

## A comparison between ilioinguinal and modified Stoppa approach in anterior column acetabular fractures

M. Scrivano<sup>a,\*</sup>, A. Vadalà<sup>a</sup>, G. Fedeli<sup>a</sup>, R. Di Niccolo<sup>a</sup>, D. Topa<sup>b</sup>, S. Porcino<sup>b</sup>, F. Pallotta<sup>b</sup>, A. De Carli<sup>a</sup>

<sup>a</sup> Department of Orthopaedic and Trauma surgery, S. Andrea Hospital, University of Rome "La Sapienza", Italy

<sup>b</sup> Department of Orthopaedic and Trauma Surgery, Ospedale San Giovanni Addolorata, Rome, Italy

### ARTICLE INFO

#### Keywords:

Modified Stoppa approach  
Anterior pelvic approach  
Ilioinguinal approach  
Acetabular fracture  
Pelvic fracture

### ABSTRACT

**Introduction:** Pelvis fractures are among the most difficult fractures to manage and treat for Orthopedic surgeons. Anatomic reduction is the main goal to reach in the acetabular fractures' treatment. The following study compares clinical outcomes and complications of Ilioinguinal versus modified Stoppa approach in Open Reduction and Internal Fixation (ORIF) of anterior column acetabulum fractures.

**Materials and methods:** A comparative analysis on 90 patients undergoing ORIF on acetabular fracture has been performed. Patients have been divided into two groups. The first group was treated by Ilioinguinal approach ( $n = 48$ ), the second group by modified Stoppa approach ( $n = 42$ ). The following parameters have been compared: quality of fragment reduction; operative time; peri- and post-operative blood loss; complications; clinical and radiographic outcomes.

**Results:** The modified Stoppa approach has shown a shorter mean operative time (146 min vs 175 min), fewer complications (14/48 vs 6/42), less blood loss both in the peri-operative phase (0.8 Hb pt vs 1.3 Hb pt) than in postoperative one (1.1 Hb pt vs 1.5 Hb pt), a lower rate of nerve, infections and critical complications. On the other hand, the ilioinguinal approach has showed better results in terms of quality of fracture reduction (43/48 patients with anatomical or near anatomical reduction vs. 37/42). No significant differences concerning vascular lesions, clinical and functional outcomes have been found between the two groups.

**Conclusions:** The modified Stoppa approach results in shorter operative time, less intra-operative blood loss and fewer complications than the ilioinguinal one. Greater anatomic reduction is achieved by Ilioinguinal approach; however, this does not necessarily translate into better clinical and functional outcomes which, overall, are comparable in the two analysed approaches. In conclusion, the modified Stoppa approach is deemed to be a better alternative in treating these fractures.

### Introduction

Pelvis fractures pose one of the most arduous challenges to orthopedic surgeon in traumatology. This is due to the anatomical complexity of the pelvic region, to the difficulty in spatial awareness and interpretation, to the proximity of very important vascular and nervous structures and, last but not least, for the difficulties in executing x-rays examinations. [1] The high chance of accidentally involving vascular and nervous structures and the potential damage to pelvic organs therein, greatly increase the complications rate.

Judet and Letournel [2] are considered pioneers in surgical treatment of acetabular and pelvic ring fractures. Being disappointed by

conservative results, they studied the anatomy of pelvic region and the most common fracture patterns detailed [3]. Their studies lead to leaps forward with regards to pelvic surgeries and to a deep improvement in the diagnostic capabilities on this anatomical area, treatment efficiencies and prognosis of these complex fractures. (Fig. 1)

CT examination, with 3D reconstruction, allows for a better analysis of what already emerges by standard radiographs, providing an increased accurate definition of the fracture and its pattern (Fig. 2a).

In this study surgical fractures affecting the anterior column of the acetabulum will be considered evaluating clinical outcomes by the two main surgical approaches deployed to treat these fractures: the ilioinguinal approach and the modified Stoppa approach (IPA Intra pelvic

\* Corresponding author at: Via di Grottarossa 1035 Via, 00189, Rome, Italy.  
E-mail address: [marco.scrivano@uniroma1.it](mailto:marco.scrivano@uniroma1.it) (M. Scrivano).

approach). The aim of this study is to compare intra-, peri- and post-operative complications of patients suffering from these kinds of fractures, based on the surgical approach performed, in order to determine which of the two represents a better choice. The parameters evaluated are operative time, quality of anatomical reduction, blood loss, clinical and functional outcomes. The hypothesis of the study is that the IPA provides a viable alternative to the Ilioinguinal approach ensuring a lower rate of associated complications.

