Medicon Medical Sciences
Volume 8 Issue 3 March 2025
Article Type: Case Series
ISSN: 2972-2721

Ilizarov Hip Reconstruction in Treatment of Unstable Hips in Young Adults - A Case Series

Reddy Lakshmana Sai*

Department of Orthopaedic Surgery, Maulana Azad Medical College, New Delhi, Delhi, India

***Corresponding Author:** Reddy Lakshmana Sai, Department of Orthopaedic Surgery, Maulana Azad Medical College, New Delhi, Delhi, India.

Received: February 05, 2025; **Published:** March 05, 2025

Abstract

Hip joint instability in young adults presents a significant orthopedic challenge, often arising from conditions like trauma, septic arthritis, developmental dysplasia, or other childhood hip pathologies. The condition is characterized by pain, limb length discrepancy, Trendelenburg gait, and functional limitations. Treatment aims to restore hip stability, alleviate pain, and correct associated deformities. Conventional approaches such as hip arthrodesis or total hip arthroplasty (THA) have limitations, including loss of range of motion, back pain, or the need for revision surgeries in younger patients.

This study explores the efficacy of Ilizarov hip reconstruction combined with pelvic support osteotomy as an alternative for addressing unstable hips in young adults. The technique includes proximal femoral valgus osteotomy and distal femoral osteotomy for limb length equalization, mechanical axis realignment, and improved hip biomechanics. Two patients with hip instability secondary to septic arthritis underwent this procedure. Preoperative planning included radiological assessments for osteotomy site determination and deformity correction using software-guided SUV systems. Postoperative evaluation involved radiographic follow-ups and assessment of mechanical axis alignment, limb length discrepancy, and functional outcomes.

The results demonstrated significant improvements in limb length, mechanical axis alignment, and Modified Harris Hip Scores, along with elimination of Trendelenburg gait. Complications, including pin site infections and mild residual discrepancies, were effectively managed. Compared to THA, this approach showed reduced revision rates, better biomechanical restoration, and enhanced functional outcomes in young patients.

Ilizarov hip reconstruction emerges as a viable option for managing unstable hips in young adults, providing effective correction of deformities and improved long-term functionality.

Keywords: unstable hips; ilizarov; hip reconstruction; young adults

Introduction

Hip joint instability in young adults is one of the challenging orthopedic problems encountered in clinical practice. It occurs mostly as a result of trauma, septic arthritis, tubercular arthritis, osteomyelitis of hip, developmental dysplasia of hip. The main aim of the treatment is to achieve functional stability at the hip joint with alleviation of pain [1].

The clinical features include pain at the hip joint, hip instability, limb length discrepancy, trendlenberg gait due to absence of femoral head and proximal migration of femur. Infection of hip joint in early childhood/infancy could lead to premature closure of triradiate cartilage, acetabular dysplasia, premature or asymmetric closure of femoral capital epiphysis, necrosis of articular cartilage, osteone-

crosis of femoral head, pseudoarthrosis of femoral neck and complete destruction of femoral head [2]. The pathology leads to chronic excessive pain and further locomotor dysfunction. Pathology also leads to strain on muscles and fibrous tissues, pelvic tilt, increased lumbar lordosis and overload over secondary socket [3]. Treatment options include hip arthrodesis but it leads to loss of range of motion, pain in contralateral hip, back pain. Total hip arthroplasty is a good option in recent times but the disadvantages include increased risk of revision surgery, increased strain leading to eventual loosening of implant [4].

Reconstructive procedures such as pelvic support osteotomy where proximal femur valgus osteotomy is done which places proximal part of femur along the lateral wall of pelvis helps in improved hip biomechanics and increased efficiency of abductor muscles. However, optimal amount of angulation is difficult to achieve and it also doesn't address the problem of limb length discrepancy. other reconstructive procedures include trochanteric arthroplasty, pelvic osteotomy and femoral osteotomy.

The use of ilizarov along with pelvic support osteotomy addressed the problem of limb length discrepancy and excessive knee valgus. Ilizarov added a distal femoral osteotomy for realignment of mechanical axis along with limb length equalization. He also made an emphasis on importance of extension along with valgus at proximal femur osteotomy [5]. Other indications include femoral neck psuedoarthrosis and traumatic hip dislocation with hip instability untreatable by open reduction or hip arthroplasty. Contraindications include age below 12 years where there increased chance of remodelling leading to loss of pelvic support even though addressed in the previous surgery [1].

