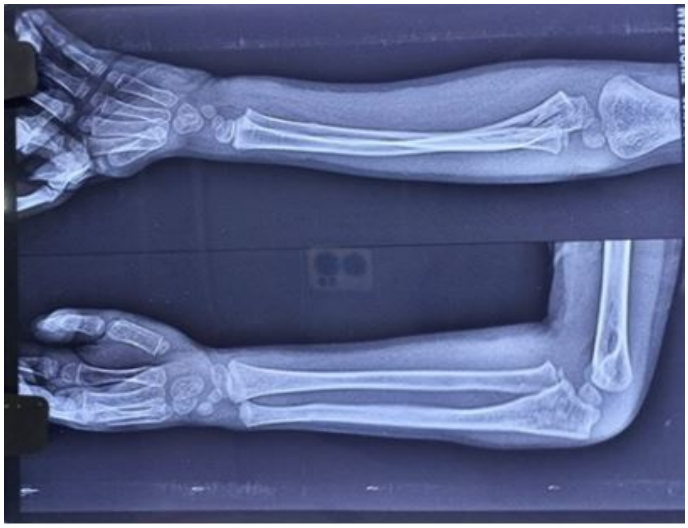

Figure 10: Pre op X-ray

Figure 11: Post op xray


Figure 12: Follow up of patient with nonunion and deformity



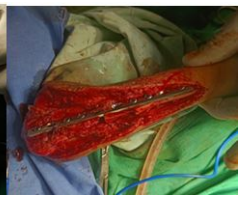

Figure 13, 14 and 15: Revision surgery of patient



Figure 16, 17 and 18: Follow up of patient

Results

The postoperative Mayo Elbow Performance Index at the time of follow-up ranged from 65 to 100, with three excellent, one good, one fair, and no poor results. The radial head remained in a completely reduced position in four patients and was subluxated in one patient at the time of the latest follow-up. Radiographically, there were four good, one fair, and no poor results. A good radiographic result was obtained in one of the patients who had undergone open reduction within three months after the injury or before the age of twelve years, whereas a fair result was obtained in one of the remaining four patients.

Disscussion

Monteggia's fracture-dislocation is rare in pediatric traumatology and pose a problem of elapsed time before management and of prognosis. Fracture dislocations are classified according to the Bado radiological classifications. For functional assessment, the choice of treatment was based on the type of fracture. The average age of our study population was 10 years; 3 cases of fractures were classified as Bado I and 2 cases as Bado III. At present, proximal ulnar osteotomy and open reduction of chronic radial head dislocation provides satisfactory functional outcomes because of anatomic alignment reconstruction(7). Park et al. (8) noted that the location of ulnar bow and its magnitude could likely determine whether osteotomy should be performed. Reduction of the radial head could be performed alone in patient whose maximum ulnar bow is less than 4 mm or whose ulnar bow lies in distal 40% of the ulna (9).

Di Gennaro et al. (10) reported that proximal one-third ulnar osteotomy presents significantly lower rate of nonunion than osteotomy of middle and distal ulna. However, in NMF patients with severe curvature of the ulna, osteotomy could be performed where the deformity is most obvious or based on the center of rotation angulation.

Internal or external fixation should be applied to stabilize the ulnar or to proceed further correction of the deformities.

Locking compression plate could guarantee adequate stability in younger patients with mild deformities, while the gap between two osteotomy sites often requires bone graft (11)

Bor et al. (12) reported four patients who were treated with closed reduction, proximal ulnar osteotomy, and Ilizarov external fixator received good clinical outcomes. Similar results were then reported by Take et al. (13) and Yuan et al. (14). Minimally invasive operation with external fixation allows gradual and spatial correction of the ulnar deformity to reduce the displaced radial head without invading the humeroradial joint, but long duration of wearing the frame could bring certain inconvenience to daily activities and needs higher compliance of the patients (12).

Open reduction of the radial head was employed by most studies. Gallone et al. (15) found no significant difference in the rate of recurrence of dislocation between close and open reduction of the radial head.

The repositioning and reconstruction of annular ligament should be taken into consideration in NMF patients because it stabilizes the radial head during forearm rotation and prevents redislocation (16).

In NMF cases with intact annular ligament, different studies reported improved elbow mobility and stability with or without reconstruction of the annular ligament (17, 18). Other studies suggested that the reconstruction of annular ligament could be avoided unless there was detectable rotational instability of the radial head after reduction intraoperatively (19).

Excessive angulation after osteotomy of the ulna could lead to re-dislocation of the radial head and requires a second surgery to enhance stability of the radiocapitellar joint. Besides, Bado III NMF was reported with higher rate of recurrence of radial head luxation, indicating that annular ligament repair is unavoidable (20).

Conclusion

Monteggia fractures become challenging if not noticed within 4 weeks after injury. Patients then require surgery to reduce the radial head and correct forearm deformities. Classification system should take dislocation of PRUJ in to consideration, which would direct management and prognosis. Also, detailed examinations, especially radiographs, should be taken when the surgeon deals with forearm trauma. Surgical intervention, including osteotomy and angulation of the ulna, reduction of the radial head, internal or external fixation and reconstruction of the stability of the PRUJ and radiocapitellar joint, could bring satisfactory outcomes to NMF patients, while site for osteotomy of the ulna, fixation method, and whether the annular ligament needs reconstruction varies from studies.

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Research Article
Functional outcome

Functional outcome of elastic nail fixation for Intertrochanteric fracture in medically high-risk elderly

Tirkey R[1], Vidyarthi A[2], Rajak CB[3*]

[1] R Tirkey, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India.
[2] A Vidyarthi, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India.
[3*] Chandra Babu Rajak, Department of Orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India.

Introduction: Intertrochanteric fractures in elderly population are major health problem. There are so many implants available to treat these fractures. We used enders nail for intertrochanteric fractures in medically compromised and high-risk patients.

Material and method: Twenty-seven patients of intertrochanteric fractures of femur were operated by condylocephalic ender's nail. We included elderly patient with age more than 60 year with high risk and medically compromised conditions. The clinical and radiographically assessment was done in all cases at 4-week, 6-week, 12 week and 6 months.

Results: Fracture healing was achieved in average 12.5 week (ranging from 10 week to 24 week). The mean Harris score was 82.

Conclusion: Our experience suggests that the chief indication of enders' nail fixation is in the treatment of intertrochanteric femur fracture in critically ill patient who cannot tolerate anaesthesia for an hour and more. Ender's nailing appears the least traumatic form of internal fixation.

Keywords: Intertrochanteric femur fractures, enders nailing, old patients

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Authors state no conflict of interest.	Non Funded.	The conducted research is not related to either human or animals use.	12.32	All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Introduction

Intertrochanteric femur fractures are major public health problem because their frequency and the associated complications in older patient. In this already fragile population, the aim of treatment is to achieve prior functional level with low rate of complications and mortality. [1], [2] Various devices have been used which usually require an incision in the upper thigh involving considerable soft tissue dissection and significant blood loss. [3],[4] In 1970, Enders described a method of treatment for intertrochanteric femur fracture using flexible condylocephalic intramedullary nail. Advantage claimed in this operation is less technical, minimal blood loss and low morbidity and mortality. [8] [15] [10] In this article we described our experience with ender's nail in intertrochanteric fracture in medically compromised and high-risk patient in the Neta ji Subhash Chandra Bose medical College Jabalpur.

Materials and methods

This prospective study includes 27 intertrochanteric fractures in medically compromised high risk elderly patient. Out of 27, 18 were stable and 9 were unstable fractures as per Evans classification. We included elderly patient with age more than 60 year with high risk and medically compromised. Presence of co-morbidities like 4 patients were having both diabetes mellitus and hypertension both. 9 patients were having ischemic heart disease with hypertension and Diabetes. 7 patients were having Chronic obstructive pulmonary disease with hypertension out of 3 also having diabetes mellitus.4 patients were having chronic renal failure with liver cirrhosis. Out of 3 having hypertension and 1 were having diabetes mellitus. 2 patients were having cerebrovascular disease. and 5 patients were having bedsore. Out of 27, 11 were female and 16 were male. All patient were walking except one hemiparetic patient who needed support to walk. The clinical and radiographically assessment was done in all cases at 4-week, 6-week, 12 week and 6 months.