**Materials e methods**

A retrospective nonrandomized cohort study has been conducted. The analysis has been multicentric considering patients suffering from anterior column acetabular fractures treated at the Sant' Andrea Hospital - University of Rome and at the San Giovanni Addolorata hospital of Roma from January 2016 to December 2021. A case-control selection has been conducted, in order to obtain homogeneous groups of patients in term of age, gender and fracture-type classification.

Inclusion criteria were:

- Anterior column acetabulum fractures with surgery indication.
- Age between 18 and 65 years.
- Follow up of at least 12 months.
- Good coxofemoral joint conditions prior to trauma.

Exclusion criteria were:

- Omolateral femur fractures.
- Isolated posterior wall fracture and Central dislocation.
- Biliateral fractures
- Severe cognitive impairment.
- Fractures treated after 4 weeks due to anesthesiological reasons.

The examined fractures have been classified according to Judet-Letournel [4] and AO/OTA [5] criteria. All patients underwent first level (dedicated Xray) and second level (CT, with 3D reconstruction) exams, aiming to properly classify the fractures. 126 patients with anterior column fractures have been selected. Out of these, 106

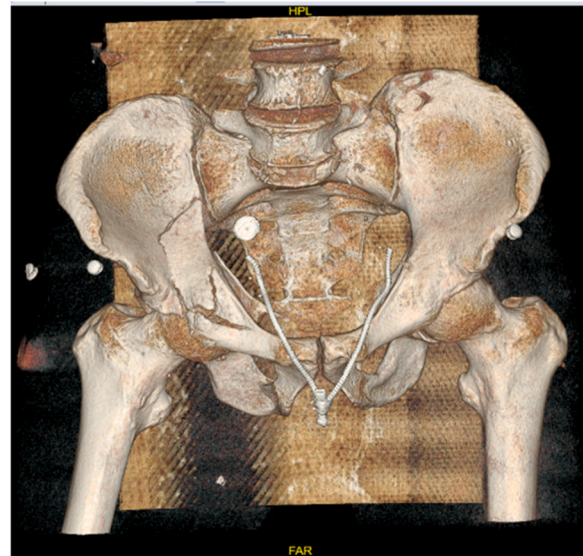


Fig. 2. a. 3D reconstruction of acetabular fracture.

complied with the selection criteria: 90 were available for follow-ups.

Patients have been divided into 2 groups based on the surgical approach performed:

GROUP A – 48 patients, by Ilioinguinal approach

GROUP B – 42 patients, by modified Stoppa approach.

The average age of GROUP A is 43.5y (18–62y), in GROUP B is 45y (23–65y). A total of 59 men and 39 women participated, respectively 27 men and 21 women in GROUP A while 24 men and 18 women in GROUP B. In GROUP A, 25 cases involved the right side, 23 the left side. In GROUP B, 23 cases involved the right side, 19 the left side.

The traumatic mechanism of fracture in 55 of 90 cases (61.1 %) has been motor vehicle accidents and in 28 of 90 cases (31.1 %) has been fall from a height greater than 3 m. 70 patients (77.78 %) were polytraumatized.

