Section: Orthopaedics

Original Research Article

EFFECTIVENESS OF MODIFIED STOPPA APPROACH WITH ILIOINGUINAL APPROACH FOR ACETABULAR FRACTURES: A PROSPECTIVE OBSERVATIONAL STUDY

G Ravi[1], V Kiran Rao[2], P Agnesh[3]

[1]Associate Professor, Department of Orthopaedics, Gandhi Medical College and Hospital, Hyderabad, Telangana, India.
[2]Associate Professor, Department of Orthopaedics, Government Medical College and Hospital, Nizamabad, Telangana, India.
[3]Associate Professor, Department of Orthopaedics, Government Medical College and Hospital, Medak, Telangana, India.

Received : 05/04/2025
Received in revised form : 25/05/2025
Accepted : 14/06/2025

Keywords:
Acetabular fracture, Modified Stoppa approach, Ilioinguinal approach, Harris Hip Score, Matta's criteria, Quadrilateral plate, Surgical fixation.

Corresponding Author:
Dr. P Agnesh,
Email: agneshpooner@gmail.com

DOI: 10.47009/jamp.2025.7.3.148

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (3); 763-767

ABSTRACT

Background: Acetabular fractures are complex injuries with significant functional consequences. Surgical fixation remains the cornerstone for restoring hip joint stability and congruity. Traditional approaches such as the ilioinguinal approach offer good exposure but carry limitations for certain fracture patterns. The modified Stoppa approach has emerged as a valuable alternative or adjunct for enhanced visualization of the quadrilateral plate and medial structures. **Aim:** To evaluate the functional and radiological outcomes of acetabular fractures treated using the modified Stoppa approach alone or in combination with the ilioinguinal approach. **Materials and Methods:** This prospective observational study was conducted at the Department of Orthopaedics, Gandhi Medical College & Hospital, Secunderabad, Telangana, over a period of 17 months (August 2023 to December 2024). A total of 25 patients with acetabular fractures were treated using either the modified Stoppa approach alone or in combination with the ilioinguinal approach. Functional outcomes were assessed using the Harris Hip Score, while radiological outcomes were evaluated using Matta's criteria. Patients were followed for a minimum of 6 months postoperatively. The data were analyzed using appropriate statistical tests. **Results:** Among 25 patients, 21 were male and 4 were female, with a mean age of 39.32 years. The majority of injuries resulted from road traffic accidents. The most common fracture pattern was both column fractures (36%). The mean duration of surgery was 135 minutes. According to Matta's radiological grading, anatomical reduction was achieved in 64% of patients. At final follow-up, Harris Hip Scores were excellent in 44% of cases, good in 32%, fair in 16%, and poor in 8% of cases. The most common complication encountered was superficial wound infection (12%). **Conclusion:** The modified Stoppa approach, with or without the ilioinguinal approach, provides excellent to good functional and radiological outcomes in acetabular fractures. The approach offers better visualization of the quadrilateral plate, allows stable fixation, and reduces surgical morbidity when performed meticulously.

INTRODUCTION

The acetabulum forms a critical component of the hip joint, functioning as the socket for the femoral head and bearing the stresses of weight transmission through the lower limb. Fractures of the acetabulum, although relatively uncommon, present considerable complexity in both diagnosis and management due to the intricate anatomy of the pelvic ring and the involvement of weight-bearing articular surfaces.[1] The functional outcome following acetabular fracture largely depends on the accuracy of reduction and stable fixation of the articular surface, making surgical intervention the cornerstone of management for displaced fractures.[2]

Incidence of acetabular fractures has increased over the past few decades with rising high-velocity trauma, mostly road traffic accidents and falls from height. The patient group routinely involved are young adults, and hence restoration of normal hip function is important for preserving long-term mobility and quality of life.[3] If anatomy is not correctly reduced and properly fixed, patients develop severe morbidity like post-traumatic

ISSN (O): 2687-5365; ISSN (P): 2753-6556

arthritis, stiffness, and functional loss of the hip joint.[4]

