

Anterior Subcutaneous Internal Pelvic Fixation (Anterior Infix) in Management of Pelvic Ring Fractures

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ABSTRACT

Background: Hemodynamic instability and a high mortality rate are symptoms of pelvic injuries. Reducing mortality, improving fracture reduction, allowing early weight bearing, and mobility are all benefits of surgical fixation for unstable pelvic injuries. Reduced soft tissue injury, less blood loss, shorter operation time, and early postoperative mobilization are all benefits of anterior infix.

The aim of the work: was in order to evaluate the clinical, radiological, and postoperative outcomes of anterior INFIX, a method for fixing pelvic rings, as well as any issues that may have occurred during or after the procedure.

Patients and methods: Patients who are suitable for anterior fixation through anterior pelvic infix were included in this prospective study. The patients included 30 individuals from the Orthopedic Surgery Department at Al-Zahraa University Hospital and the Faculty of Medicine for Girls at Al-Azhar University. In this study the mean age of the studied cases ranges from 19 to 85 years old with a mean 36.97 years old. All patient's injuries have been resulted from high energy trauma. 10 patients (33.3%) have a lateral compression type 2 injury, 10 patients (33.3%) have vertical shear injury, 9 patients (30%) have a combined mechanism injury, and 1 patient (3.3%) have lateral compression type 3 injury.

Results: The mean of operative delay was 11.83 days with a range from 2 to 40 days and Intraoperative blood loss ranged from 30 to 80 milliliter, with an average of 49 milliliter. From all patients, there 27 patients (90%) had posterior fixation in addition to anterior infix. Regarding reduction evaluation (Matta radiological score) 12 patients (40%) were excellent, 15 patients (50%) were good, and 3 patients (10%) were fair. Postoperative lateral femoral cutaneous nerve (LFCN) was found intact in 21 patients (70%) and was injured in 9 patients (30%). From all patients there 2 patients only (6.7%) were have surgical site infection. There was neither fixation failure nor screw loosening in any patient. The mean time for union was 10.87 weeks with a range from 8 to 14 weeks and the mean time for removal was 4.96 months with a range 3 to 12 months. The mean functional score (Majeed score) was 92.5 with a range from 69 to 100. Grading the functional outcome according to Majeed score, 22 patients (73.3%) were excellent, 7 patients (23.3%) were good, and 1 patient (3.3%) was fair.

Conclusion: For the treatment of unstable pelvic ring injuries, the INFIX is effective enough. We think this is the gold standard for treating pelvic ring injuries. When external fixation is not an option, the INFIX is a better choice for anterior pelvic fixation. Both the total axial stiffness and the stiffness at the pubic symphysis were higher with INFIX compared to external fixation. Reduced infection risk, more patient mobility, and decreased nursing needs are some of the benefits of the INFIX versus external fixation.

1. INTRODUCTION

Only around 2% to 8% of all bone fractures occur in the pelvis. Injuries like this are common after exposure to high-energy trauma, such as in crashes in cars or falls from large heights, and they may be life-threatening. (1)

Compared to non-operative therapy, surgical stabilization of unstable pelvic injuries had better functional results, shorter hospital stays, earlier weight bearing and mobilization, and decreased mortality. (2)

In instances involving multiple, compressed fractures or large pelvic defects of the anterior pelvic ring, coagulopathies, or history of prior hip or abdominal surgery, the minimally invasive surgical technique of anterior subcutaneous internal pelvic fixation may be very beneficial in terms of complication rates. Since the anterior infix is subcutaneously implanted in its own compartment, it will not come into touch with any potential laparotomy site. (3).

Short surgery duration, little blood loss, minimum soft tissue injury, early postoperative mobilization, and no connection of implants with intra-abdominal compartment are all benefits of anterior infix. Additionally, substantial soft tissue dissection is not essential. (4)

INFIX system is composed of two poly-axial pedicular screw inserted supra-acetabulum and connected by subcutaneous precontoured rod. (5)

2. PATIENTS AND METHODS

Patients who are suitable for anterior fixation by anterior pelvic infix were included in this prospective study. The patients included 30 individuals from the Orthopedic Surgery Department at Al-Zahraa University Hospital and the Faculty of Medicine for Girls at Al-Azhar University.