In 68 of 90 patients (75.5 %), in accordance with the principles of

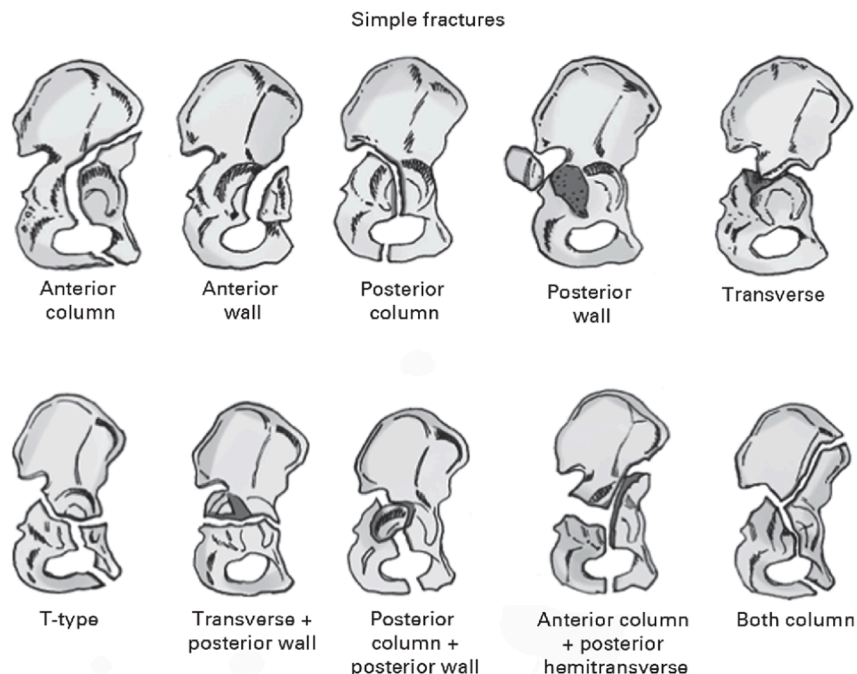


Fig. 1. Judet-Letournel classification of fractures concerning the acetabulum: 5 simple, 5 complex.

damage control, an anterior external fixator has been applied in ER because of diastasis of the pubic symphysis; transtectal and iuxtatectal fractures of the acetabulum; subluxation or dislocation of the femoral head.

### Surgical approach

All surgery has been performed by two surgical equipes of comparable experience in pelvic surgery. Patients were placed on supine decubitus during all procedures, as per protocol patients have been catheterized in order to keep the bladder empty to reduce the possibility of iatrogenic damage and to monitor the occurrence of hematuria, a clear sign of to the urirany system damage.

All patients have been provided an antibiotic prophylaxis therapy as soon as they arrived in the ER. A C-arm has always been used to monitor the different phases of reduction and synthesis. The surgeries for fracture reduction and synthesis have been performed in accordance with AO principles and guidelines.

### Ilioinguinal approach

Letournel described the ileoinguinal approach (Fig. 3a and b) in 1961, with the aim of identifying and synthesizing fractures with anterior column or acetabular wall involvement (anterior column, anterior wall, anterior wall with posterior hemitransverse, T-shaped) [3,6,7]. This approach may be leveraged also for fractures affecting the posterior column, in those cases where it guarantees an acceptable view also of the rear portion of the greater and lesser sciatic notch. The downside of this

approach, besides being particularly extended, is also being in proximity of important neurovascular structures, including the femoral nerve and the external iliac artery and vein. In this approach the rectus abdominis muscles must be detached and the incision of the fascia of the inguinal canal is often leading cause of post-surgery infections and inguinal hernia [7–9].

### Note on surgical technique

The ilioinguinal approach often requires extensive cutaneous and soft tissue exposure. The skin incision extends from the posterior portion of the iliac crest to pubic symphysis extending several centimeters beyond the median line. For deep tissues dissection, the aponeurosis of the oblique external muscle must be identified and cut, followed by the inguinal ligament. On the deep plane three windows may be identified.

The lateral window is located at the level of the iliac fossa and requires the identification and isolation of the lateral femoralcutaneous nerve (structure at risk in this approach): this window provides a wide view of the iliac fossa and is useful to reduce and synthesize iliac displaced fractures or pathologies affecting the sacroiliac joint. The middle window is created after identifying and isolating the ileo-psoas muscle with the adjacent femoral nerve (laterally) and the arteries and veins of the external iliacs complex (medially): this window, once the ilepectinal crest is identified and incised, give access to the true pelvi and allows visualization of the quadrilateral surface and part of the posterior column. The medial window is created between the vessels of the external iliacs (laterally) and the spermatic cord – round ligament (medially); it provides acces to the pubic branch and is useful for performing closure in cases of pubic symphysis diastasi, as well as to fix the medial side of the plate inserted; furthermore, this window allows adequate visualization of the bladder and emptying of massive hematomas that often collect in this area (Fig. 4).

### Modified Stoppa approach

Cole and Bolhofne introduced the intrapelvic modified Stoppa approach (Figs. 5 and 6) to manage acetabular fractures in 1994 [9]. Stoppa's procedure was originally conceived to treat inguinal hernias. This approach is less invasive than ileoinguinal as it avoids the lateral and middle windows and offers a better exposure of the quadrilateral surface, the medial wall of the acetabulum and the anterior column. However, it does not allow access and thus synthesis of conjoined sacral fractures, as well as does not allow good visualization of the posterior column.