Operative procedure – Under effect of anaesthesia the patient is put on fracture table in supine position with legs well abducted to allow the medial aspect of the knee. After draping reduction was achieved under c- arm. A nail of size was assessed pre operatively in normal limb from mid inguinal point to grater trochanter up-to adductor tubercle. Nail width was preoperatively assessed with more than 80 percent of isthmus under zero magnification x-ray. At diaphysio-metaphysial junction medial and lateral aspect of distal femur 1 cm skin incision was taken followed by entry was made with curved awl and enders nail was inserted firstly medial side enders nail was hammered up to cancellous bone of head followed by lateral side enders nail was also hammered in cancellous bone of femoral head and enders nail eye were locked using enders locking pins. And limb was kept in boot and bar brace to prevent rotation. Quadriceps strengthening exercises, knee mobilization and ankle pump were encouraged from the post operative day 1 with back care and chest physiotherapy was also encouraged.

Non wight bearing was advised for 6 weeks (non wight bearing toe touch with walker was permitted according to patient self-confident in post operative 4 week). Partial weight bearing was initiated after post op 6 week. it was gradually progressive to full weight bearing as per tolerance and absence of radiological evidence of collapse. Successive reviews were done at 12 week and 6 months during which rotation in flexion and extension, limb length discrepancy and knee range of motion were assessed.

Results

Patients were assessed at 4 week, 12 weeks and 6 months, out of 27 all were left the hospital in 12 – 15 days. The mean Harris score was 82. Out of 4 lost to follow up. bone healing was achieved in average 12.5 week (ranging from 10 week to 24 week) .

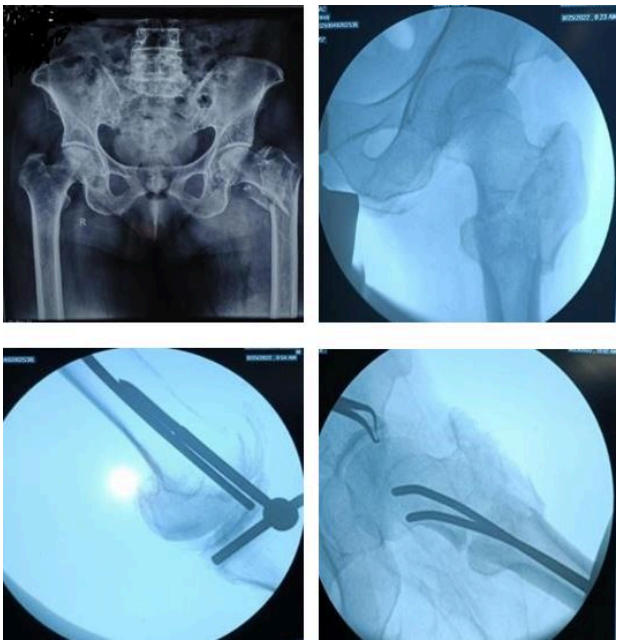

Figure 1: A, B, C and D, Pre op x-ray and intra operative image intensifier pictures

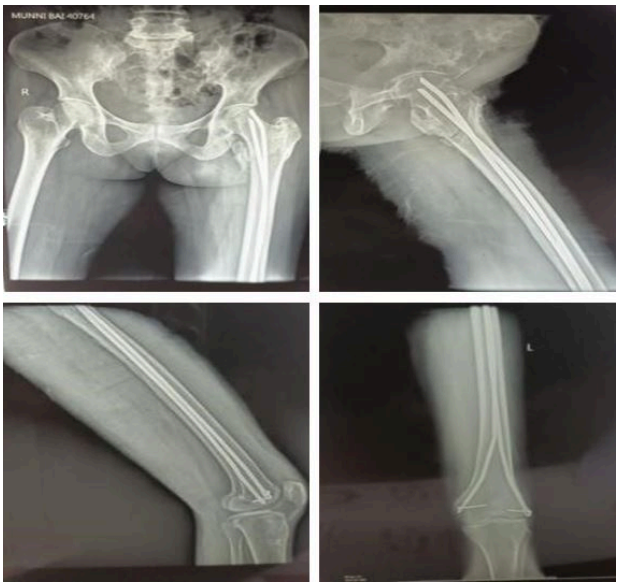

Figure 2: A, B, C and D, 4 week follow up X-ray showing healing of fracture without displacement.

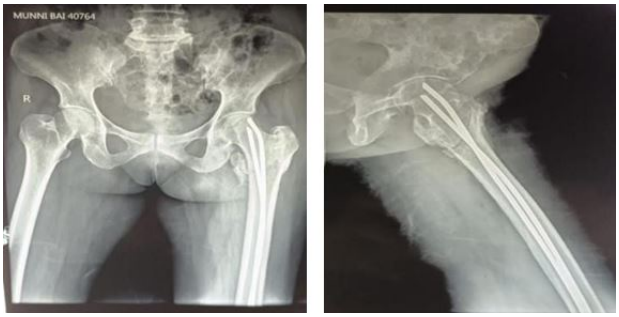

Figure 3: A and B At 6-month follow up, bone union achieved without displacement and shortening

Complications

Complications of enders nailing in 27 patients

Complications	No	Percentage
External rotation (15%)	4	17.3 %
Shortening (avg 1.5 cm)	5	21%
Varus deformity	2	8.6%
Migration proximal	1	4.3 %
Migration Distal	1	4.3%
Infection	Nil	0 %
Total with complication	12	56.3%

Table 1: Complications of the surgery

Discussion

The series of cases emphasised again the advantage of enders nailing in intertrochanteric fracture, the operative procedure is simple, short and associated with minimal soft tissue and blood loss, as a results morbidity and mortality are lower than the other methods. Biomechanically placement of enders' nails more medial than other devices that's why fatigue failure was rare. Due to flexibility of nail lead to micromovement at fracture site accounts for the absence of delayed union and non-union. [11], [13] [19] Knee pain accounts for 1/3rd of patient but it resolves spontaneously or after removal of implant. [16]

Conclusion

Our experience suggests that the chief indication of enders' nail fixation is in the treatment of critically ill patient who cannot tolerate anaesthesia for an hour and more. Even of proximal femoral nail and Dynamic hip screw with small incision causes bleeding and stress on physiology. enders nailing is the least traumatic form of internal fixation.

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Research Article
floating knee injuries

A case series on floating knee injuries with ipsilateral femur and tibia fracture

Singh V[1*], Gupta N[2], Nagdev S[3], Dwivedi VM[4]

[1*] Vivek Singh, Professor, Department of Orthopaedics, R D Gardi Medical College, Ujjain, Mp, India.
[2] N Gupta, Department of Orthopaedics, R D Gardi Medical College, Ujjain, Mp, India.
[3] S Nagdev, Department of Orthopaedics, R D Gardi Medical College, Ujjain, Mp, India.
[4] V M Dwivedi, Department of Orthopaedics, R D Gardi Medical College, Ujjain, Mp, India.

Background: The floating injuries occur due to high velocity trauma following motor vehicle accidents. Management of such complex injuries is a challenging task even in experienced hands as there are no standard treatment guidelines. All the patient were first stabilized initially by external fixator and subsequently taken up for definitive surgery. Early fixation and aggressive mobilization ensure fracture union and leads to fewer complications.

Material and method: In this study, 10 cases of fracture ipsilateral femur and tibia were operated in R.D. Gardi Medical College, Ujjain between February 2022 to February 2024 with the sequence of early fixation by application of external fixator on the day of admission, followed by delayed definitive surgery through ORIF with plate osteosynthesis or CRIF with intermedullary nail as needed according to the fracture. This study incorporates all fractures associated with floating knee viz, fracture shaft femur, fracture distal femur (intra/extra articular), fracture proximal tibia with diaphyseal extension and fracture shaft tibia, also includes compound, comminuted fractures.

Results: With the surgical management protocol followed by us, union was achieved in all the 10 cases. Post operative infections was observed in 1 patient out of 10 and knee stiffness was noted in about 3 patients. The present study had a minimum follow up of 6 months.

Conclusion: The surgical management protocol implemented yielded outstanding functional and radiological outcomes across all cases. Patients demonstrated a remarkable ability to resume their pre-injury functional activities and achieved full weight-bearing walking without assistance within six months post-surgery.