Materials and Methods

Total of 2 patients were operated using ilizarov hip reconstruction who were diagnosed to be cases of hip instability secondary to septic arthritis hip. Patients were classified based on classification system of Hunka Et al and were found to be of type 4 & 5 [6]. Clinical assessment and appropriate radiological investigations were performed. Clinical assessment included physical examination, gait analysis and a modified harris hip score. Assessment of any deformity, examination of contralateral hip and spine were also done.

Software guided SUV system is used for mechanical axis realignment at proximal and distal femoral osteotomy sites. Patient is allowed to bear weight after removal of SUV for proximal femur osteotomy correction to avoid hardware problems. Distraction is started from day 7 after mechanical axis correction at rate of 1mm/day (divided 4 times per day).

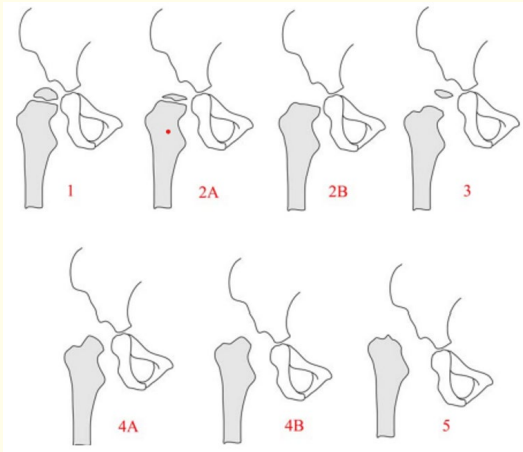


Figure 1: Hunka et al classification.

Patients were readmitted after one month for SUV guided correction of varus at distal femoral osteotomy after completion of distraction. Patients were followed up monthly on OPD basis. Physical examination and fresh radiographs were done on each visit. Scannogram was done preoperatively and after removal of ilizarov for assessment of correction.

Preoperative Planning

Standard AP radiograph of pelvis taken with a single leg stance on either limb. An AP radiograph of with affected limb in maximal adduction is taken with patient lying supine and limb adducted, flexed over the contralateral hip. Proximal migration is calculated as the distance between the lines joining sacroiliac joints and greater trochanters on both the sides [7].

Pelvic mechanical axis angle is taken as the angle between horizontal pelvic line and line extending proximally from centre of knee joint and ankle joint. On weight bearing the limb becomes slightly adducted so as to bring knee joint line parallel to ground and pelvis drops on the contralateral side which serves as reference for pelvic support osteotomy. The amount of valgus correction needed at proximal femur osteotomy site is sum of adduction contracture and maximum adduction plus an over correction of 15 degrees to compensate for atrophy of soft tissues between proximal femur lateral wall of pelvis [8].