Duration of the study:

The population of the study enrolled from August 2023 and to be continued till August 2024 including 30 patients with diagnosis of unstable pelvic ring fractures with regular postoperative follow up for at least 6 months.

Inclusion criteria:

- Skeletally mature adults above 18 years old.
- Vertical shear pelvic injury (VS).
- Lateral compression pelvic injury type 2 & 3 (LC 2 & 3).

Exclusion criteria:

- Concomitant acetabular fractures.
- Pathological fractures
- Open fractures.

Preoperative evaluation of the patients:

The patients were assessed clinically and radiologically.

- **Clinical assessment:**

By history, mode of trauma and general, regional and local examination. In addition to evaluation of associated injuries.

- **Radiological evaluation:**

- X-rays:

-The patient is positioned supine with each leg internally rotated 15-20 degrees and the beam is directed halfway across the anterior superior iliac spine (ASIS) and pubic symphysis for the pelvis postero-anterior view.

- Pelvis inlet view: Positioning the patient supine with both legs internally rotated 15-20 degrees and the beam focused at ASIS with a caudad tilt of 40 degrees is the standard procedure.

- Pelvis outlet view: While lying on their back, the patient's legs should be bent at a 45-degree angle to one another and the beam is aimed 5cm below pubic symphysis with 40 degrees cephalad tilt.

- CT scan with 3D reconstruction.

The operative technique:

Fitness for surgery: A thorough evaluation of the patients' medical history, physical condition, and standard pre-operative laboratory testing were used to determine their surgical readiness.

Consent: The patients gave their standard consent.

Surgical techniques and implants:

On a radiolucent surgical table, the patient was laid down in a supine posture. From the umbilicus to the proximal thigh, the whole pelvis was sterilely prepared and draped. By obtaining an ideal "teardrop" picture via the obturator-outlet view (30 degrees medial and cephalic tilt of the C-arm), the fluoroscopic images allowed for the identification of the anterior inferior iliac spine (AIIS) as the osseous entry. The anterior inferior iliac spine (AIIS), which is typically 3–4 cm distal and 2 cm

medial to it, might be difficult to palpate in obese people.

In order to access AIIS, a slanted incision of 2 to 3 cm was created. The AIIS was exposed by bluntly separating the inter-muscular gap between the sartorius medially and the tensor fascia lata laterally.

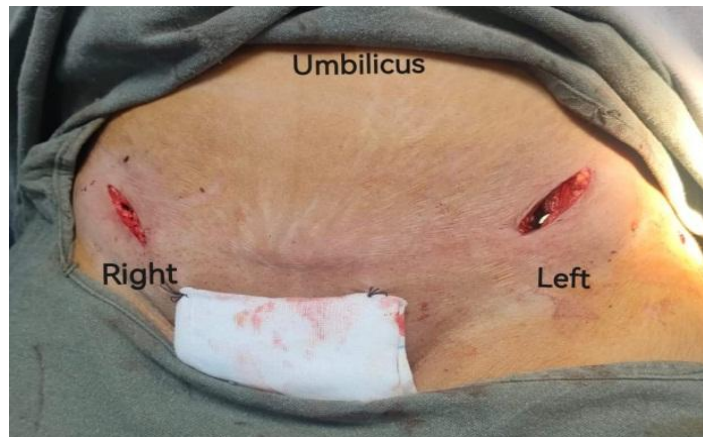


Figure 1: skin oblique incisions centered over the AIIS in line with the groin crease.

The awl was used to establish an entrance site between the ilium's medial and lateral bone plates. Inserting screws into the anterior inferior iliac spine is the procedure. The posterior superior iliac spine (PSIS) was being approached via an osseous tunnel that a pedicle finder was creating. The ideal orientation for the screw is 30 degrees medial and 20 degrees cranio-caudal. Obturator inlet, iliac oblique, and obturator exit are the standard fluoroscopic views used in the operating room.