Keywords: floating knee injuries, ipsilateral femur and tibia fracture, polytrauma

Corresponding Author

Vivek Singh, Professor, Department of Orthopaedics, R D Gardi Medical College, Ujjain, Mp, India.
Email: drviveksingh29@rediffmail.com

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Authors state no conflict of interest.	Non Funded.	The conducted research is not related to either human or animals use.	13.21	All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Introduction

In 1975, Blake and McBryde introduced the term 'floating knee' to describe ipsilateral fractures of the femur and tibia. This combination of injuries transcends mere bone lesions, typically resulting from high-energy trauma in patients with multiple injuries and a multitude of other lesions. Following initial evaluation, patients should be stratified, with only stable individuals undergoing immediate reduction and internal fixation, while others may require external fixation. Definitive internal fixation of both bones consistently produces optimal outcomes across various series. When both fractures (femoral and tibial) are extra-articular, nailing of both bones represents the preferred fixation method. In cases involving articular fractures, plates emerge as the standard of care. A substantial portion, approximately 40%, of floating knees necessitate a combination of implants. Although associated ligamentous and meniscal lesions are common, they may be inconsequential in cases of intraarticular fractures, which typically carry the poorest prognosis for this type of injury. (1) Major lower limb injuries involve many or all components of lower limb architecture namely skin, soft tissue, osseous, vascular and neural element which makes for prompt and precise evaluation and management for optimizing functional outcome. In major lower limb trauma, often in polytrauma setting the important question is whether to salvage or amputate the injured limb. Unfortunately, data on this issue is often conflicting and confusing. For both cultural and practical reasons, patient prefers to retain their own limb even though deformed, provided it is painless and retains its function. Clinical examination is of paramount importance, such injuries are often associated with head injuries, chest or abdominal trauma, and other significant musculoskeletal trauma. Detailed examination is necessary to exclude associated injuries. While assessing the patient, aggressive resuscitation should be initiated preferably in operation theatre. As described by Blake, McBryde and Fraser classification, we have included all fracture patterns associated with floating knee with variable degree of comminution and compounding.

Fraser et al.(3) initially categorized floating knee injuries into three types: Type I, involving fractures of the femur and tibia shaft without involvement of the knee joint articular surface; Type II, where fractures extend into the knee joint. Type II was further divided into subtypes: Type IIa, involving tibial plateau; Type IIb, featuring an intercondylar fracture of the distal femur; and Type IIc, encompassing both tibial plateau and distal femur articular surface. This classification was recently revised by Ran to incorporate disruption of the extensor apparatus. According to Ran, Type I fractures are extra-articular, Type II are intra-articular, and Type III are accompanied by patella fractures (4)

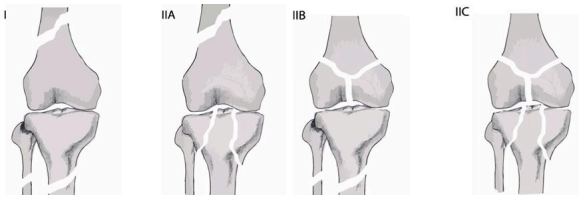

Figure 1: Fraser classification of floating knee11 Type I, IIA ,IIB, IIC

Material and method

This prospective interventional study includes patients admitted in Orthopedics dept, RDGMC, Ujjain, MP with a diagnosis of ipsilateral fracture of the femur and tibia, who were managed in a single first-level trauma centre between February 2022 and February 2024. 10 cases of fracture ipsilateral femur and tibia were taken into account. Inclusion criteria was patients diagnosed with a floating knee injury, patients with lower limb trauma, regardless of the mechanism or nature of the injury, patients with skeletal maturity, defined as those aged 15 years and above and patients managed surgically with a minimum follow-up period of 6 months. Exclusion criteria was patient with neurovascular injury, patients with any history of malignancy or pathologic fractures, patients whose follow-up was discontinued, patients with a history of metabolic or other types of bone diseases and patients with periprosthetic fractures.

All admitted patients underwent initial stabilization in the emergency unit. In cases of polytrauma, management followed the Advanced Trauma Life Support (ATLS) protocol. Comprehensive evaluations were conducted to rule out neurovascular and additional injuries. Initial injury stabilization was tailored to each patient's specific and general physiological condition. Perioperative planning relied on standard radiographic images and 3D CT scans. These imaging modalities were utilized for further fracture classification and surgical strategizing. Patients with open injuries classified according to the Gustilo-Anderson classification system underwent emergency debridement, sterile coverage, and external fixation of the fracture as part of damage control surgery/orthopedics (DCS) on the day of admission.

Patients with clean wounds were administered a first-generation cephalosporin (1 g ceftriaxone as the initial choice). For patients with contaminated wounds, an additional aminoglycoside (amikacin 500 mg) and metronidazole 500 mg were added. This antibiotic regimen was maintained for Gustilo type III open fractures. Prophylactic tetanus therapy was also administered to all patients presenting with open injuries. Patients in an unstable general condition and with closed fractures were either admitted to the trauma ward or the surgical intensive care unit (SICU) for intensive management. Those with suspected haemothorax or pneumothorax received chest drains for appropriate management.

Additionally, colour doppler was conducted before the procedure for every suspected patient of vascular injury. All patients eligible for surgical stabilization underwent either general or spinal anesthesia. The surgical approach, reduction technique, and implant selection were determined according to the fracture pattern and classification based on Fraser’s classification (2), as well as the patient’s physiological state upon presentation and the condition of the soft tissue. All surgical procedures were conducted when patients were hemodynamically stable. Patient with shaft femur fracture preferably treated with antegrade intermedullary nail whereas those with fracture distal femur (intra and extra articular) with plate osteosynthesis by distal femur locking plate.

In distal femur fracture associated with Hoffa's fracture, anteroposterior CC screw was additionally used along with plate. In majority of cases, anterolateral approach (swash buckler) was preferred and in some patient with medial condyle comminution, medial buttress plate was also used by medial approach. For tibia fracture, proximal tibia with diaphyseal extension were treated with plate osteosynthesis by locking hockey plate and majority cases were operated by anterolateral approach. Medial plate was also used in case of severe comminution. However, all diaphyseal tibial fractures were managed by intermedullary nail. In instances of severe soft tissue compromise, external fixation was the preferred method for definitive fixation. The postoperative protocol encompassed temporary immobilization, infection prophylaxis, and meticulous wound dressing to facilitate proper wound and soft tissue healing. Patients with significant soft tissue defects underwent skin grafts or flap surgery as deemed necessary.

Rehabilitation, including physiotherapy, commenced once proper wound healing was attained, typically between 10 to 21 days following surgery. Patients were encouraged to achieve full range of motion (ROM) in both hip and knee joints, incorporating isometric exercises for quadriceps and isotonic exercises for hamstrings, as tolerated. Non-weight-bearing ambulation using crutches was permitted for six weeks, provided the contralateral limb was unaffected, followed by a transition to partial weight-bearing. Full weight-bearing was only permitted after clinical and radiological union had been confirmed. Active ROM exercises were delayed for some patients who underwent knee-spanning external fixation.

On average, patients attained full weight bearing after four weeks for extra-articular fractures and eight to ten weeks for intra-articular fractures. The discharge of patients from the hospital was primarily based on the patient's general clinical condition, while the hospital length of stay (LOS) was influenced by the severity of the initial trauma.

Upon discharge, patients were scheduled for postoperative follow-up appointments at the outpatient orthopedic clinic at two weeks, one month, and once every three months for one year, followed by yearly appointments thereafter. Routine follow-up examinations included radiographic assessments (anteroposterior, lateral, and oblique views) of the injured segments and evaluations of functional outcomes using the Karlstrom and Olerud grading system (fig. 2)

Criterion	Excellent	Good	Acceptable	Poor
Subjective symptoms from thigh or leg	None	Intermittent slight symptoms	More severe symptom, impairing function	Considerable function impairment: pain at rest
Subjective symptoms from knee or ankle joint	None	Same as above	Same as above	Same as above
Walking ability	Unimpaired	Same as above	Walking distance restricted	Uses cane, crutch or other support
Work and sports	Same as before the accident	Given up some sport; work same as before accident	Change to less strenuous work	Permanent disability
Angulation, rotational deformity or both	0	<10°	10-20°	>20°
Shortening	0	<1 cm	1-3 cm	>3 cm
Restricted joint mobility	0	<10° at ankle; <20°	10 -20° - at ankle; 20-40°	>20° at ankle; >40°

Figure 2: the Karlstrom and Olerud grading system

Postoperative complications were documented and classified as either early, including wound infection and septic shock, or late, such as knee stiffness, nonunion and nerve palsy. All clinical and functional outcomes were assessed on 6 months follow up.

Case 1

Figure 3: Images A, B and C - Preoperative radiographs (A , B) showing AP and Lateral view comminuted fracture distal femur with intercondyle extension . (C) showing fracture distal 1/3rd shaft tibia & fibula.

