

Clinical comparative analysis on unstable pelvic fractures in the treatment with percutaneous sacroiliac screws and sacroiliac joint anterior plate fixation

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Abstract. – OBJECTIVE: To investigate clinical efficacy of unstable pelvic fractures in the treatment with percutaneous sacroiliac screws and sacroiliac joint anterior plate fixation.

PATIENTS AND METHODS: 64 patients with unstable pelvic fractures were selected in the hospital from January 2008 to June 2011, and were randomly divided into two groups. (32 patients with sacroiliac anterior plate fixation as the control group, and another 32 patients with percutaneous sacroiliac screw internal fixation as the observation group). The perioperative period clinical indicators, postoperative Matta score, postoperative Majeed function score of all patients were compared and analyzed.

RESULTS: The operation time, intraoperative blood loss, wound total length, postoperative fever time, duration of hospitalization in the observation group were significantly less than those in the control group. The complication rate (3.1%) in the observation group was lower than that in the control group (21.9%). The rate of Matta score excellent (96.9%) in the observation group was higher than that in the control group (81.2%) after the treatment. The rate of Majeed function score excellent (93.8%) in the observation group was significantly higher than that in the control group (75%) after the treatment.

CONCLUSIONS: Percutaneous sacroiliac screw internal fixation in the treatment of unstable pelvic fractures has less injury, less bleeding, less pain and rapid recovery which is a safe and effective minimally invasive operation method. The clinical curative effect of percutaneous sacroiliac screw internal fixation is better than anterior plate fixation for the treatment of sacroiliac joint. The full preparation before the surgery and patients with positive can substantially reduce the occurrence of complications rate.

Key Words:

Percutaneous sacroiliac screw internal fixation, Sacroiliac anterior plate fixation, Unstable pelvic fracture.

Introduction

Studies have shown that the mortality of patients with pelvic fractures is about 10% to 20%, mainly due to bleeding, chest injury and brain injury¹. For the treatment of unstable pelvic fractures, anatomic reduction of the fracture and securely fixed is the preferred method. Percutaneous sacroiliac screw surgery with the low infection rate which is less invasive for patients, is the preferred method for the treatment of unstable pelvic fractures²⁻³. In order to investigate clinical curative effect on unstable pelvic fractures in the treatment with percutaneous sacroiliac screws and sacroiliac joint anterior plate fixation, we selected 64 cases of unstable pelvic fracture patients admitted to our hospital from January 2008 to June 2011, who are treated with the different fixed treatment method, which is reported as follows.

Patients and Methods

General Information

From January 2004 to June 2011, 64 consecutive patients treated in our hospital for unstable pelvic fractures were analyzed. Mean age of the patients was 38.4±17.5 years (range 21 to 57). Of the 64 patients, 49 are male and 15 are female. The causes of the injury are road accidents (52 cases) falls from height (10 cases), and crush (2 cases). There were 45 Tile type C1 fractures, 16 type C2 fractures and 3 type C3 fractures.

The 64 patients were randomized divided in to 2 groups (32 patients each), i.e., control group and observation group. In the control group, mean age of the patients was 37.3±16.5 years (range 21 to 55). Of the 32 patients, 25 are male and 7 are female. The causes of the injury are road accidents (25 cases), falls from height (6

cases), and crush (1 case). There were 23 Tile type C1 fractures, 8 type C2 fractures and 1 type C3 fracture. In the conservation group, mean age of the 32 patients was 39.3 ± 18.4 years (range 22 to 57). Of the 32 patients, 24 are male and 8 are female. The causes of the injury are road accidents (27 cases), falls from height (4 cases), and crush (1 case). There were 22 Tile type C1 fractures, 8 type C2 fractures and 2 type C3 fracture. The difference in general information (gender, age, average age, etc.) between the two groups of patients were not significant ($p > 0.05$) but comparable.

Unstable pelvic fracture 64 patients were admitted to our hospital from January 2008 to June 2011, aged 21 to 57 years old, the average age 38.4 ± 17.5 years, including 49 males and 15 females. The causes of injury are as follows: traffic accident 52 patients, falls 10 patients, squeezing 2 patients. The Tile classification is as follows: 45 cases of C1-type patients, 16 cases of patients with type C2, C3 patients with type 3 cases. And hemorrhagic shock 38 patients, associated with other fractures of 27 patients. The time from injury to surgery for all patients is for 1 ~ 18d, the average time is 7.2 ± 4.6 d. All patients were randomly divided into two groups: 32 patients with Sacroiliac anterior plate fixation work as the control group and 32 patients with percutaneous sacroiliac screw internal fixation work as the observation group. The difference in general information (gender, age, average age, etc.) between the two groups of patients were not significant ($p > 0.05$) but comparable.