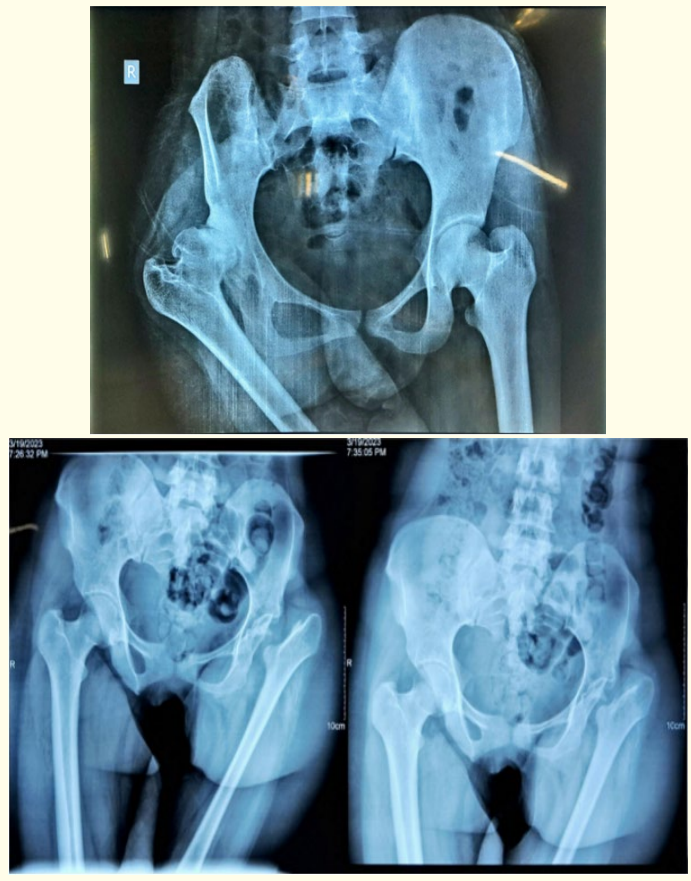


Figure 2 & 3: Pre operative images taken in maximum abduction.

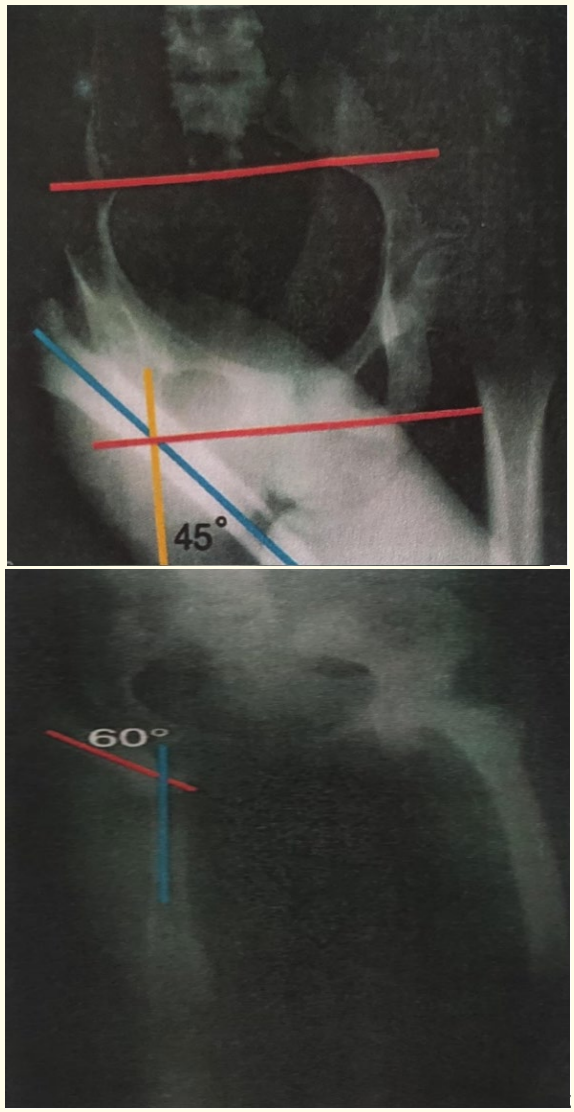


Figure 4 & 5: Demonstrating pre operative planning as described in paley's textbook.

limb length discrepancy is measured by scannogram i.e AP radiograph of pelvis with both lower limbs. It also helps in determining any abnormality in femur and tibia apart from coronal plane deformity at hip joint.

Surgical Planning and Procedure

The components of ilizarov hip reconstruction include a proximal femoral osteotomy for valgus and extension along with distal femoral osteotomy for lengthening and realignment. The level of proximal osteotomy is determined by AP pelvis radiograph in maximum adduction. The level of osteotomy is where femoral shaft crosses ischium [9]. The amount of valgus and extension at proximal osteotomy site is determined by adding 15 degrees to the maximal adduction at hip to compensate for fatigue of abductor muscles and fixed flexion contracture at hip respectively. Intraoperatively amount of internal rotation is decided to compensate for external rotation that occurs with adduction at hip [10].