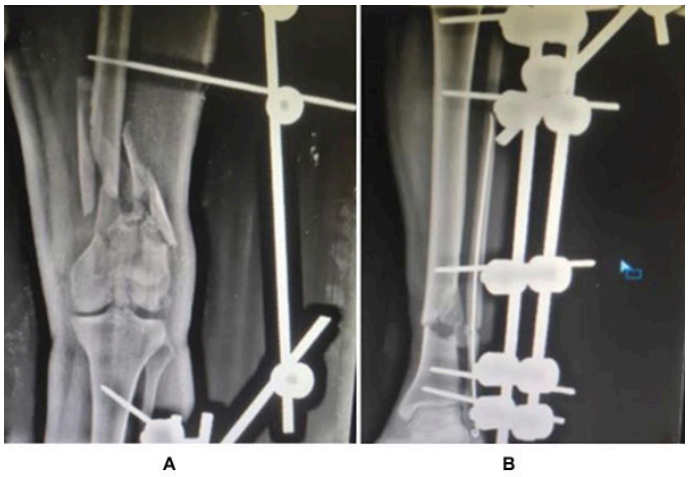

Figure 4: Post-operative radiographs showing Knee spanning external fixator which is extended upto distal tibia.

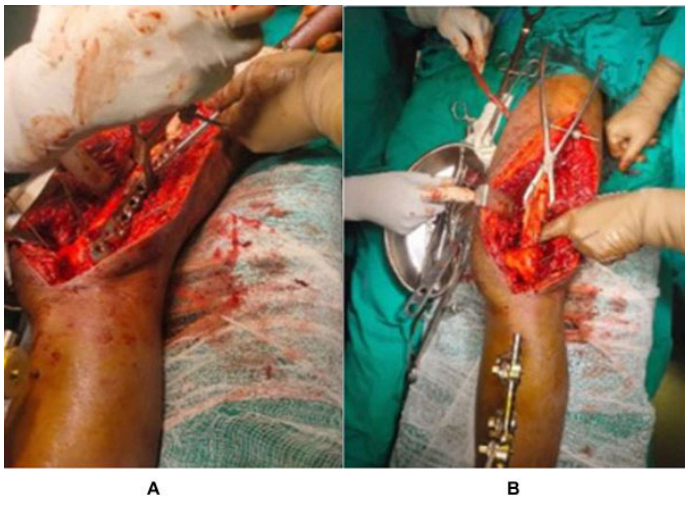

Figure 5: (A) and (B) – intraoperative pictures of distal femur fixation by anterloateral approach (Swash buckler)

Figure 6: A, B, C and D– Showing immediate postoperative radiographs (A,B) – Distal femur plate osteosynthesis with distal femur locking plate and anteroposterior screw for hoffas fracture. (C, D)- Tibia interlock nailing and fibula rush nail.

Figure 7: A, B, C and D – 3 months post operative radiographs of a case showing significant callus formation at distal femur fracture.

Figure 8: A and B. Three months follow up showing active and passive knee range of motion.

Case 2:

Figure 9: Images- A &B– preoperative radiographs showing fracture distal femur with intercondylar extension, communited patella fracture and segmental communited fracture of proximal 1/3 rd and distal 1/3rd shaft tibia with intraarticular extension to ankle joint and distal 1/3rd fibula fracture.

Patients demographics (Masterchart)

Data compilation of 10 cases included in the study . Abbreviations used :

MOI- Mechanism of injury , SOI- Site of injury, OA/OTA- Arbeitsgemeinschaft für Osteosynthesefragen/Orthopedic Trauma Association, FE- Femur, TI- Tibia, LOS – Length of stay, IM- Intramedullary, NA- Not applicable, RTA- Road Traffic Accident, FFH-Fall from hight, HO- Heavy object injury

Table 1: Patients demography

CASE	AGE	GENDER	MOI	SOI	FRASER CLASS	OA /OTA CLASS FE	OA /OTA CLASS TI	GUSTILO CLASS TI	ASSOCIATED INJURY TI	MANAGEMENT DONE FE	MANAGEMENT DONE TI	COMPLICATIONS TI	KARLSTORM OLERUD SCORE	LOS (days)SCORE
1.	17	MALE	RTA	Left	II B	33C	42C2+	NA	Comminuted fracture	Plate	Plate		good	25
						3.1	43C2		patella ,medial					
									malleolus fracture .					
2.	30	MALE	RTA	Left	II B	33C	42B2	FE -I	NONE	Plate	Nail		good	22
						2.2		TI -II						
3.	42	MALE	FFH	Right	I	32C2	42C2	TI -I	NONE	Nail	Nail		Excellant	18
4.	46	MALE	RTA	LEFT	IIA	33C2	42C2	FE -II	Ipsilateral patella	Antegrade	Plate		Excellant	23
									fracture .	nailing				
5.	51	MALE	HO	Right	IIC	33C3	41C2	FE -II	Medial malleolar	Plate	Plate	Knee stiffness	Poor	17
								TI -II	fracture (ipsilateral)					
6.	25	MALE	RTA	LEFT	IIA	32C2	41C1	NA	None	Plate	Plate	Knee stiffness	Acceptable	22
7.	67	FEMALE	FFH	Right	I	32A2	42A1	FE -I	Ipsilateral multiple	Antegrade	Antegrade	None	excellant	25
								TI -I	rib fracture	IM nail	IM nail			
8.	33	MALE	RTA	Right	I	32B2	42A1	TI -III A	Ipsilateral shaft	Plate	IM Nail	Wound infection	good	39
									radius fracture					
9.	58	FEMALE	FFH	Left	II A	32	41C1	NA	Ipsilateral calcaneum	Antegrade	Plate	DVT small	Excellent	31
						Al			fracture	nail		sephanous vein		
10.	19	MALE	RTA	Right	I	32B2	41A3	NA	Bilateral clavicle and multiple rib fracture	nail Antegrade	Antegrade nail	None	Excellent	24

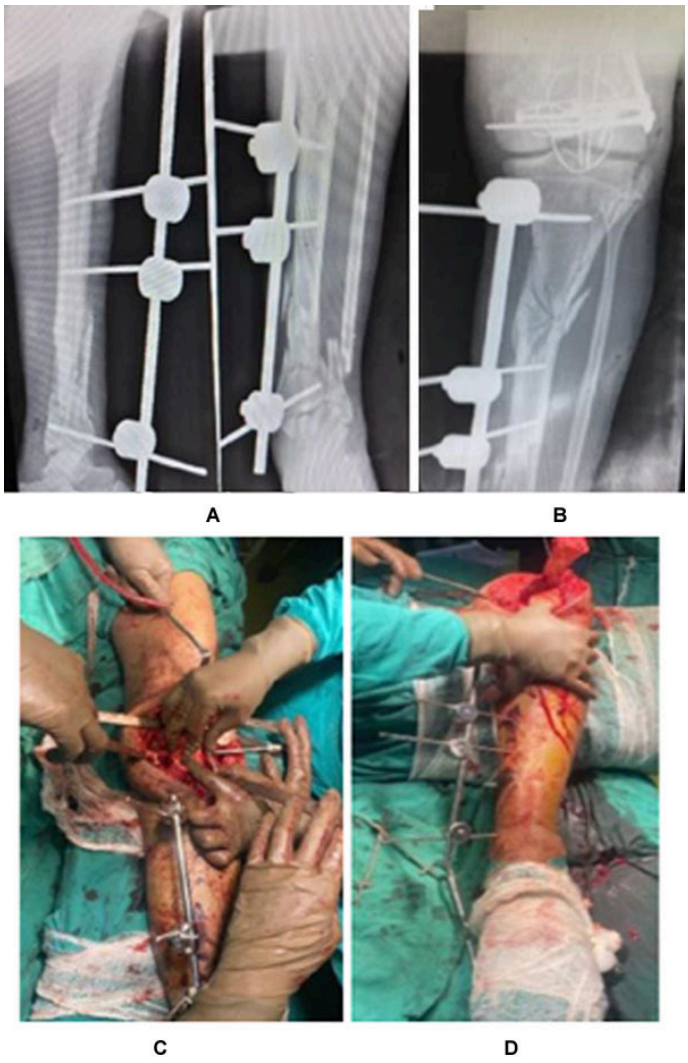

Figure 10: (A,B) showing immediate post external fixation, uniplanar fixator applied for tibial fracture seen in above radiograph.(C,D) intraoperative pictures showing distal femur plating and patellar TBW with encirclage.