This approach doesn't require accurare isolation of the iliac vascular-nervous bundle, while it requires the identification and isolation of anastomosis of the iliac and obturator vessels (corona mortis) whose bleeding may be fatal. Additional risks are iatrogenic damage of the obturator nerve and the superior gluteal artery [10–12].

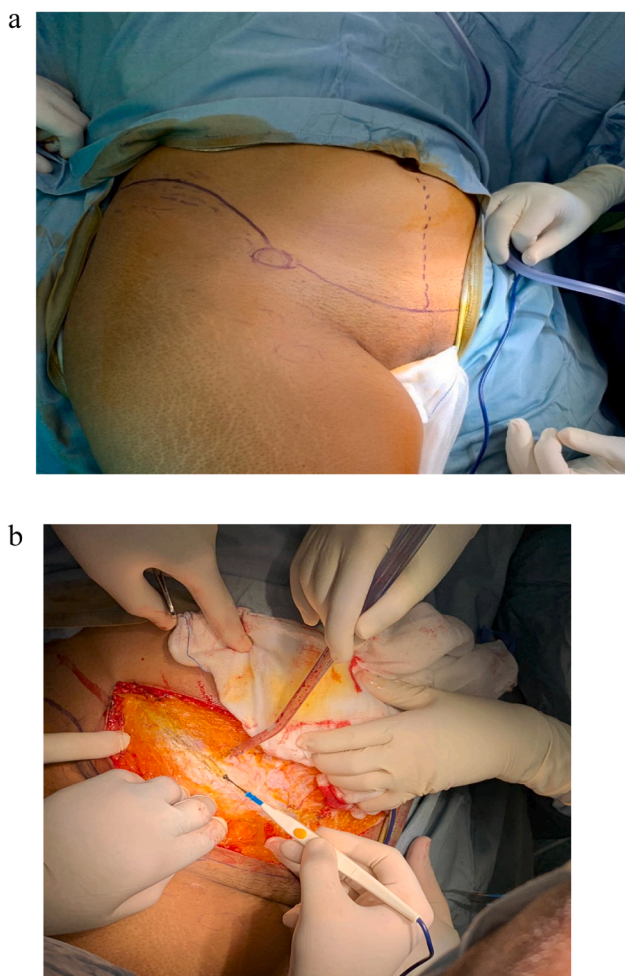


Fig. 3. a, Fig. 3b. Ilioinguinal approach.

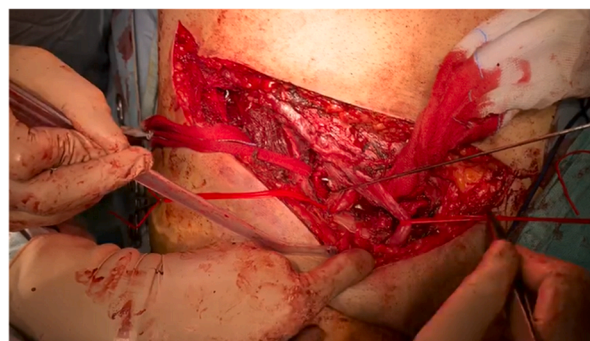


Fig. 4. Visualization of the three windows with retrieval of the structures bordering them.



Fig. 5. Modified stopgap approach.



Fig. 6. Modified Stoppa approach.

#### Notes on surgical technique

The modified Stoppa approach (AIP) usually relies on a Pfannenstiel-type horizontal incision extended for about 10 cm in length and located 2 cm proximal to the pubic symphysis. The superficial dissection provides wide visualization of the rectus abdominis muscles; the following deep dissection requires a vertical incision of the rectus fascia along the linea alba with the aim to obtain an immediate and adequate exposure of the pubic ramus, the bladder and true pelvis. The iliac vessels and the spermatic corda - round ligament are laterally divaricated, often even without the need for their detection and isolation. Through further lateral divarication of the iliopsoas muscle, after incision of the iliopectine crest, such access allows excellent exposure of the anterior acetabular column. In this approach taking good care to isolate the obturator nerve achieves a wide visualization of the lamina quadrilatera in order to fix, for example, an infrapectineal plate. A required step in this procedure is the immediate identification and ligation or cauterization of the corona mortis, located approximately 5–7 cm lateral to the pubic symphysis. Although there is an optimal exposure of the anterior column and quadrilateral surface, this access does not allow for the treatment of fractures affecting the posterior column due to inadequate view of the greater or lesser sciatic notch.