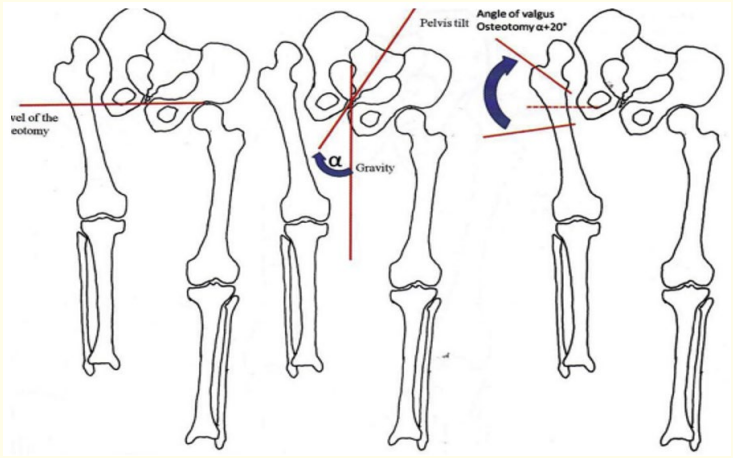


Figure 6 & 7: Angle needed for correction and site of osteotomy.

ilizarov added a distal femoral osteotomy for hip reconstruction in addition proximal femur subtrochanteric pelvic support osteotomy to compensate for valgus angulation, lengthening and allows derotation. The level of osteotomy is determined by the point where the perpendicular line from horizontal line of pelvis extending through the apex of valgus angulation and the mechanical axis of tibia extending proximally intersect. The amount of varus angulation is determined by proximal valgus angulation and is equal to angle made between the lines made to decide osteotomy site [11].

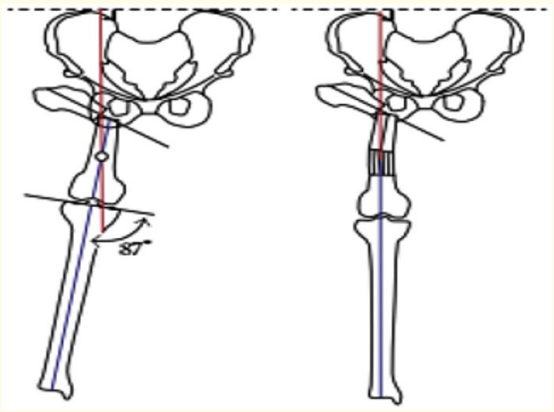
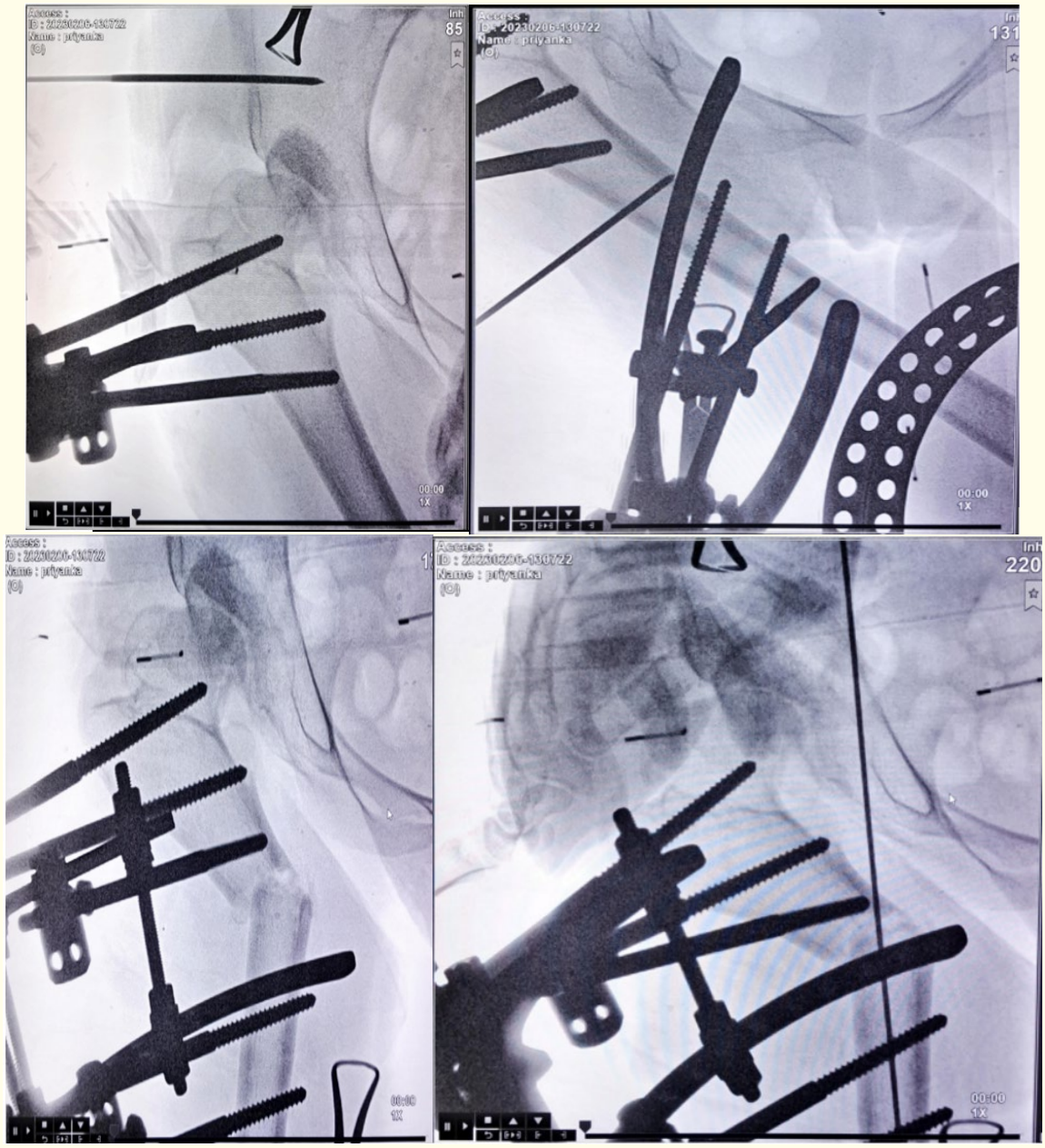