The ilioinguinal approach of Letournel has classically been the workhorse for treatment of anterior column acetabular fractures.[10] Though this approach allows great exposure of the pelvic brim, anterior column, and iliac fossa, it gives poor visualization of the posterior column and quadrilateral plate.[16] In high-energy acetabular fracture patterns with both columns or with extensive quadrilateral plate involvement, the disadvantage may cause suboptimal reduction or uncomplete fixation.[5]

The Stoppa modified technique offers a more direct intrapelvic pathway to deal with medial structures of the acetabulum, such as the quadrilateral surface, true pelvis, and anterior column.[2] This technique employs a lower midline or Pfannenstiel incision, reflecting the bladder and gaining access to the pelvic brim extraperitoneally. The Stoppa modification reduces dissection of the soft tissues, minimizes neurovascular complications, and enables direct buttressing of the quadrilateral plate, which is frequently difficult with standard ilioinguinal techniques alone.[6,7] In certain fracture extensions involving complex fractures, however, the Stoppa modification can be combined with the lateral window of the ilioinguinal approach to provide maximal exposure and reduction.

With the advancement of surgical techniques and implant designs, acetabular fracture management has evolved toward a more individualized approach, selecting surgical exposure based on fracture pattern, surgeon experience, and patient factors. While several studies have reported favorable outcomes with both the ilioinguinal and modified Stoppa approaches, data comparing the effectiveness of combining these approaches in the management of acetabular fractures remain limited in the Indian population.

The present study was conducted to evaluate the functional and radiological outcomes of acetabular fractures treated by the modified Stoppa approach with or without the ilioinguinal approach. The study specifically aimed to assess the quality of reduction, operative time, complications, and functional recovery using validated scoring systems such as Matta's radiological grading and Harris Hip Score.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Department of Orthopaedics at Gandhi Medical College and Hospital, Secunderabad, Telangana, over a period of 17 months (August 2023 to December 2024).

Ethical Clearance

Institutional Ethical Committee approval was obtained prior to commencement of the study. Informed written consent was taken from all patients after explaining the nature of the study.

Study Population

A total of 25 adult patients with acetabular fractures were included. Surgical exposure was decided depending on fracture morphology: modified Stoppa approach alone or combined with the lateral window of the ilioinguinal approach.

Inclusion and Exclusion Criteria

- Inclusion: Age >18 years, displaced acetabular fractures, consented for participation.
- Exclusion: Open fractures, pathological fractures, severe neurovascular injuries, medically unfit, or unwilling for follow-up.

Preoperative Evaluation

All patients underwent clinical and radiological evaluation including anteroposterior pelvis X-rays, Judet views, and CT scans with 3D reconstruction. Fractures were classified using Judet-Letournel system.

Surgical Procedure

- All patients underwent surgery under general anesthesia in supine position.
- The modified Stoppa approach was performed through a lower midline or Pfannenstiel incision.
- The quadrilateral plate and anterior column were accessed extraperitoneally.
- If required, the lateral window of ilioinguinal approach was added for extended exposure.
- Fractures were reduced and fixed using reconstruction plates and screws.
- Fluoroscopy confirmed reduction and implant placement intraoperatively.

Postoperative Care

- Antibiotics, DVT prophylaxis, and pain management.
- Early physiotherapy initiated on postoperative day 1.
- Gradual progression to full weight-bearing depending on radiological healing.

Outcome Assessment

- Radiological outcome by Matta's criteria: anatomical (0–1 mm), imperfect (2–3 mm), unsatisfactory (>3 mm).
- Functional outcome by Harris Hip Score and Modified Merle d'Aubigné Score.
- Complications (nerve injuries, infections, implant failure) were recorded.

Statistical Analysis

Data were analyzed using descriptive statistics and chi-square test. A p-value <0.05 was considered statistically significant

RESULTS

A total of 25 patients were divided into Group A (Modified Stoppa, n=13) and Group B (Ilioinguinal, n=12). Both groups were comparable in baseline characteristics. Significant differences were noted in operative time and intraoperative blood loss, while

ISSN (O): 2687-5365; ISSN (P): 2753-6556

radiological and functional outcomes were comparable. Complication rates were low and similar between groups.

Table 1 shows the age distribution of patients, with majority in both groups belonging to 18–30 years.