In 6 patients presenting with a high fracture of the anterior column and a fracture of the iliac wing in order to obtain an optimal reduction of the fracture it was necessary to create an additional lateral window. These patients were excluded from the study due to the use of a combined ilioinguinal and Stoppa approach.

The post-operative mobilization protocol is variable depending on patient's clinical conditions and the complexity of the fracture treated.

In both groups, however, kinesis of the affected hip and lower limb has been started within the first postoperative week; isometric exercises for quadriceps strengthening, ankle dorsiflexion, and active and passive kinesis exercises for the knees began as early as possible; loading was never allowed before three months postoperatively. The operative time has been calculated through analysis of the electronic surgical logbook.

The quality of the post-operative reduction has been assessed, blinded, by an orthopedic surgeon, using Matta [13] criteria on post-operative radiographs. These parameters evaluate the reduction on the residual displacement of the examined fragments:

- Anatomic reduction: 0–1 mm.
- Good reduction: 2–3 mm of residual displacement.
- Failed reduction: > 3 mm of residual displacement.

Blood loss analysis was done on patients' medical records. All patients had serialized blood tests from admission to the ER to the morning of surgery and then on 1st, 3rd and 5th postoperative day. We compared the decrease in Hb value between the two groups and the cases who needed bags of blood products both pre- and postoperatively. Patients who received at least one hemotransfusion were excluded from the evaluation of blood loss trends from the day after transfusion.

Peri- and post-operative complications have been also examined through medical records from the admission to the follow-up. We have considered:

- Nerve complications
- Vascular complication
- Infectious complications both superficial and deep.
- Other serious complication.

Clinical and functional outcomes have been evaluated according to two different scales: the Harris Hip Score (HHS) and the Merle d'Aubigné scale. The Merle d'Aubigné scale scores: 15–18 points (excellent); 11–14 points (good); 7–10 points (poor); <7 points (unsatisfactory). The Harris Hip score ranges from 0 to 100 points that assesses both clinical and functional outcomes of the patient through a series of questions.

Statistical analysis was performed with the JAMOVI software. Results were expressed as mean, standard deviation, absolute or percentage number. Statistical significance between continuous variables with a normal distribution was analyzed with the Student's *t*-test, non normal distribution was analyzed with the Mann-Whitney U test and the significance between the groups in terms of gender. *p*-values less than or equal to 0.05 have been considered as significant (Table 1).

#### Results

Patients were first evaluated in terms of their demographics. Nosignificant differences were observed between the groups in terms of gender ( $P = 0.427$ ), age ( $P = 0.739$ ) and follow-up ( $P = 0.315$ ). Patients were examined at a mean follow-up of 40 months (range: 12–72). The mean follow-up in group A was 42 months (range: 12–72), with a mean score of 86/100 at the HHS, while at the Merle d'Aubigné scale:

- 24 cases (50 %) excellent,
- 11 cases (22.92 %) good,
- 7 cases (14.58 %) poor
- 6 cases (12.5 %) unsatisfactory:

overall, in 35/48 patients (72.92 %) the results were satisfactory (excellent + good).

In group B, the mean follow-up was 38 months (range: 12–72), with a mean score of 84/100 at the HHS; on the Merle d'Aubigné scale:

**Table 1**  
Fracture pattern with the respective performed accesses.

	Ilioinguinal	Stoppa
<b>N. patients</b>	48	42
<b>Age</b>	43.5 (18–62)	45 (23–65)
<b>Gender</b>		
Male	27	24
Female	21	18
<b>Fracture side</b>		
Right	25	23
Left	23	19
<b>Mechanism of injury</b>		
Motor vehicle accidents	30	25
Fall from height	15	13
Others	3	4
<b>Fracture type (AO/OTA)</b>		
Anterior column (62-A3)	31	29
Posterior column (62-A2)	0	0
Anterior wall (62-A3.1)	3	2
Transverse (62-B1)	5	3
T-type (62-B2)	4	4
Ant. column + post. emitransverse (62-B3)	4	4
Both columns (62-C)	0	0
Transverse + post wall	1	0

- 23 (54.76 %) excellent
- 7 (16.67 %) good
- 7 (16.67 %) poor
- 5 (11.90 %) unsatisfactory

Overall, in 30/42 cases (71.43 %) the results are satisfactory (excellent + good).