Polyaxial pedicle screws with a length of 70 to 100 mm and a diameter of 6.5 to 7.3 mm were used as implants. After inserting the connecting rod, the pedicle screw head was maintained at a minimum distance of 2 cm from the bone surface to prevent compression of vascular tissues.

Just like that, the other side of AIIS underwent the same treatment. Starting with one AIIS incision and working its way across the deep fascia, a subcutaneous tunnel was created. A titanium rod is used to link the two pedicle screws; it is over-shaped on the abdomen and pushed beneath the skin at the bikini line level. This rod has a diameter ranging from 5.5 to 6.5 mm.

Hand manipulation with screw handles, compression or distraction via C-rings and laminar spreaders, a femoral distractor, or leg traction may all help reduce unstable pelvic injuries. With the use of the screwdriver, the end cap was securely fastened on both sides. Next, the rod and bone were checked for sufficient distance using two overlapping fingers.

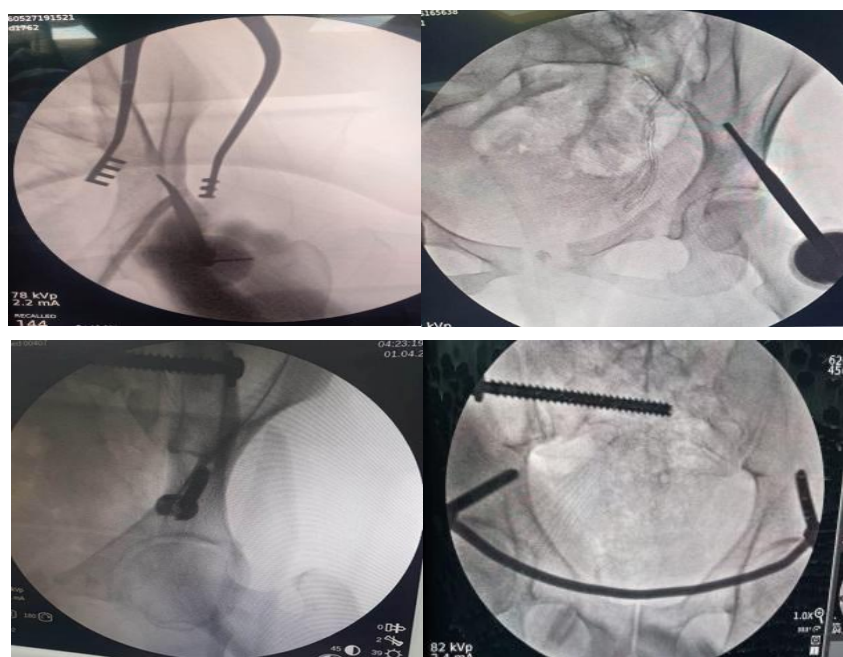


Figure 2: intraoperative fluoroscopic images for infix and also showing posterior fixation by iliosacral screw.

Postoperative management and follow up:

Starting on day 2, patients were permitted to touch weight carry on the fracture side, while the undamaged hemipelvis could bear full weight. Between six and twelve weeks, depending on the institution, the wounded side might carry some weight; following complete union, it could bear all of the patient's weight.



Figure 3: Immediate post-operative x-rays.

Follow up evaluation were performed at 2, 6 weeks, 3 months and 6 months then yearly thereafter.

It is recommended to leave the anterior infix for a minimum of three months. After this time has passed, removing the implant is as easy as pie, using just the same incisions made during implantation and causing minimum harm to the soft tissues, resulting in a shorter hospital stay.

Statistical analysis:

Following the collection, coding, and revision of the data, it was then put into the version 20 of the Statistical Package for Social Science (IBM SPSS). For the qualitative data, the information was provided in the form of numbers and percentages; for the quantitative data with a parametric distribution, the mean, standard deviations, and ranges were presented; and for the quantitative data with a non-parametric distribution, the median information was supplied along with the inter quartile range (IQR).

With a margin of error of 5%, the confidence interval was set at 95%. Accordingly, the following is why the p-value was deemed significant:

- $P > 0.05$: Non-significant (NS)
- $P < 0.05$: Significant (S)
- $P < 0.01$: Highly significant (HS).