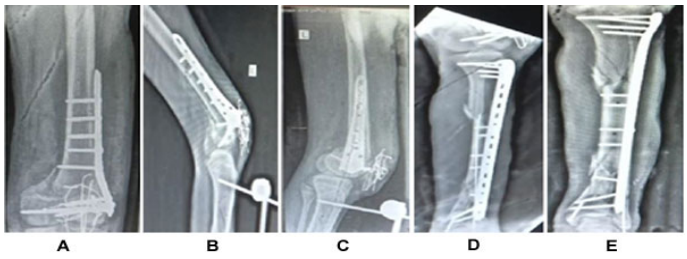

Figure 11: showing immediate postoperative radiographs. (A,B,C) – showing distal femur fracture fixation with distal femur locking plate with patellar TBW and encirclage. (D,E) showing tibial fracture fixation with long hockey plate done by minimally invasive percutaneous plate osteosynthesis (Mippo technique) and medial malleolus fracture fixed with CC screw , fibula fracture fixation done by 2.5 mm rush nail.

Figure 12: A, B, C and D- Three months follow up- xray

Figure 13: A, B and C- Follow up pictures of patient

Results

In the present study, a comprehensive analysis of the available data yielded several key findings. The mean age of the cases was 38 years, with a range from 17 to 67 years. Out of the 10 cases examined, 8 were males and 2 were females. Fractures were distributed evenly between the left and right lower extremities, with 5 cases on each side. The majority of cases (60%) resulted from road traffic accidents, while 30% were attributed to falls from altitude, and 10% were caused by heavy objects.

Regarding treatment, both intramedullary nails and plates were utilized for femoral and tibial fractures, with each method employed in 5 cases. Concomitant injuries were observed in 7 cases, adding complexity to the management approach. Notably, 50% of tibial fractures and 40% of femoral fractures were classified as open, with Gustilo type II being the most common subtype in both cases. Evaluation at the 6-month follow-up revealed promising outcomes, with 80% of cases achieving excellent to good results according to the Karlström–Olerud scoring system. However, 10% of cases demonstrated acceptable results, while 10% exhibited fair to poor outcomes, underscoring the challenges inherent in managing these complex injuries.

Discussion

The prognostic indicators in floating knee cases encompass associated injuries and the type of fracture, whether it's open, intra-articular, or comminuted. Achieving a favourable final outcome necessitates the proper management of associated injuries, employment of external fixation, intramedullary nailing for both fractures, plate osteosynthesis and combination of implants. Notably, optimal results were attained when both fractures underwent intramedullary nailing, facilitating an earlier return to normal activity levels compared to alternative treatment approaches. Many surgeons regard the type of fracture (open, intra-articular, comminuted) and the severity grade of soft tissue and associated injuries as crucial prognostic indicators for both initial and final outcomes in patients with floating knee injuries. These factors represent significant risks for unfavourable outcomes in such cases. Through multivariate analysis, certain studies have identified intra-articular involvement of the knee joint as a significant contributing factor affecting the final outcome of floating knee injuries. Within these variables, the Fraser type plays a pivotal role in determining the ultimate result, with knee involvement considered the most influential factor. Some studies have shown poorer outcomes when one or both fractures involve the joint compared to cases where both fractures are diaphyseal. According to the Blake and McBryde classification, type I cases tend to have better outcomes, whereas type II cases typically exhibit comparatively poorer outcomes, likely due to articular injury and knee stiffness following prolonged protection.

In a study by Rethnam et al., 29 patients with floating knee injuries were managed over a 3-year period. The mechanism of injury was RTA in 27 patients. There were 38 associated injuries.

Twenty patients had intramedullary (IM) nailing for both fractures. The complications were knee stiffness, foot drop, delayed union of tibia, and superficial infection. The mean age of the study group was 28 years (18-56). The right side was involved in 19 and left side in 10 patients. There were 20 Type 1, 3 Type 2A, and 6 Type 2B floating knee injuries according to the Fraser classification. Results of this study showed that the frequency of injured men was higher than in females and the most common cause of injury was vehicle accidents. It was also shown that almost half of the patients were in the age group of 20-29. (8)

Dwyer showed that the middle third of the shaft of both femur and tibia was most commonly (75%) involved, as in other reports. Concomitant injuries were common and were observed in 40 of the 60 patients, and delayed mobilization in all of them. A higher percentage (27%) of patients underwent amputations compared with the maximum of 25% in other studies (5). The reported incidence of open fractures is consistently high, 57% to as high as 81%. The most common pattern is an open tibial and closed femoral fracture. The obviously deformed and bruised limb is easily distracting. Associated trauma to the head, chest, abdomen, pelvis, and long bones of contralateral extremity is common. The reported rate of such injuries may be as high as 89%, highlighting violence involved. (6) In largest series reported till date by Kao et al., 110 (26%) patients had head injury, 37 (8.8%) had pelvis fracture, and 230 (55%) had contralateral serious extremity injury. Surprisingly, incidence of vascular injury is reportedly low (7). Paul et al. reported (29%) vascular injuries in their series of 21 patients (9). This high rate was, however, not shared in larger studies. Kao et al. in fact, did not comment on vascular insult in their report on 419 patients. (7) Most of injuries to head, chest, and abdomen were life threatening. Adamson et al., in their study, encountered 71% major associated injuries with 21% vascular injuries. The reported mortality rate ranged from 5% to 15%, reflecting seriousness of associated injuries. (10)

Piétu et al., in a retrospective analysis of 172 cases according to the Fraser classification, reported that 71.5% of the cases were type I and the repartition of the type II in the three subgroups was as follow: II A 8.2%, II B 11.6%, and II C 8.7%. At least one of the fractures was open in 69.2% of the patients. The average Injury Severity Score (ISS) was 19.5. The polytraumatized patients (ISS over 18) represented 37.7% of cases. The surgical procedure started within 6 first hours in 62% of injured people. The Intramedullary nailing was preferred method at femur site (73%, 126 cases), tibia Intramedullary nailing was performed in 54.4% of cases, and external fixation was used in one in every four patients. (11)

In a study by Abalo et al. on 43 patients with floating knee injuries, results showed that there were 32 males and 11 females with a mean age of 37 years. All patients had sustained their injuries in motor vehicle accidents. According to Fraser's classification, there were 21 type I, 10 type IIa, 7 type IIb, and 5 type IIc. The complications encountered were 1 case of fat embolism, 8 cases of knee stiffness, 10 cases of delayed union, 9 cases of infections, and 7 cases of nonunion. (12)

In our study, an in-depth examination of the data revealed significant findings. The average age of the individuals under review was 38 years, ranging from 17 to 67 years. Among the 10 cases analyzed, 8 were male and 2 were female. Fractures were equally distributed between the left and right lower extremities, with 5 cases observed on each side. Predominantly, road traffic accidents accounted for 60% of the cases, followed by falls from altitude contributing to 30%, and heavy object-related incidents representing 10% of the cases. Among the 10 patients, 4 (40%) were classified as Fraser type I, while 3 (30%) were categorized as type IIA. Additionally, 2 patients (20%) fell into the type IIb category, and 1 patient (10%) was identified as type IIC. (13)

In terms of treatment, both intramedullary nails and plates were employed for addressing femoral and tibial fractures, with an equal distribution of each method observed across 5 cases. The presence of concomitant injuries complicated the management strategy in 7 cases. Noteworthy findings include 50% of tibial fractures and 40% of femoral fractures being classified as open, with Gustilo type II being the predominant subtype in both instances. Our study observations revealed that fractures treated with interlock nails demonstrated favorable postoperative knee range of motion and early weight-bearing capability. Conversely, fractures managed with plate osteosynthesis were associated with prolonged pain, knee stiffness, delayed weight bearing, and an elevated risk of infection due to prolonged intraoperative durations. Patients treated with a combination of implants exhibited superior functional outcomes compared to those managed solely with plate osteosynthesis for both fractures.

Evaluation conducted at the 6-month follow-up indicated promising outcomes, with 80% of cases achieving excellent to good results based on the Karlström–Olerud scoring system. However, 10% of cases demonstrated acceptable results, while another 10% exhibited fair to poor outcomes, highlighting the inherent challenges associated with managing such complex injuries.