Comparison of the two surgical approach shows that patients treated with ilioinguinal have slightly better clinical and functional outcomes, although not in a statistically significant manner. (HHS, *p*-value:0.90; Merle d’Aubigné, *p*-value:0.95). (Table 2)

Radiographic evaluation for assessment fracture’s reduction according to Matta’s criteria [13] was performed in blinded by a single observer (orthopedic surgeon) based on the radiographic images acquired in the immediate post-operative period.

The analysis showed reduction quality assessed as anatomic in 30/48 patients (62.5 %), good in 13/48 (27.1 %) and unsatisfactory in 5/48 (10.4 %) in group A; overall, reduction was assessed as satisfactory (anatomic + good) in 43/48 (89.6 %). In Group B, the quality of reduction was rated as anatomic in 24/42 (57.1 %), good in 12/42 (28.6 %) and unsatisfactory in 6/42 (14.3 %): thus, overall, the quality of reduction was satisfactory in 36/42 (85.7 %) (Table 3). One-way ANOVA analysis did not yield statistically significant values (*p*:0.49).

The mean operative time was 175 min in group A (range: 145–240 min) and 146 min in group B (range: 120–210 min). The difference between the two groups was about 29 min lesser in group B with a statistically significant difference (*p*: < 0.05).

No vascular complications occurred in the patients in both groups.

In group A, a total of 8 cases out of 48 patients (16.7 %) suffered from neuroapraxia: in 6 cases (12.5 %) the lateral femoral-cutaneous nerve has been affected, in 2 cases (4.2 %) the femoral nerve, no cases of neuroapraxia of the obturator nerve were recorded. In 4 cases a residual

**Table 2**  
Clinical and functional outcomes.

Clinical and functional outcomes	Ilioinguinal	Stoppa
<b>Merle D’Aubigne scale</b>		
Excellent (15–18)	24	23
Good (11–14)	11	7
Poor (7–10)	7	7
Unsatisfactory (<7)	6	5
<b>Harris Hip Score</b>	86	84
<b>Mean follow-up (month)</b>	42 (12/72)	38 (12/72)

**Table 3**  
Fracture’s reduction in terms of mm of residual displacement.

Fracture’s reduction quality (mm)	Ilioinguinal	Stoppa
Anatomic (0–1)	30	24
Good (2–3)	13	12
Unsatisfactory (>3)	5	6

hypoesthesia along the lateral femoral-cutaneous nerve territory occurred with only a mild discomfort reported by the patients. In group B, 3 cases (7.1 %) of obturator nerve neuroapraxia were registered and no other neurological lesions. In these cases, the neuropathies disappeared within 9 months from the surgery.

In 3 patients in group A (6.2 %) there were superficial surgical wound infections treated with seriate dressings and oral antibiotic therapy. No deep tissue infections occurred. In group B, 2 cases (4.8 %) of superficial infections occurred, treated like in group A. No deep tissue infections occurred. The overall incidence of complications in group A has been 29.2 % (14/48 patients); in group B, 14.3 % (6/42). The statistical analysis highlighted a significant difference (*p* > 0.003) (Table 4).

In group A, 3 out of 48 cases (6.5 %) reported other serious complications: in two case there was bladder perforation treated by stitching and catheter for about 30 days. In another cases an excessively long screw has implanted that penetrated of the coxofemoral joint and has been removed in a second surgery the following day (Fig. 7). In group B one patient (3.6 %) who had previously undergone inguinal hernia surgery, had an iatrogenic opening of the peritoneum with subsequent leakage of some bowel loops: in this case, the assistance of the general surgery colleague on duty, reduced the loops and stitched of the peritoneum without further post-operative complications.

Statistical analysis by total number of complications resulted as statistically significant in one-way ANOVA test (non-parametric).