Results

The patients included in the study ranged in age from 19 to 85 years old, with a mean age of 36.97. Fifteen instances, or half of the total, were men.

		No	%
Gender	Female	15	50.0%
	Male	15	50.0%

Age	Mean $\pm$ SD	36.97	16.75
	Range	19	85

table (1): Demographic data among studied groups

From the various comorbidities measured, hypertension (HTN) was the most common comorbidity that was found in 2 patients (6.7%) followed by DM that was found in 1 patient (3.3%). In mode of trauma was found road traffic accident (RTA) in 16 patients (53.3%) followed by pedestrian trauma that was found in 8 patients (26.6%) and followed by fall from height that was found in 6 patients (20%), all patients' injuries have been resulted from high energy trauma.

		No	%
Comorbidity	DM	1	3.3%
	HTN	2	6.7%
	No	27	90.0%
Mode of trauma	RTA	16	53.3%
	Pedestrian trauma	8	26.6%
	Fall from height	6	20.0%

Table (2): patient comorbidities and mode of trauma among studied groups.

From Fracture classification according to Young and Burgess classification there 10 patients (33.3%) have lateral compression type 2 (LC2), 10 patients (33.3%) have vertical shear (VS), 9 patients (30%) have combined mechanism, and 1 patient (3.3%) have lateral compression 3 (LC3).

		No	%
Fracture classification	LC 2	10	33.3%
	VS	10	33.3%
	Combined	9	30.0%
	LC 3	1	3.3%

Table (3): Fracture classification among studied groups.

The mean of operative delay was 11.83 days with a range from 2 to 40 days and the mean of intra-operative blood loss was 49 ml with a range from 30 to 80 ml.

	Minimum	Maximum	Mean	SD
Operative delay by days	2	40	11.83	8.45
Intra-operative blood loss by ml	30	80	49.00	13.66

Table (4): Operative delay and intra-operative blood loss among studied groups.

From all patients, 27 patients (90%) required posterior fixation in addition to anterior infix. However, 3 patients (10%) didn't need posterior fixation.

		No	%
Posterior fixation	NO	3	10.0%
	YES	27	90.0%

Table (5): Posterior fixation among studied groups.

Regarding Reduction evaluation (Matta radiological score) 12 patients (40%) were excellent, 15 patients (50%) were good, and 3 patients (10%) were fair.

		No	%
Matta radiological score	Excellent	12	40.0%
	Good	15	50.0%
	Fair	3	10%

Table (6): Reduction evaluation (Matta radiological score) among studied groups.

postoperative lateral Femoral Cutaneous nerve (LFCN) was intact in 21 patients (70%) and was injured in 9 patients (30%). All affected patients were improved with neurotonics and completely relieved after infix removal except one patient. On the other side, one patient was intact after fixation and got nerve injury during removal of infix.

		No	%
LFC Nerve	Injury	9	30.0%
	Intact	21	70%

Table (7): Lateral Femoral Cutaneous nerve assessment among studied groups.

From all patients there only 2 patients (6.7%) were having surgical site infection and improved after antibiotics and wound care.

		No	%
Infection	Infection	2	6.7%
	No	28	93.3%

Table (8): Surgical site infection among studied groups.

There was neither fixation failure nor screw loosening in any patient.

		No	%
Fixation Failure	Yes	0	0%
	No	30	100%

Table (9): Fixation Failure among studied groups.

The mean time for union was 10.87 weeks with a range from 8 to 14 weeks and the mean of time for removal was 4.96 months with a range from 3 to 12 months.

	Minimum	Maximum	Mean	SD
Time for union by weeks	8	14	10.87	2.50
Time for removal by months	3	12	4.96	1.90

Table (10): Time to union and time to removal among studied groups

The mean functional score (Majeed score) was 92.5 with a range from 69 to 100.

	Minimum	Maximum	Mean	SD
Majeed score	69	100	92.50	7.93

Table (11): Majeed score among studied groups.

Grading the functional outcome according to Majeed score, 22 patients (73.3%) were excellent, 7 patients (23%) were good, and 1 patient (3.3%) was fair.