Conclusion

The floating knee presents as a complex injury extending beyond mere ipsilateral fractures of the femur and tibia. Prognostic indicators for both initial assessment and final outcomes include associated injuries and the type of fracture, Our experience underscores the persistent high rate of complications associated with the floating knee, regardless of the treatment modality employed. Surgeons should prioritize complication reduction in managing this injury. We advocate for an initial assessment of patients to identify potential life-threatening injuries, followed by prompt surgical fixation of both fractures, preferably utilizing external fixation in emergency settings. Additionally, attention should be given to addressing soft tissue injuries. Internal fixation, thorough evaluation of knee ligaments for associated injuries, and rigorous postoperative rehabilitation are essential components for achieving favorable functional outcomes. Adherence to meticulous management protocols is paramount throughout the treatment process.

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Research Article
Anterior cruciate ligament

Lateral Extra articular Tenodesis (L.E.T.) to control Anterolateral instability associated with ACL (Anterior cruciate ligament) deficient knees– A Novel study

Dubey A[1*]

[1*] Ashish Dubey, Peetambara hospital 29, Nehru colony, Gwalior, Madhya Pradesh, India.

Introduction: Chronic ACL laxity, in particular Rotational laxity associated with an explosive pivot shift test, has being tend to cause combined damage to ACL and Anterolateral structures of knee. We, hereby present a study of adding a LET procedure to such Anterolateral Rotational instability.

Material and methods: We operated 8 cases (All males) with complete ACL tear with Anterolateral instability (7 patients with Grade 2 Pivot shift test,1 with Chronic ACL injury) from May 2020 to October 2021.We did primary ACL reconstruction in all knees, with adding LET procedure (Modified Lemaire's technique).

Results: All patients were followed up for period of 6 months to 1 year (Average 8.6 months). A pre & Postoperative outcome scores were assessed by Lachman test, Pivot shift test (-ve in all, in post-op follow-up), Lysholm score (mean 90.75, %,) and Tegner score (average Gr 4).

Conclusion: After this study we can conclude that adding a LET procedure (Modified Lemaire's technique) to an ACL deficient knee with Anterolateral instability (like explosive Pivot shift test), is beneficial as not only it reduces the Anterolateral instability but also, greatly reduces the risk of Graft Failure.

Keywords: LET procedure, Anterolateral instability, ACL reconstruction

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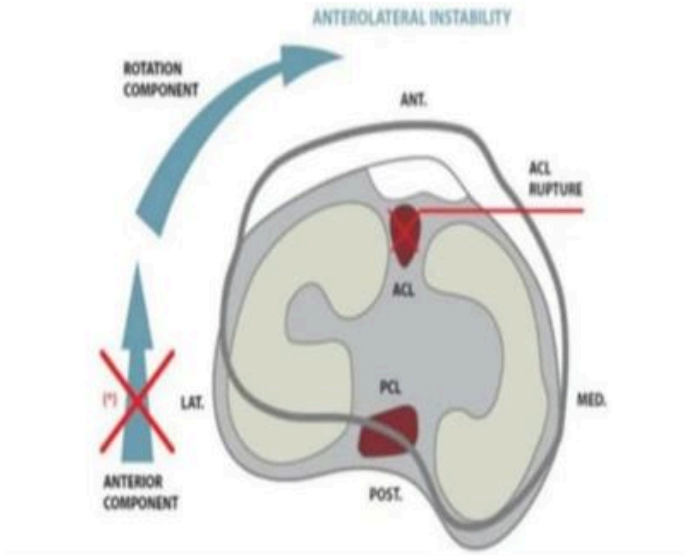
Authors state no conflict of interest.	Non Funded.	The conducted research is not related to either human or animals use.	15.36	All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Introduction

Chronic ACL laxity & in particular rotational laxity associated with an explosive positive pivot shift test, has been associated to combined damaged to ACL and Antero or posterolateral structure of the knee. We hereby provide a study of adding a LET procedure to ACL reconstruction associated with anterolateral rotational instability. Long term results are good for ACL reconstruction, however 0.7 to 20% present with recurrent instability due to graft failure. Overall revision rate is as close to 8 to 40%.

Antero Lateral Ligament is the ligament responsible for rotational instability. Diagnosis of ALL tear is done by clinically by Grade 2/3 pivot shift with marked rotational instability. Radiologically by X-ray picture. MRI is best in T2 Coronal image.

LET procedure is also called as lateral plasty. Can be defined as, any lateral – extraarticular procedure which will control anterolateral laxity and contribute to decrease pivot shift after a rupture of ACL.



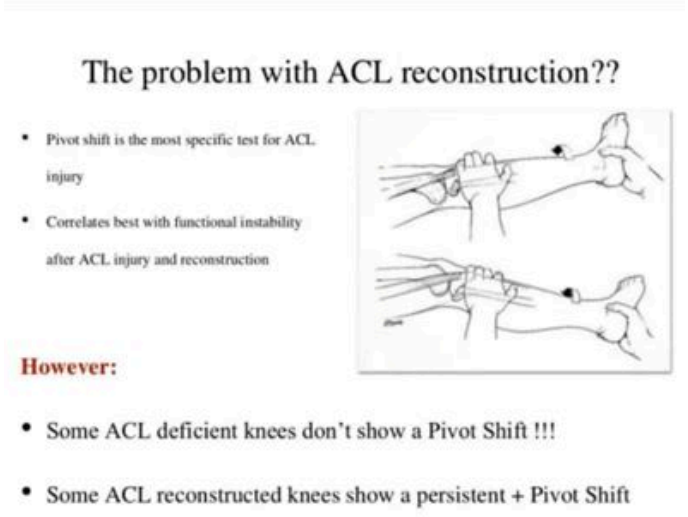


Figure: 1 and 2 Anatomical and clinical presentation of Pivot shift test

Figure: 3 and 4 Anatomy of ALL

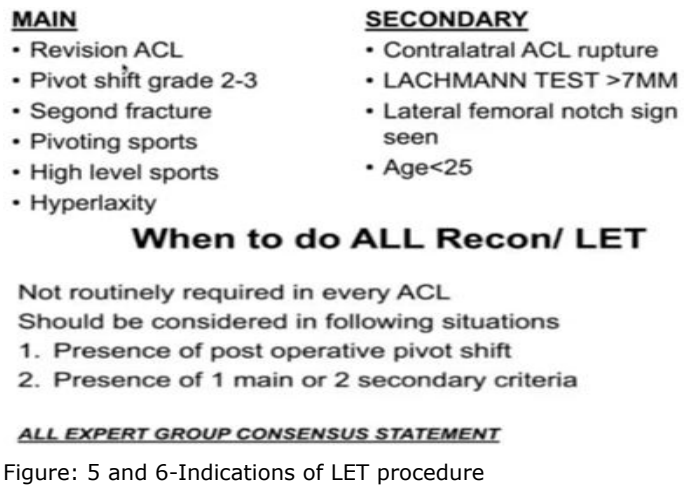


Figure: 5 and 6-Indications of LET procedure

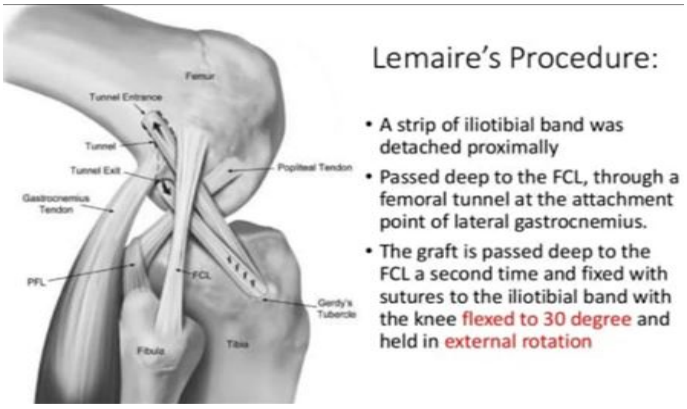


Figure: 7 Lemaire's procedure

Various surgical procedures have been devised since 1967, when Lemaire described it first. They used either ITB, PTB grafts, ST & / or gracilis graft. Other known techniques are Macintosh procedure (3), Losee technique (4), Arnol & coker (5), Wilsen & Scraton (1979)

(They all used IT band), Andrew procedure, Muller Procedure, Benam procedure (They used Lateral ½ of PTB) and Zamns & Rowe technique (They used semitendinosus). Most accepted is modified Lemaire procedure, which is also the present method of choice.