18 patients required hemotransfusions: 11/48 (22.9 %) in group A and 7/42 (16.6 %) in group B. This data showed no statistically significant relevance (*p* = 0.43). In the preoperative an average reduction of the Hb value of 1.5 points has been recorded in both groups. In the postoperative Day I, in group A, patients had a decrease of 1.3 Hb points, on Day III there was a further decrease of 1.3 points and 0.2 points on Day V, with an overall average decrease of 2.8 Hb points between surgery and Day V and 4.3 Hb points from ER accesso to Day V. In group B, the Hb decrease was 0.8 points in the perioperative period, 1.0 points between postoperative Day I and Day III, and 0.1 between postoperative Day III and Day V, with a total loss of 1.9 Hb points from surgery to Day V and 3.4 points from ER access to Day V. The overall difference in reduction of Hb values between the two groups was 0.9 points less in patients treated with Stoppa’s modified approach, a value considered statistically significant both in the perioperative (*p* > 0.003), between post-op day I and III (*p* > 0.001) and between post-op day III and V (*p* > 0.001) (Graph 1, Table 5).

**Discussion**

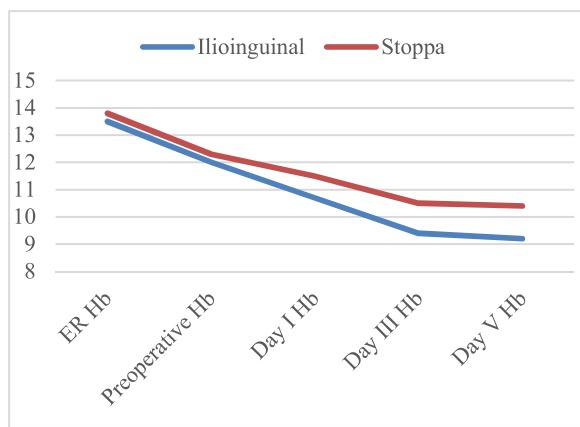
Synthesis surgeries for anterior column fractures of the acetabulum are complex because they are part of a polytrauma framework.

**Table 4**  
Complications.

Complications	Ilioinguinal	Stoppa
Obturator n. neuroapraxia	0	3
Lateral femoral-cutaneous n. neuroapraxia	6	0
Femoral n. neuroapraxia	2	0
Vascular lesions	0	0
Wound infections	3	2
Other severe complications	3	1
<b>Total</b>	<b>14</b>	<b>6</b>



Fig. 7. 3D-CT image showing the screw protruding in hip joint.



Graph 1. Hb values trend.

Table 5  
Hb values.

Blood loss (pts)	Iliioinguinal	Stoppa
ER Hb	13,5	13,8
Preoperative Hb	12	12,3
Day I Hb	10,7	11,5
Perioperative blood loss	1,3	0,8
<b>Hb values post-op</b>		
Day III Hb	9,4	10,5
Day III Hb blood loss	1,3	1
Day V Hb	9,2	10,4
Day V Hb blood loss	0,2	0,1
<b>Tot. Hb post-op. blood loss</b>	1,5	1,1

To date, ilioinguinal approach is still the most common surgical access to treat these kind of fractures [9]. For several years, a variant of an approach used in the past for inguinal hernia surgeries (Stoppa) has been developed in order to seek a route that would allow adequate visualization of the fractures while limiting the complications present in this type of surgery.

The modified Stoppa approach (AIP) is gaining increasing popularity as it has the potential to simplify a complex approach with many complications such as the ilioinguinal approach. In this study, we voluntarily included only those patients suffering from fractures of the anterior column and hemitransverse fractures with the aim to adequately compare these two surgery approaches.

Patients with fractures involving both columns have been excluded, because these would have required a double access and would pose a bias in the clinical, radiological and functional evaluation of the examined groups. The isolated posterior wall fracture and central

dislocations were excluded from the comparison.

The hypothesis under evaluation, therefore, was to understand if the modified Stoppa approach allows for adequate surgical gesture, ensuring, at the same time, a decrease in the incidence of intra- and perioperative complications. We therefore compared, retrospectively, a group of patients on whom the ilioinguinal access has been performed (group A) on a case-control group selected according to fracture type, gender and age treated with the modified Stoppa procedure (group B).