Figure 8

Patient is positioned supine on OT table followed by cleaning and draping under aseptic conditions. Hip is maximally adducted and flexed to the contralateral side and site of proximal osteotomy is determined under c arm guidance at level of femur crossing ischium. A pelvic arch is used for holding proximal fragment with 3 drop pins spanning appropriately. Hydroxyapatite pins are used for better hold and to prevent infections. A 5/8 ring is used for middle fragment. Distal fragment is held using 2 full ilizarov rings fixed by olive wires and drop pins. Osteotomy is performed as per planning under c arm guidance with an 4.8 mm drill bit and osteotome. Frame is then connected using connecting rods, hinges and conical washers [12].



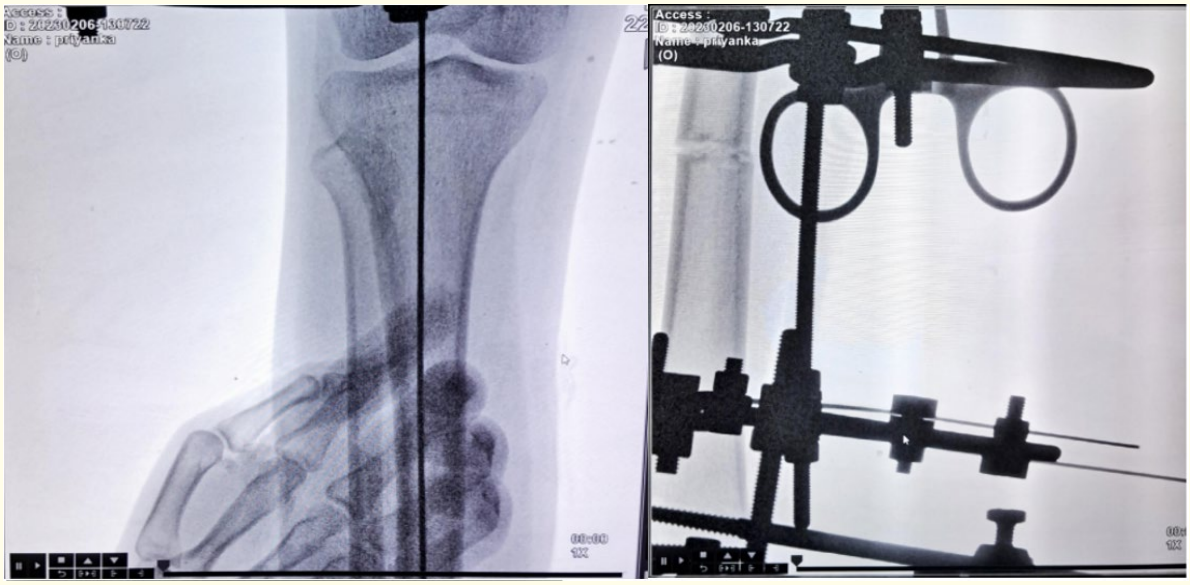


Figure 9 & 10: Intra operative images.