Material and method

We operated 8 patients (All males) with ACL tear associated with anterolateral instability from May 2020 to Oct 2021, with ACL reconstruction with LET procedure (with modified Lemaire's procedure). Mean age of patient was (26.25 Years). 7 patients were chosen for LET because of explosive Pivot shift test. All patient undergone standard AP & Lateral view X-rays and MRI Scans. All patients had undergone ACL reconstructions with LET, by modified Leamire,s procedure. All patients were operated under spinal anesthesia with knees hanging down and, in all patients, tourniquet was used. In all patients, pre-operatively Lachman's & pivot shift tests done to assess instability, after giving spinal anaesthesia.

All patients had undergone routine Arthroscopic ACL reconstruction, all with hamstring graft. In all patients, LET procedure (modified Lemaire's procedure) was added afterwards. After inflating tourniquet, an incision was made at the lateral aspect of knee, from the lateral epicondyle towards Gerdy's tubercle. The iliotibial band was exposed and a 10x1 CM strip was excised from the middle of the iliotibial band, living its distal end attached to Gerdy's tubercle. The free end of the graft was whipstitched with high strength braided suture, then the graft was rerouted by a curved clamp deep to the LCL. Now attention was paid for fixation of graft proximally by clearing the lateral epicondyle so as to attach the graft, just proximal and anterior to lateral epicondyle.

The graft was fixed with knee in 30° flexion and foot in neutral rotation, with giving slight tension on graft so as not to over constrain the joint. The graft was fixed proximally at the above-mentioned point, with the help of a staple. The iliotibial band was sutured in to place. The subcutaneous tissue and skin was closed in layers by absorbable sutures. Post operative management is done as standard protocols as of ACL reconstruction were followed. Isometric exercises for Quadriceps and SLRT were started immediately. Knee immobilized in full extension for three weeks. ROM was limited to 0-90° till 3 weeks and then full flexion was allowed. Patients were mobilized with cruthes and weight bearing was minimal as tolerated, for 3 weeks.

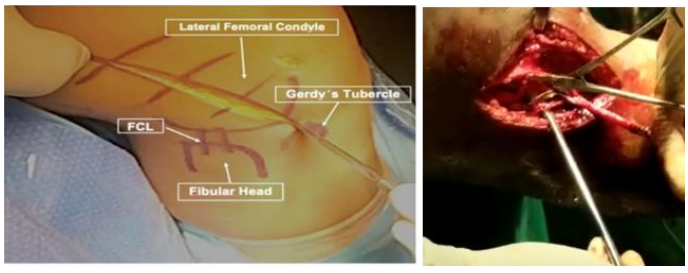


Figure: 8 and 9 Incision and dissection

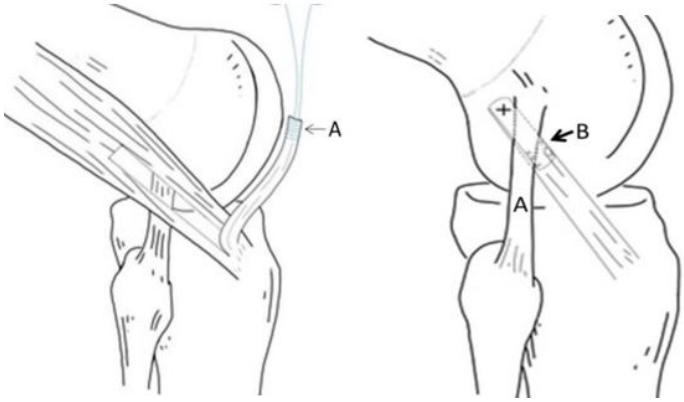


Figure: 10 and 11 Diagrammatic presentation of LET procedure

Table 1- Age, sex and duration of follow up of patient

S. No	Age	Sex	Duration of follow-up
1	30	M	12 Months
2	26	M	6 Months
3	28	M	8 Months
4	22	M	8 Months
5	31	M	7 Months
6	25	M	10 Months
7	26	M	10 Months
8	22	M	8 Months

Table 2- ACL reconstruction technique and graft type

S.No	ACL Reconstruction technique	Graft Type
1	Anatomical (Anteromedial portal)	Hamstring
2	Anatomical (Anteromedial portal)	Peroneus longus
3	Anatomical (Anteromedial portal)	Hamstring
4	Anatomical (Anteromedial portal)	Hamstring
5	Anatomical (Anteromedial portal)	Hamstring
6	Anatomical (Anteromedial portal)	Hamstring
7	Anatomical (Anteromedial portal)	Hamstring
8	Anatomical (Anteromedial portal)	Hamstring

Table 3- Different tests for ACL injury

S. No	Pivot shift Gr 2/3	Segond's fracture	Pivoting sport	Hyperlaxity	Others
1	+Gr2	-	-	-	-
2	-	-	+	-	Chronic ACL Injury
3	+Gr2	-	-	-	Contusion of lateral condyle (MRI)
4	+Gr2	-	-	-	Age <25 years
5	+Gr2	-	-	-	Contusion of lateral condyle (MRI)
6	+Gr2	-	-	-	Contusion of lateral condyle (MRI)
7	+Gr2	-	-	-	Age <25 years
8	+Gr2	-	-	-	-

Table 4- Different scores after surgery

S.No	Lachman Test		Pivot Shift		Lysholm Score	Tagners Socre
	Pre-Op	Post-Op	Pre-Op	Post-Op (6 M - 1Y)	(Post Op)	
1	1+	1	2	-ve	95	5
2	2	1+	2	-ve	85	4
3	1+	1	2	-ve	91	4
4	1+	1	2	-ve	89	4
5	1+	1	2	-ve	94	4
6	1+	1	2	-ve	92	4
7	1+	1	2	-ve	90	4
8	1+	1	2	-ve	90	4
				Average	90.75	


Figure: 12 and 13 Clinical follow up of patient

Results

All patients were followed for 6 months to 1 year (average 8.6 Months). Pre & Post operative outcome score were assessed including Lachman and pivot shift test, Lysholm score and Tegner score. No patients had any signs of infection or neuro vascular injury. No patients had any over constrained joints. Till one year follow-up, there was a significant improvement in Lachman & pivot shift test. The follow-up is still continuing to assess the return to pre injury level.

Discussion

When performed in addition to an ACL reconstruction, LET procedure has been demonstrated to significantly reduce anterior tibial translation and anterolateral instability in addition to reducing the force, experienced by the graft, when an anteriorly directed load applied. Getting an over constraint knee is one disadvantage with this procedure but a limited tension may reduce it. However, with added LET procedure, the risk of graft failure is definitely reduced. To date, there are limited outcome data for patients undergoing combined LET with ACL reconstruction. Marcacei et al (6) reported at 10-to-30-year follow-up with mean lysholm score 97.3, ours were 90.75% with mean follow-up of 8.6 months. In comparison to a study of isolated LET procedure by Romy Deviandri (14) in four patients, post op assessment of all patients was 1+ Lachman, -ve, pivot shift and tegner score of pre injury level (4) with average lysholm score of 82% (almost similar to our observations).

Conclusion

Since we have a smaller number of patients and our follow-up is of shorter duration, still we can conclude, it is always beneficial to combine LET procedure with ACL deficient knee Who present with signs of anterolateral instability (like explosive pivot shit) as it will reduce anterior tibial translation and anterolateral instability and will also reduce the risk of graft failure.

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Case Report
Monteggia fracture

Hume fracture- Monteggia fracture variance- A case report

Singh V[1*]

[1*] Vivek Singh, Professor, Department of Orthopaedics, R D Gardi Medical College, Ujjain, Mp, India.

Background: The Hume fracture is an injury to elbow consist of fracture of the olecranon with associated anterior dislocation of the radial head which occurs in children. It's a variance of Monteggia fracture.

Material and method: We hereby presenting a rare case of Hume fracture in a 9-year-old girl treated by open reduction and internal fixation by tension band wiring and olecranon shortening.

Results: At 5 months follow up patient is having 90 degree of flexion and 120 degrees of extension from completely extended elbow.

Conclusion: Hume fracture is a rare variance of chronic Monteggia fracture dislocation. Results are good, if treated properly.