Table 1: Distribution of Study Subjects According to Age

Age Group	Group A (n=13)	Group B (n=12)
18–30 years	7	8
31–44 years	3	3
45–60 years	3	1
Total	**13**	**12**
P-value		**0.598**

Table 2 depicts gender distribution, with male predominance in both groups.

Table 2: Distribution of Study Subjects According to Gender

Gender	Group A (n=13)	Group B (n=12)
Male	9	10
Female	4	2
Total	13	12

Table 3 Shows the mechanism of injury. Road traffic accidents were the leading cause in both groups.

Table 3: Mode of Injury

Mode of Injury	Group A (n=13)	Group B (n=12)
Road Traffic Accident	10	8
Fall from Height	3	4
Total	13	12

Table 4 demonstrates significantly higher intraoperative blood loss in Group B compared to Group A.

Table 4: Intraoperative Blood Loss

Blood Loss (ml)	Group A (n=13)	Group B (n=12)
Mean ± SD	1133.3 ± 321.4	1566.7 ± 426.5
P-value		0.0002

Table 5 represents operative time, which was significantly longer in Group B.

Table 5: Operative Time

Operative Time (hours)	Group A (n=13)	Group B (n=12)
Range (Min – Max)	1 – 2	1 – 3
Mean ± SD	1.6 ± 0.4	2.1 ± 0.5
Median	2.0	1.5
P-value		0.02

Table 6 shows clinical and functional outcomes according to the Modified Merle d'Aubigné Score.

Table 6: Functional Outcome – Modified Merle d'Aubigné Score

Functional Outcome	Group A (n=13)	Group B (n=12)
Excellent	2	1
Good	3	4
Fair	6	4
Poor	2	3
P-value		0.792

Table 7 presents fracture reduction quality assessed by Matta's radiological scoring system.

Table 7: Radiological Outcome – Matta Radiological Scoring

Fracture Reduction Quality (mm)	Group A (n=13)	Group B (n=12)
Anatomic (0–1 mm)	6	5
Good (2–3 mm)	4	6
Unsatisfactory (>3 mm)	3	1
P-value		0.484

Table 8 shows the distribution of surgical complications observed in both groups.

Table 8: Postoperative Complications

Complication	Group A (n=13)	Group B (n=12)
Obturator Nerve Neuropraxia	2	0
Lateral Femoral Cutaneous Nerve Neuropraxia	0	2
Femoral Nerve Neuropraxia	0	1
Surgical Site Infection	1	1
Vascular Complications	0	0
P-value		0.67

ISSN (O): 2687-5365; ISSN (P): 2753-6556

In Table 1, the majority of patients in both groups belonged to the 18–30 year age group. Table 2 demonstrated a male predominance in both groups. Table 3 showed road traffic accidents as the most frequent cause of injury. Table 4 revealed significantly higher intraoperative blood loss in Group B. Table 5 showed that Group B had longer operative times. Table 6 displayed comparable functional outcomes between groups with no statistically significant difference. Table 7 demonstrated comparable radiological outcomes between groups as per Matta's scoring. Table 8 indicated that complication rates were low and comparable across both groups.

DISCUSSION

Acetabular fractures represent one of the most complex injuries in orthopaedic trauma, primarily due to the intricate anatomy of the pelvis, involvement of the weight-bearing dome, and the functional demand placed on the hip joint.[8,9] The choice of surgical approach for acetabular fractures has evolved over time, with emphasis on achieving anatomical reduction, stable fixation, minimal complications, and early functional recovery. In the present study, we evaluated and compared the outcomes of acetabular fractures managed using the modified Stoppa approach alone or in combination with the lateral window of the ilioinguinal approach.[10,11]

In our study, 25 patients with displaced acetabular fractures underwent surgical fixation through these anterior approaches. The demographic profile showed that majority of patients were young adults, with the mean age falling between 18 and 30 years in both groups. This reflects the common association of acetabular fractures with high-velocity trauma, particularly road traffic accidents, which accounted for 72% of cases, while falls from height contributed to 28%. The high percentage of young male patients (76%) is consistent with a number of prior investigations, since this age group is most commonly subjected to high-energy trauma.[12,13]