Post Operative Evaluation

Patient is started on appropriate antibiotics postoperatively. Full weight bearing is started along with physiotherapy from day one. SUV is used for any further valgus correction. Appropriate pin site care is also started. Distraction is started at the distal osteotomy site for lengthening.

Patient is assessed with radiograph on subsequent OPD visits. Varus correction at distal osteotomy site is done after addressing limb length discrepancy with the help of SUV . lengthening is continued with the horizontal axis of pelvis is parallel to ground. Rate of distraction should be about 1mm per day.

Mechanical axis is also assessed postoperatively with standing radiographs. Any misalignment is addressed by manipulating the external fixator. Followup is done by radiographs every 4 weeks on OPD basis. Fixator is removed when there is full consolidation at proximal and distal osteotomy sites along with alignment of mechanical axis. Removal of fixator is done in minor OT under sterile conditions and physiotherapy is continued till maximal function is achieved.

Complications

The most common complication encountered is pin site infection. It is addressed with local gentamicin injection and antibiotics. Knee stiffness and residual limb length discrepancies were also noted. irregular distraction at distal femoral site is noticed in a patient which lead to difficulty in varus correction.

Results

Advances in arthroplasty causes more accurate restoration of biomechanics and reduced limb length discrepancy to less than 2cm (lai et al). however in young adults less than 30 years of age there is increased risk of complications in patients undergone arthroplasty procedures as described by Giard et al. four factors which decide the risk of revision are hard on soft wearings, younger age of replacement, one or more previos surgeries and atleast one dislocation after primary THA. Increased rates of revision and complications

associated with young THR imples the necessity of alternative for treatment of unstable hips in young adults [13].

Ilizarov hip reconstruction along with pelvic support osteotomy provides a better alternative for unstable hips. It helps in addressing limb length discrepancy and gait disturbances. Mechanical axis alignment is done with soft ware guided SUV achieves accurate results. It has fewer rate of complications along with better alignment of mechanical axis.

Improvement in modified harris hip score along with elimination of trendlenberg gait were also monitored.ilizarov hip reconstruction in comparison to total hip arthroplasty has decreased need for revison surgery, increased range of motion allowing better perineal hygiene and ability to squat [14].

Discussion

Hip joint instability in young adults, particularly as a sequela of septic arthritis or congenital anomalies, poses significant challenges in orthopedic management. The primary objectives in treating such cases are to achieve functional stability, alleviate chronic pain, and address associated deformities such as limb length discrepancy, Trendelenburg gait, and mechanical axis misalignment. This study explores the application of Ilizarov hip reconstruction combined with pelvic support osteotomy as a solution to these complex issues.

The results of this study demonstrated the effectiveness of Ilizarov hip reconstruction in restoring functional stability and addressing the biomechanical challenges of hip instability. The addition of pelvic support osteotomy to the Ilizarov technique allowed for improved abductor muscle efficiency and correction of proximal femoral migration, thereby eliminating Trendelenburg gait. Furthermore, the inclusion of distal femoral osteotomy facilitated mechanical axis realignment and limb length equalization, critical for achieving normal gait and reducing strain on adjacent joints.

Advantages Over Conventional Techniques

Conventional treatments such as hip arthrodesis and total hip arthroplasty (THA) have significant drawbacks in young adults. Hip arthrodesis, while providing stability, results in loss of hip motion and secondary complications such as contralateral hip and back pain. THA, on the other hand, is associated with a high risk of implant loosening, wear-related complications, and frequent revision surgeries, particularly in younger patients with high activity levels. This study highlights that Ilizarov hip reconstruction provides a viable alternative with fewer long-term complications, improved biomechanical outcomes, and greater preservation of hip function.