Methods

The observation group was treated with percutaneous sacroiliac screw internal fixation: The patient is under general anesthesia supine position. Lumbosacral slightly padded fluoroscopy C-arm X-ray machine and EMG machine monitor exploited. Patients with pelvic are manually reducted anteroposterior bit, export bit, entrance bit. Put a Kirschner wire to determine the point of the needle on the patient's body surface, identify the patient's bone density to determine the sacral wing slopes. The cortex is the anterior border of the security zone. Stab the guiding needle into the sacral vertebrae from the security zone so that the needle is located in the center of the sacral wing of slopes and sacral vertebral. For the patients of joint separation, the needle is located in the midline that is upward and forward to be vertical with the flat of the joint. For the patients

with sacral fractures, needlepoint need to cross the midline, the needle is flat to be vertical with the flat of the sacral fractures. When stabbing guide pin into the ipsilateral sacral wing, tip in the side the sacral wing of slopes is recommended, gently drill into the guide pin, measure precision depth employing reverse foot, utilize hollow drill to make sacroiliac screw channel ready, then screw into the 6.5 mm hollow cancellous bone lag screw with a washer added.

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The control group was treated with the sacroiliac anterior plate fixation screw internal fixation: The patient is under general anesthesia supine position, cut the attachment point of the abdominal muscles along the iliac crest to the rear, reveal Iliac fossa, sacroiliac joint in front, presacral outer side, use auxiliary screw reset. Two or three 5-hole pelvic reconstruction plate were fixed into across the sacroiliac joint diagonal line. each steel plate fixed in sacrum side needed two screws T-distal radius steel plate across the sacroiliac joint is fixed by 2 to 3 screws. All fracture patients during treatment without a death by decisive, fast, and effective treatment of the medical staff.

Determining the Efficacy

Matta scoring criteria⁴ Reset effect on the patient's evaluation: (1) Excellent: Pelvic ring separation shift < 4 mm. (2) Good: 4-10 mm. (3)

Table I. The indicators comparison between two groups of patients' perioperative clinical.

Group	Number	Operative time (min)	Blood loss (ml)	The total length of the wound (mm)	Postoperative fever (d)	Hospitalization time (d)
The control group	32	116.7 ± 18.5	517.4 ± 135.1	154.6 ± 17.2	4.0 ± 1.3	17.1 ± 4.6
The observation group	32	84.9 ± 13.2	12.8 ± 3.6	18.5 ± 3.9	2.4 ± 0.8	9.4 ± 2.2
<i>t</i>		6.581	43.527	32.483	8.752	9.168
<i>p</i>		0.019	0.000	0.000	0.002	0.001

Available: 10-20 mm. (4) Bad: > 20 mm. In accordance with the the Majeed function score⁵ of patients with postoperative pain, fracture healing time, functional recovery status of evaluation: (1) Excellent: 85 to 100 points. (2) Good: 70 to 84 points. (3) Available: 55 to 69 points. (4) Bad: < 55 minutes.

Statistical Treatment Analysis

All data is processed by using SPSS16.0 statistical software (SPSS Inc., Chicago, IL, USA). χ^2 test and *t*-test are adopted and. $p < 0.05$ for difference was considered statistically significant.

Results

The Indicators Comparison Between two Groups of Patients' Perioperative Clinical

The result of the comparison of the two groups of patients with perioperative clinical indicators (Table I), the observation group, operative time, blood loss, the total length of the wound, postoperative fever, hospitalization time were significantly less than the control group, the difference was significant ($p < 0.05$), with statistical significance.

Comparison of Postoperative Complications

The result of the comparison of postoperative complications (Table II), the complication rate of the observation group was significantly lower

than the control group, a significant difference ($p < 0.05$) and significant. We found only one patient in the observation group had infection. After irrigation, debridement and topical antibiotic treatment, the infection is under control. The malposition of the screws and the damage of nerve did not occur.

The Comparison of Postoperative of Matta Ratings

Postoperative Matta ratings comparison results (Table III), observation group were rated Matta excellent and good rate was significantly higher than that in the control group, the difference was significant ($p < 0.05$), statistically significant.

Scores Comparison of Postoperative Majeed Function

Postoperative Majeed function score comparison results show the excellent and good rate (Table IV). Postoperative Majeed function score of the observation group was significantly higher. The difference was significant ($p < 0.05$), which was statistically significant.