		No	%
Grade	Excellent	22	73.3%
	Fair	1	3.3%
	Good	7	23.3%

Table (12): Grading the functional outcome according to Majeed score among studied groups.

3. DISCUSSION

At the Orthopedic Surgery Department, Faculty of Medicine for girls Al-Azhar University (Al-Zahraa University Hospital), and Al-Bank Al-Ahly Hospital for Integrated Care, thirty individuals were enrolled in a prospective study to examine the efficacy of anterior subcutaneous internal pelvic fixation in the treatment of unstable pelvic ring fractures.

Our research included patients ranging in age from 19 to 85 years old, with a mean age of 36.97. Fifteen instances, or half of the total, were men.

Researchers Ansari M. et al. (6) used a retrospective selection method to examine 31 patients admitted to a tertiary care hospital in the Indian state of Maharashtra who had unstable pelvic ring injuries. They had an INFIX procedure. There were 21 men and 10 women, with a mean age of 46.

Eleven patients who had suffered several traumas and had pelvic fractures repaired with an anterior subcutaneous internal fixator after a high energy trauma were the subjects of a retrospective study carried out by García M. et al. (7). About 50.5 years old was the average age.

The average age of the 18 adult patients treated with INFIX in a prospective research by Nandi R. et al. (8) was 39.55 years, and the majority of patients were less than 50 years old; 83% of patients were male. The trial ran from July 2017 to December 2019.

According to the mechanism of injury in our study the mode of trauma was found RTA in 16 patients (53.3%) followed by pedestrian trauma that was found in 8 patients (26.6%) and followed by fall from height that was found in 6 patients (20%), all patient's injuries have been resulted from high energy trauma. From other associated injuries, chest injuries were found in 10 patients (25% of associated injuries), lower limb fractures in 10 patient (25%), upper limb fractures in 6 patient (15%), head injuries were found in 5 patients (12.5%), spine fractures were found in 4 patients (10%), abdominal injuries in 3 patients (7.5%), urogenital injury in one patient (2.5%) and finally maxillofacial fracture was found in 1 patient (2.5%). There was no associated injury in 7 patients (23.3% of patients).

The majority of injuries occurred as a result of car accidents (23 instances), then falls from heights (7 cases), and one instance of a pedestrian being struck by a vehicle (one case), according to Ansari M., et al. (6).

The mechanism of injury was determined to be precipitation in two car accidents and five run-overs, according to García M. et al. (7).

Ghosh S. et al. (9) found that 77.3% of injuries occurred as a result of car accidents, 21.3% as a result of falls from great

heights, and 1.3% as a result of falls of heavy items (one case). In nine instances (12%), three of which had open fractures, there were associated orthopedic injuries to the upper limb. The injury to the upper limb most often connected with the humeral shaft was a fracture. Fractures occurred in 22 patients (29.3% of the total) in the lower extremities; the most prevalent site of involvement was the femoral shaft (14 instances), followed by both bones of the leg (6 patients). We found 8 incidences of open fractures. Fractures of the acetabulum occurred in 14.7% of cases, those of the sacrum in 9.3%, those of the spine in 4.0%, and miscellaneous injuries in 2.7% of patients. Two individuals were found to have facio-maxillary fractures.

There was a tie between motorcycle accidents (29%, $n = 7$) and motor vehicle accidents (29%, $n = 7$), according to Steer et al. (10); the third leading cause was falling from a great height (25%, $n = 6$). This matched the results of our research.

In our study the fracture classification according to Young and Burgess classification there 10 patients (33.3%) have LC2, 10 patients (33.3%) have vertical shear, 9 patients (30%) have combined mechanism, and 1 patient (3.3%) have LC3.

A study by Ansari et al. (6) shown that the Young and Burgess classification was used to categorize the pelvic fracture. There was one patient with LC type 1, seven with LC type 2, six with LC type 3, eight with APC type 2, and nine with APC type 3.

According to Young's classification, there is lateral compression, anteroposterior compression, and vertical shear, however García M. et al. (9) shown that type B and type C are 6 and 5, respectively, according to Tile categorization.