Keywords: Hume Fracture, Monteggia fracture Variance, ORIF with TBW

Corresponding Author

Vivek Singh, Professor, Department of Orthopaedics, R D Gardi Medical College, Ujjain, Mp, India.
Email: drviveksingh29@rediffmail.com

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Authors state no conflict of interest.	Non Funded.	The conducted research is not related to either human or animals use.	13.25	All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Introduction

The Hume fracture is an injury of the elbow comprising a fracture of the olecranon with an associated anterior dislocation of the radial head which occurs in children. It was originally described as an undisplaced olecranon fracture, [1] but more recently includes displaced fractures and can be considered a variant of the Monteggia fracture.[2] The injury was described in 1957 by A.C. Hume of the orthopaedic surgery department of St. Bartholomew's Hospital, Rochester. [1]

Although the precise mechanism of injury is unclear, the injury occurs in children who have fallen heavily with their arm trapped under the body. In his original description of the injury, Hume suggested that the injury occurred as a result of hyperextension of the elbow leading to fracture of the olecranon, with pronation of the forearm leading to the radial head dislocation.[1]

In the original description by Hume, where the olecranon fractures were not displaced, treatment consisted of closed reduction of the radial head dislocation under general anaesthesia by supination of the forearm. This was followed by immobilisation of the arm in a plaster cast with the elbow flexed at 90° and the forearm in supination for 6 weeks.[1]

Where the olecranon fracture is displaced, open reduction internal fixation is recommended. Once the olecranon has been repaired, closed reduction of the radial head dislocation is usually possible. This is followed by immobilisation with the elbow flexed to 90° and the forearm in the neutral position. The duration of immobilisation depends on clinical assessment of the joint, and mobilisation may be possible after as little as 4 weeks.[2]

Case report

A 9 years old female presented in our opd with history of trauma due to fall in home 1 month back, with complain of pain and swelling in right elbow with completely extended right elbow and no flexion in elbow for 1 month. Patient was treated by conservatively elsewhere. On examination patient is having tenderness, swelling and completely extended right elbow with no movement at elbow. Diagnosis was Hume fracture-malunited Monteggia Fracture variance, right elbow.

Preoperative profile, x-ray and CT scan of elbow is done and patient is operated by posterior trans-olecranon approach. Olecranon shortening is done by freshened the fracture ends and tension band wiring of olecranon is done. Physiotherapy of elbow started from third post operative day. Patient was followed up regularly. Tension band wiring is removed after five months of surgery because wires are protruding from skin. At 5 months follow up patient is having 90 degree of flexion and 120 degrees of extension from completely extended elbow.

Figure 1: A, B, C, D- Preoperative X-ray and CT scan of patient

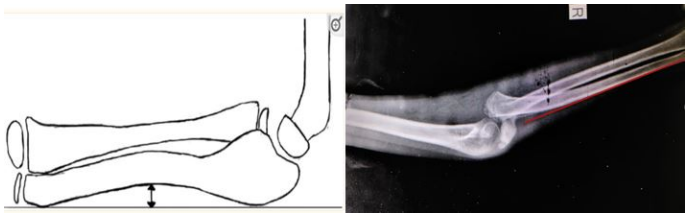

Figure 2: A-The ulnar bow sign- a dorsal line is drawn from olecranon to the distal edge of the ulna on a lateral view, more than 1 mm gap indicates a curvature in the ulna, B- Ulnar bow sign was absent in our case.

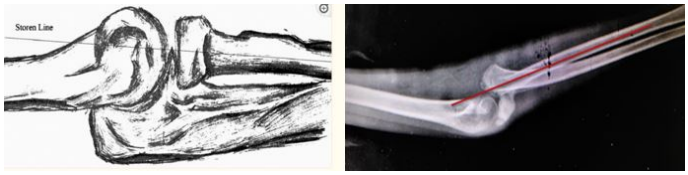

Figure 3: A- Soren line- the axis of radius normally travels through the center of humeral capitellum, in lateral view. B- It was passing anterior to capitellum in our case.

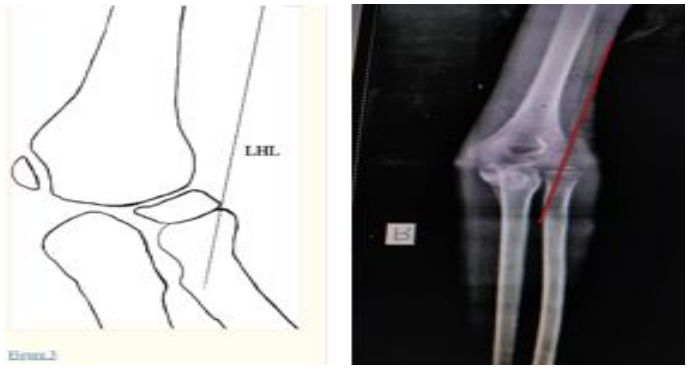

Figure 4: A- The lateral humeral line along the lateral margin of humeral lateral condyle and is parallel to the axis of distal humeral shaft on AP view.

Normally, the LHL is parallel to the radial neck cortex simultaneously. B- In our case, it is not parallel to the radial neck.

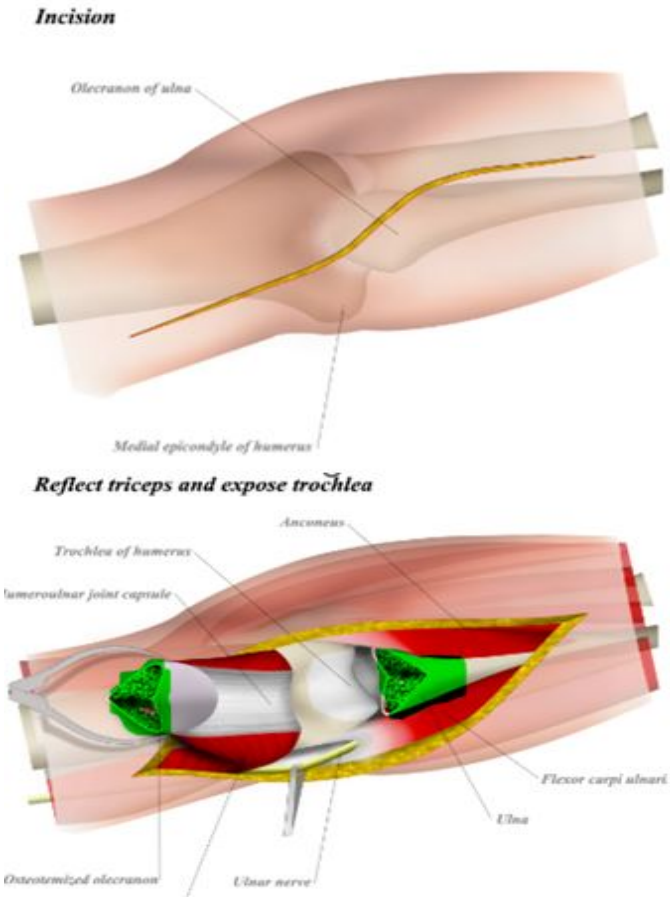

Figure 5: Operative procedure- A- Posterior trans-olecranon approach, B- Shortening of olecranon

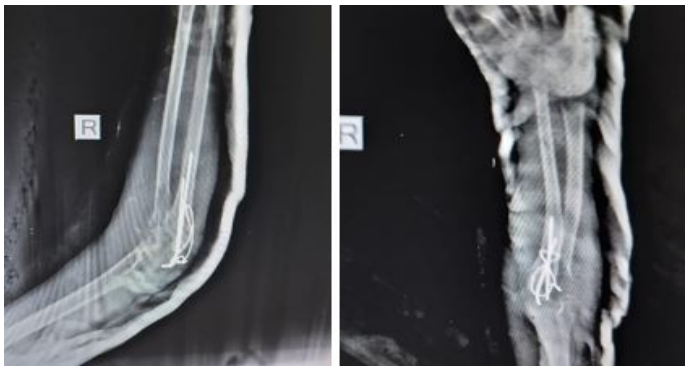

Figure 6: A and B- Post operative Xray, Lateral and AP view

Figure 7: A, B, C- Post op clinical picture and physiotherapy

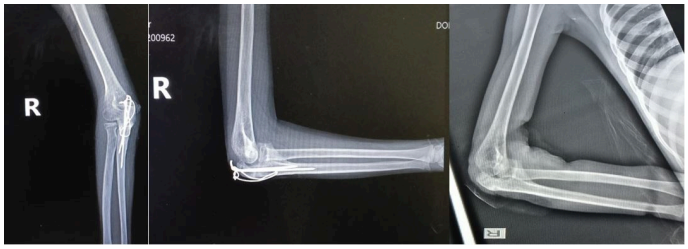

Figure 8: A and B Follow up xray at 4 months, C- After implant removal at 5 months

Figure 9: Final follow up at 5 months

Conclusion

Hume fracture is a rare variance of chronic Monteggia fracture dislocation. Results are good, if treated properly. If the olecranon fracture is displaced, open reduction internal fixation is recommended. Once the olecranon has been repaired, closed reduction of the radial head dislocation is usually possible.

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