Discussion

The traditional method of treatment of unstable pelvic fractures often used external fixator fixed pelvis in a state of emergency percutaneous pathway. Such temporary fixation can effectively

Table II. Comparison of postoperative complications (n, %).

Group	Number	Infection	Osteonecrosis	Nonunion	Fracture displacement	The total number of complications
The control group	32	3 (9.4)	1 (3.1)	1 (3.1)	2 (6.3)	7 (21.9)
The observation group	32	1 (3.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.1)
χ^2					5.143	
<i>p</i>					0.023	

Table III. Comparison of postoperative of Matta ratings (n, %).

Group	Number	Excellent	Good	Available	Bad	The total excellent rate
		< 4 mm	4-10 mm	10-20 mm	> 20 mm	
The control group	32	18 (56.3)	8 (25.0)	4 (12.5)	2 (6.3)	26 (81.2)
The observation group	32	24 (75.0)	7 (21.9)	1 (3.1)	0 (0.0)	31 (96.9)
χ^2						4.010
<i>p</i>						0.045

stabilize patients with pelvic fractures and also relieve pain and stop bleeding so as to achieve the purpose of saving the lives of patients⁶. Studies have shown that the sacroiliac screw fixation can be effective for patients with pelvic ring firmly fixed⁷. However, Griffin et al⁸ reported 62 cases of unstable pelvic fractures were treated with sacroiliac screw fixation, 30 cases of fracture instability. Reilly et al⁹ also reported that the quality of fracture reduction will seriously affect the anatomy of the sacrum vestibule, thereby affecting patients sacroiliac screw accuracy and postoperative stability. Stability of unstable pelvic fracture rely on the integrity of the front and rear ring, therefore the ring of the front and rear of the sacroiliac joint and pubic symphysis should be respectively fixed.

Sacroiliac anterior plate fixation can make patients sacroiliac joint stable, but not separation of the pubic symphysis, which has some limitations.

During surgery sacroiliac anterior plate fixation cause greater trauma, thus, increasing the soft tissue damage and the chance of infection. Percutaneous sacral iliac screw fixation is less invasive for patients, but the related surgical technique is difficult to grasp. Once the technology is not in place, surgery may also be damage to the nerves and blood vessels in patients. Therefore it is difficult for the technology to be widely promoted at the grassroots level hospitals. Surgery needs to use a large number of X-ray irradiation, patients inevitably suffer secondary damage. The

studies have shown that in the observation group, operative time, blood loss, the total length of the wound, postoperative fever, hospitalization time were significantly less than the control group, percutaneous sacroiliac screw fixation of unstable pelvic fractures is a morerational minimally invasive surgery, clinical efficacy is more significant. The complication rate of the observation group was significantly lower than the control group, because of smaller wound, shorter operating time, significantly reducing the risk of infection. As long as it is fixed firmly, we can significantly reduce the occurrence of complications. In observation group postoperative Matta rated excellent and good rate was significantly higher than that in the control group, the observation group postoperative the Majeed function rated excellent and good rate was significantly higher. The results demonstrate that postoperative patients recovered well. The results of this study show that the efficacy of the observation group is better than the control group.

Percutaneous sacroiliac screw fixation implemented in patients with Tile C fractures has good mechanical strength advantage, and fixed to good effect. That intraoperative EMG monitoring did not show abnormal EMG, which may be associated with the small sample size of this study, cases and intraoperative needle in the right way. EMG intraoperative detection can be effective in preventing surgery on patients with nervous system damage.

Table IV. Scores for comparison of postoperative Majeed function (n, %).

Group	Number	Excellent	Good	Available	Bad	The total excellent rate
		8-100 score	70-84 score	55-69 score	< 55 score	
The control group	32	13 (40.6)	11 (34.4)	5 (15.6)	3 (9.4)	24 (75.0)
The observation group	32	19 (59.4)	11 (34.4)	2 (6.3)	0 (0.0)	30 (93.8)
χ^2						4.267
<i>p</i>						0.039

Conclusions

Percutaneous sacral iliac screw fixation of unstable pelvic fractures have less damage, less bleeding, pain light, quick recovery, which is a safe and effective minimally invasive surgical techniques. The clinical curative effect of percutaneous sacroiliac screw internal fixation is better than anterior plate fixation for the treatment of sacroiliac joint. The full preparation before the surgery and patients with positive cooperation can substantially reduce the occurrence of complications rate, which is worthy of clinical use.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

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