The average number of days it took to get from injury to surgery was 11.83 (range: 2–40), and the average amount of blood lost during surgery was 49 ml (range: 30–80).

The results of the study by Ansari M. et al. (6) were as follows: 16 patients required an intensive care unit stay for an average of nine days plus 2.5 days (ranging from six to thirteen days), the average blood loss was 125 ml (ranging from forty to 350 ml), which is significantly less than the blood loss in open reduction and fixation with plates, and the average surgical time was eighty-three minutes (ranging from forty-five to one hundred and twenty minutes).

Steer et al. (10) shown that, on average, 5.2 days elapsed between injuries and surgeries (0-13).

Xiaotian et al. (11) shown that, on average, patients lost between 23 and 37 milliliters of blood throughout the 30-46 minute surgery.

According to Ghosh S. et al. (9) the average time between patient presentation and operation was 9.67 days, with a range of 1 day to 37 days. Ten patients (19.2%) out of fifty-two who underwent surgery within 48 hours of presentation, twenty-seven (51.9%) within a week, and the remaining fifteen (20.8%) after more than a week owing to the presence of serious comorbidities, which prolonged the time it took for patients to relax and become anesthetically suitable for surgery. The longest length of time spent in the hospital was 45 days, while the average was 14.4 days. Our research confirmed this.

According to posterior fixation, from all patients there 27 patients (90%) had also posterior fixation in addition to anterior infix. Posterior fixation wasn't needed in 3 patients (10%).

Additionally, 25 patients had posterior fixation performed in addition to anterior INFIX, as shown by Ansari M. et al. (6).

From the reduction assessment (Matta radiological score), 12 patients (or 40%) were deemed exceptional, 15 patients (or 50%) were deemed good, and 3 patients (or 10%) were deemed fair.

Alencar D. et al. (12) performed a case series analysis looking backwards. Results from the INFIX technology shown that out of 34 patients treated, 23 had excellent reduction, 11 had acceptable reduction, and 0 had moderate or poor reduction.

Twelve patients had an outstanding decrease, eight had a good one, and three had a fair one, according to Xiaotian et al. (11). This matched the results of our research.

Our research indicated that the lateral femoral cutaneous nerve was intact in 21 patients (70%) and damaged in 9 patients (30%), according to the evaluation of postoperative sequelae. With the exception of one case, all of the afflicted patients had full relief upon infix removal and showed improvement with neurotonics. In contrast, one patient had damage during removal even though they were unharmed during fixation. Antibiotics helped only 2 individuals (6.7% of the total) who had an infection at the surgery site. No patient had screw loosening or fixation failure.

The lateral femoral cutaneous nerve neuralgia symptoms were alleviated when the implants were removed in three patients, according to Ansari M., et al. (6). There were indications of heterotrophic ossification in four of the individuals. A patient required implant removal due to symptoms of superficial infection and screw backout. No one had symptoms of a severe illness.

Three infections, one implant failure, two instances of too-deep implantation, seven instances of irritation of the lateral femoral cutaneous nerve, and three instances of device-associated discomfort were among the problems documented by Vaidya et al., (13) in their study.

According to Gardener et al. (14) six patients had Grade 1 heterotopic ossification at the screw heads, which was the most significant consequence. The fixator removal surgery debrided this symptomatic patient. Two patients had neuropraxia of the lateral femoral cutaneous nerve, which had completely healed by the time they were last seen. No patient had a loss of pelvic reduction, and all pelvic fractures were successfully repaired. The only patient who had any kind of deep infection was the one whose skin broke out superficially due to implant irritation; this condition cleared up after the implants were removed.

All instances were found to be stable and devoid of displacement, as shown by Hoskin et al. (15). The lateral femoral cutaneous nerve neuropathic pain and an infection in one of the wounds necessitated the immediate removal of the patient. Twelve individuals had lateral femoral cutaneous nerve palsy, impacting 20 out of 42 nerves. Patients experienced relief from all problems associated with the lateral femoral cutaneous nerve after its excision. Asymptomatic heterotopic ossification occurred in nine cases, whereas three patients had profound infections and one patient had symptoms as a result of the bar.