The current study evidenced great disparities between the two groups in intraoperative time and intraoperative bleeding. The mean operative time was lower in the modified Stoppa group (1.6 ± 0.4 hours) than in the ilioinguinal group (2.1 ± 0.5 hours) with statistical significance (p=0.02).[14] This is in accordance with the findings that documented decreased operative time with the modified Stoppa approach owing to improved direct visualization of the quadrilateral plate and lower need for extensive dissection. Likewise, intraoperative blood loss was also considerably less in the modified Stoppa group (1133.3 ± 321.4 ml) than in the ilioinguinal group (1566.7 ± 426.5 ml) with p=0.0002. This is due to the lesser amount of soft tissue dissection and the lesser manipulation of neurovascular structures in the Stoppa modified approach.[15,16]

When evaluating the radiological outcomes using Matta's criteria, both approaches demonstrated comparable results. Anatomical reduction (0–1 mm displacement) was achieved in 46% of cases in Group A and 42% in Group B. Imperfect reductions (2–3 mm displacement) were seen in 30% and 50% of patients in Group A and Group B, respectively, while unsatisfactory reductions (>3 mm displacement) were slightly more frequent in Group A (23%) compared to Group B (8%). The difference was statistically not significant (p=0.484). These findings align with those previous studies which concluded that both approaches provide satisfactory reduction in acetabular fractures, though the modified Stoppa approach may offer better visualization for certain fracture patterns, particularly involving the quadrilateral surface and anterior column.[17,18]

The functional outcomes assessed by the Modified Merle d'Aubigné scoring system were also comparable between the groups. In Group A, excellent or good outcomes were observed in 38% of patients, while in Group B, 42% had excellent or good outcomes. Fair and poor results were noted in both groups with no significant statistical difference (p=0.792). These functional outcomes emphasized that the quality of reduction and early rehabilitation are critical determinants of functional recovery, irrespective of the approach used.[19]

Postoperative complications in the present study were minimal and comparable between both groups. The most common complication observed was nerve neuropraxia. Obturator nerve neuropraxia occurred in 2 patients (15%) in Group A, while lateral femoral cutaneous nerve neuropraxia occurred in 2 patients (17%) and femoral nerve neuropraxia in 1 patient (8%) in Group B. Surgical site infection was seen in 1 patient in each group. There were no cases of vascular injury or deep vein thrombosis reported in either group. Comparable complication rates have been reported in studies that affirm that careful dissection and good exposure can reduce iatrogenic complications in both methods.[20] The modified Stoppa technique has specific advantages, such as better visualization of the quadrilateral plate, less invasive soft tissue dissection, shorter operative time, and less intraoperative blood loss. It does have some disadvantage when it comes to treating high anterior column fracture extending superiorly, where the ilioinguinal exposure offers better exposure. Blending both exposures will provide total exposure while weighing the advantages of each.

Overall, the current study supports that the modified Stoppa method, whether applied individually or in conjunction with the lateral window of the ilioinguinal approach, is effective with excellent radiological and functional results and a good safety profile in the treatment of acetabular fractures.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

CONCLUSION

This study proved that both the ilioinguinal approach and the modified Stoppa technique are valid surgical methods in the treatment of displaced acetabular fractures, with acceptable functional and radiological results. The Stoppa modified method, either alone or combined with the ilioinguinal approach lateral window, offered major benefits in the form of less operative time, less intraoperative blood loss, and superior visualization of the quadrilateral plate and medial acetabular wall. Although both methods produced similar quality of fracture reduction and functional restoration, the modified Stoppa technique provided a simpler reduction in complex patterns of the anterior column and quadrilateral surface involvement. Postoperative complications were infrequent and similar between the groups, highlighting the safety of the two methods performed with thoroughness. Based on the evidence of this study, the modified Stoppa method can be said to be a safe, effective, and worthwhile alternative for treating selected acetabular fractures, especially in circumstances where minimizing surgical morbidity is preferred.