Several aspects were considered such as: quality of fracture's reduction, operative time, blood loss, incidence of vascular-nervous complications, superficial and deep infection, and functional recovery through evaluation scales. In literature, different studies already have attempted to evaluate the possible superiority of one surgical technique over the other. Taller et al. in 2010 [14], compared these two surgical accesses showing that the modified Stoppa approach was less invasive and more respectful of soft tissue, also ensuring a lower incidence of peripheral neuropathy. Fan et al. in 2012 [15] confirmed these results by reporting a better fracture reduction rate and lower rate of complications. Matta et al. [9] supported better fracture reduction with ilioinguinal access, also reporting a lower rate of heterotopic ossification and faster recovery from a muscular standpoint. More recently, authors with larger case histories have reported overall discordant opinions: Rocca et al. [16], in an article published on Injury in 2014 confirmed the better clinical results of the modified Stoppa access, while reporting fewer intra- and peri-operative complications; whilst Hammad et al., in 2015 [17], denied these results, reporting completely overlapping findings between the two techniques. In this study, the comparison of surgical timing showed a statistically significant shorter operative duration in patients treated with the modified Stoppa approach with an average operative duration of 146 min (average saving of about 29 min. This finding we reported, moreover, is in line with that previously reported by Adawy et al. [18], who reported a time saving with Stoppa's approach of about 94 min.

Regarding blood loss, the comparison between the two groups, showed, in pre- and postoperative serialized controls, that blood loss was greater in patients treated with ilioinguinal procedure, especially in the perioperative and early postoperative days (blood controls performed on postoperative days I and III with a greater average loss of 0.5 points in group A on day I, 0.3 points on day III and then reduced in day V to 0.1 points). In the final computation, patients in group A lost about 0.9 Hb points more than patients in group B. Data were statistically significant both in the perioperative ( $p > 0.003$ ), between post-op day I and III ( $p > 0.001$ ) and between post-op day III and V ( $p > 0.001$ ). These data are in line with what Ma et al. reported in 2015 [19].

About nerve complications, the reported data are clearly linked on the type of surgical access performed. In group A patients, the neuropathies recorded were at the lateral femoral-cutaneous nerve in 6 cases and at the femoral nerve in 2 cases, with an overall rate of postoperative neuropathies recorded of about 16.7%; in group B, on the other hand, these complications were always at the obturator nerve and occurred in only 3 cases (7.1%), thus demonstrating a lower incidence, but without showing statistical significance ( $p = 0.11$ ). Concerning vascular complications, it should also be noted that the potential targets that could be attacked iatrogenically were different. In our case series, however, no vascular complications occurred.

Overall, the total incidence of complications recorded in group A was 29.2% (14/48) while in group B it was 14.3% (6/28). These data are in line with literature, and in our case the comparison yielded a statistically significant value ( $p > 0.03$ ). The application of Matta's criteria also gave us the opportunity to assess, in blinded, the quality of reduction of the fractures under investigation. In patients with ilioinguinal approach, the quality of reduction, and thus of synthesis, was found to be satisfactory in 89.6% of cases, while in patients treated with the modified Stoppa approach this value was 85.7%.

Patients in group A, despite a better quality of fracture reduction, statistical significance was not reported. Our study appears to be in line

with Yang et al.'s 2020 study [20] showing a higher percentage of reduction considered satisfactory.

Patients in group A also showed better results in clinical and functional outcomes on both the Merle d'Aubigné scale (satisfactory results in 72.9% vs 71.4 %) and the Harris Hip Score (group A 86/100 vs 84/100 for group B) although not statistically significant. In agreement with Meena et al. in 2021 [6] we showed that the ilioinguinal approach presents better clinical and functional results at follow-up as an absolute value. However, it should be highlighted that, despite a better fracture reduction, there was no difference in clinical and functional tests thus going to validate the overlapping of both techniques in the final clinical and functional outcomes. This study, although carried out on a multi-center basis in order to increase the case series under examination suffers from a not large number of patients included in the two groups. The incidence of such fractures is an infrequent occurrence, and other studies, although authoritative, have also suffered from the small number of cases; among other things, the need to create control groups as homogeneous as possible with each other required the use of inclusion and exclusion criteria that further reduced the population. Finally, it should be noted that this study, being retrospective and not randomized, inevitably suffered from a baseline bias in the selection of patients.

## Conclusion

The modified Stoppa approach for the treatment of anterior column acetabulum fractures has less blood loss, fewer overall complications, and shorter duration of surgery than the ilioinguinal approach. The ilioinguinal approach has better anatomic fracture reduction with overlapping clinical and functional outcomes between the two types of surgical accesses. Based on the observed cases, the initial hypothesis of the study is confirmed in that the modified Stoppa approach has been shown to be a better alternative for the management of these fractures, although a study articulated over a larger number of patients and with more long-term follow-up would be needed to confirm this.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

The authors thank Alberto Lanzillotti in providing language help.

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