The mean time for union was 10.87 weeks with a range from 8 to 14 weeks and the mean time for removal was 4.96 months with range from 3 to 12 months.

Liu et al.,⁽¹⁶⁾ showed that the radiological healing was in 4.5 ± 1.1 months.

Scheyerer et al.,⁽¹⁷⁾ showed that the radiological healing was in 3.5 ± 0.75 months.

Fang et al.,⁽¹⁸⁾ showed that the radiological healing was in 14.7 weeks.

The mean functional outcome score (Majeed score) was 92.5 with a range from 69 to 100. The Grading of functional outcomes among studied groups there 22 patients (73.3%) were excellent, 7 patients (23.3%) were good and only 1 patient (3.3%) was fair.

The Majeed score, according to Ansari M. et al. (6), ranged from 46 to 98, with nine patients demonstrating great outcomes, seventeen displaying acceptable results, five demonstrating fair results, and one demonstrating bad results. The average score was 78 ± 12.4 .

The majority of patients had stable bone union and full range of motion after six months, as shown by an average Majeed score of 78, as demonstrated by Bahe-Elden Elahfie, M., et al. (19). In addition, these patients had no trouble going about their regular workdays.

The findings of the Majeed score were shown by Vaidya et al. (13) to be 87 outstanding, 77 good, and 33 fair.

The Majeed score was exceptional in 14 patients, good in 7, and fair in 2 after 1 year after surgery, according to Xiaotian et al. (11).

Functional results were good in seven individuals and excellent in eight, according to Shetty et al. (17).

At the 6-month follow-up after surgery, the average Majeed score was 92.67 (SD= 5.85), according to Sharma et al. (20). Outcomes were good for 8.3% of patients and outstanding for 91.6% of patients based on clinical grading.

Due to the positive functional result, low complication rate, and excellent union rate seen in our study's follow-up patients, we recommend INFIX for the fixing of anterior ring fractures.

This goes along with the findings of steer et al. (10) who found that the pelvic INFIX approach is a reliable and safe way to treat lesions to the anterior pelvic ring that are currently unstable. This method has been shown to be effective in treating more severe cases of pelvic injuries, and the complication rates are comparable to those of earlier research.

In addition, the findings of Rahul et al. (21) showing INFIX is a more effective method of pelvic stabilization than anterior external fixation are widely accepted.

When the surgical field is contaminated with bowel or bladder content as a result of visceral injuries, intraabdominal surgical procedures, or the presence of suprapubic catheters, external fixators are preferred, according to Bagga et al. (22). significant restrictions, such as being bulky, causing infections at the pin site, osteomyelitis, and decrease loss. Notwithstanding the author's conclusion, INFIX is a radiologically and clinically confirmed alternative to traditional methods of treating anterior ring pelvic fractures. Though INFIX is comparable to external fixators, it offers many benefits, such as stronger supraacetabular screws that provide biomechanical stability, a more comfortable fit for patients, and the potential to facilitate early movement.

Furthermore, in contrast to the study conducted by Owen et al. (23) involving a very obese patient, the current method of fixation using single and double rod structures alone was shown to be insufficient in maintaining acceptable stability. With the insertion of two cross-links between the INFIX's twin rods, the build was successfully salvaged and healed well.

Finally, we do not deny that there are several limitations to our research, including the small sample size. We may apply the procedure to a larger spectrum of pelvic injuries, according to this research, by establishing that INFIX application is a

repeatable technique with relatively minimal problems compared to standard external fixation.

4. CONCLUSION

Injuries involving the pelvic ring may be difficult to cure. Our study's positive clinical and radiographic results indicate that this modified pedicle screw-rod fixation, which is minimally invasive, is an effective method for treating unstable pelvic ring injuries. We think this is the gold standard for treating pelvic ring injuries.

In cases where external fixation would have been employed, the INFIX is a better alternative for anterior pelvic fixation since it reduces the risk of problems.

Both the total axial stiffness and the stiffness at the pubic symphysis were higher with INFIX compared to external fixation. Reduced infection risk, more patient mobility, and decreased nursing needs are some of the benefits of the INFIX versus external fixation.

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