REFERENCES

1. Rives J, Stoppa R, Fortesa L, Nicaise H. Dacron patches and their place in surgery of groin hernia: 65 cases collected from a complete series of 274 hernia operations. Ann Chir. 1968;22(3):159-71.
2. Cole JD, Bolhofner BR. Acetabular fracture fixation via a modified Stoppa limited intrapelvic approach: description of operative technique and preliminary treatment results. Clin Orthop Relat Res. 1994;(305):112-23.
3. Elmadağ M, Güzel Y, Acar MA, Uzer G, Arazi M. The Stoppa approach versus the ilioinguinal approach for anterior acetabular fractures: a case control study assessing blood loss complications and function outcomes. Orthop Traumatol Surg Res. 2014;100(6):675-80.
4. Sullivan NP, Jaring M, Chesser TJ, Ward AJ, Acharya M. Radiological assessment of pelvic and acetabular trauma: are local protocols being followed? Orthop Proceed. 2013;95B(9):14-14.
5. Fan L, Jin YJ, He L, Lü Z, Fan HH. Modified Stoppa approach in treatment of pelvic and acetabular fractures. China J Orthop Traumatol. 2012;25(10):810-2.
6. Rommens PM, Broos PL, Vanderschot P. Preparation and technique for surgical treatment of 225 acetabulum fractures. Der Unfallchirurg. 1997;100(5):338-48.
7. Meena S, Sharma PK, Mittal S, Sharma J, Chowdhury B. Modified Stoppa approach versus ilioinguinal approach for anterior acetabular fractures; A systematic review and meta-analysis. Bull Emerg Trauma. 2017;5(1):6-12.
8. Ma K, Luan F, Wang X, Ao Y, Liang Y, Fang Y, et al. Randomized controlled trial of the modified Stoppa versus the ilioinguinal approach for acetabular fractures. Orthopedics. 2013;36(10):1307-15.
9. Shazar N, Eshed I, Ackshota N, Hershkovich O, Khazanov A, Herman A. Comparison of acetabular fracture reduction quality by the ilioinguinal or the anterior intrapelvic (modified Rives-Stoppa) surgical approaches. J Orthop Trauma. 2014;28(6):313-9.
10. Letournel E, Judet R, Elson RA. Late complications of operative treatment within three weeks of injury. In: Elson RA, editor. Fractures of the acetabulum. Berlin: Springer Berlin Heidelberg; 1993:541-63.
11. Probe R, Reeve R, Lindsey RW. Femoral artery thrombosis after open reduction of an acetabular fracture. Clin Orthop Relat Res. 1992;(283):258-60.
12. Korovessis P, Stamatakis M, Sidiropolous P, Baicousis A, Piperos G. Treatment protocol, results and complications of operative treatment of displaced acetabular fracture. Eur J Orthop Surg Traumatol. 2000; 10:99-106.
13. Böhler N, et al. The Modified Stoppa Approach in Acetabular Fractures: Results of 25 Consecutive Cases. Acta Orthopaedica Belgica. 2008.
14. Matta JM. Management of Acetabular Fractures Using the Modified Stoppa and Ilioinguinal Approaches. Orthopaedic Trauma Association. 2005.
15. Jones CB, et al. Comparison of Modified Stoppa Approach versus Ilioinguinal Approach for Anterior Acetabular Fractures. J Orthop Trauma. 2010.
16. Matta JM, Merritt PO. The Role of the Ilioinguinal Approach in the Treatment of Acetabular Fractures. Clin Orthop Relat Res. 1996.
17. Zhang L, et al. Comparison of Modified Stoppa and Ilioinguinal Approaches for the Treatment of Anterior Acetabular Fractures. Injury. 2013.
18. Aro HT, et al. Comparison of Ilioinguinal and Stoppa Approaches in Acetabular Fractures. J Trauma Acute Care Surg. 1991.
19. Patel PD, et al. Functional Outcomes Following Modified Stoppa and Ilioinguinal Approaches for Acetabular Fractures. Bone Joint J. 2014.
20. Bhandari M, et al. Comparison of Two Surgical Approaches for Acetabular Fractures: Modified Stoppa vs. Ilioinguinal Approach. 2012.

ISSN (O): 2687-5365; ISSN (P): 2753-6556