Role of Software-Guided SUV System

The use of a software-guided SUV system for mechanical axis realignment proved to be a significant advancement in achieving accurate and reproducible outcomes. By allowing precise corrections at both proximal and distal osteotomy sites, the system minimized the risk of residual deformities and complications such as irregular distraction or misalignment. This represents an improvement over traditional methods, where intraoperative judgment often played a larger role in determining correction angles.

Challenges and Complications

Despite the advantages, the procedure is not without its challenges. Pin site infections were the most common complication observed, underscoring the need for stringent postoperative pin care protocols. Knee stiffness and minor residual limb length discrepancies were also reported, though these were manageable with targeted physiotherapy and further adjustments using the external fixator. Additionally, the learning curve associated with the Ilizarov technique and the SUV system may limit widespread adoption in centers with limited expertise.

Functional Outcomes

The functional outcomes of this approach were particularly encouraging. Patients demonstrated significant improvements in the Modified Harris Hip Score, indicative of reduced pain, improved mobility, and enhanced quality of life. The ability to squat and main-

tain perineal hygiene, often compromised in THA patients, was preserved, making this technique especially suitable for young, active individuals.

Future Implications

The study highlights the potential of Ilizarov hip reconstruction as a definitive treatment for unstable hips in young adults. Long-term studies with larger patient cohorts are needed to validate these findings and compare them directly with contemporary THA outcomes. Further refinement of the SUV system and integration of advanced imaging modalities could enhance precision and reduce the incidence of complications.

Conclusion

Ilizarov hip reconstruction with pelvic support osteotomy offers a promising alternative for treating hip instability in young adults, addressing both functional and biomechanical challenges. By providing a stable, functional hip joint with minimal risk of revision surgery, this technique paves the way for improved long-term outcomes in a demographic where conventional treatments often fall short.

References

1. Umer M., et al. "Hip reconstruction osteotomy by Ilizarov method as a salvage option for abnormal hip joints". InHip Preservation Techniques. CRC Press (2019): 147-154.
2. Betz RR., et al. "Late sequelae of septic arthritis of the hip in infancy and childhood". J Pediatr Orthop 10 (1990): 365-72.
3. Aksoy MC and Musdal Y. "Subtrochanteric valgus-extension osteotomy for neglected congenital dislocation of the hip in young adults". Acta Orthopaedica Belgica 66.2 (2000): 181-6.
4. Choi IH., et al. "Sequelae and reconstruction after septic arthritis of the hip in infants". JBJS 72.8 (1990): 1150-65.
5. Ilizarov GA and Samchukov ML. "Reconstruction of the femur by the Ilizarov method in the treatment of arthrosis deformans of the hip joint". Ortopediia travmatologiia i protezirovanie 6 (1988): 10-3.
6. Hunka L., et al. "Classification and surgical management of the severe sequelae of septic hips in children". Clinical Orthopaedics and Related Research (1976-2007) 171 (1982): 30-6.
7. Paley D., et al. "Deformity planning for frontal and sagittal plane corrective osteotomies". Orthopedic Clinics of North America 25.3 (1994): 425-66.
8. Paley D. "Principles of deformity correction". New York: Springer (2002): 689-94
9. SL Weinstein and IV Ponseti. "Congenital dislocation of the hip". Springfield, IL: Thomas; 1951. Palliative procedures (1951): 289-30
10. Aksoy MC and Musdal Y. "Subtrochanteric valgus-extension osteotomy for neglected congenital dislocation of the hip in young adults". Acta Orthopaedica Belgica 66.2 (2000): 181-6.
11. S Robert Rozbruch., et al. "Ilizarov Hip Reconstruction for the Late Sequelae of Infantile Hip Infection". J Bone Joint Surg Am 87.5 (2005): 1007-18.
12. Paley D., et al. "Deformity planning for frontal and sagittal plane corrective osteotomies". Orthop Clin North Am 25 (1994): 425-65.
13. Paavilainen T, Hoikka V and Paavolainen P. "Cementless total hip arthroplasty for congenitally dislocated or dysplastic hips: technique for replacement with a straight femoral component". Clinical Orthopaedics and Related Research® 297 (1993): 71-81.
14. Kocaoglu M., et al. "The Ilizarov hip reconstruction osteotomy for hip dislocation". Acta Orthopaedica Scandinavica 73.4 (2002): 432-8.

Volume 8 Issue 3 March 2025