

## Observation on closed reduction and internal fixation with external fixation in treating unstable pelvic fracture.

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### Abstract

**Objective:** To explore the clinical effects of percutaneous anterior screw fixation and external fixation on unstable pelvic fracture.

**Methods:** 80 patients with unstable pelvic fracture from January 2013 to 2015 were selected and then divided into study group and control group according to random number table. The control group was given an open reduction internal fixation and study group was given percutaneous anterior screw fixation and external fixation. Compared surgery time, blood loss of operation, iconography complete recovery time, complete load walk time, comprehensive clinical effects and complications after surgery of patients in two groups.

**Results:** Surgery time, blood loss of operation, iconography complete recovery time, complete load walk time in the study group were better than patients in the control group ( $P<0.05$ ). Good rate of the study group was 95.0%, 70.0% in the control group, the study group was better compared with the control group ( $P<0.05$ ); Complication rate after surgery is less than the control group obviously ( $P<0.05$ ).

**Conclusion:** The therapeutic effects of closed reduction internal fixation and external fixation are better. Short surgery time, subtle wound, low bleeding, all meet modern surgical minimally invasive concept, which can be applied to clinic.

**Keywords:** Closed reduction internal fixation, External fixation, Unstable pelvic fracture.

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### Introduction

Pelvis is circular structure, it composes of two hip bones and one sacrococcyx, of which, two hip bones compose of bilateral ilium, pubis and Y cartilage through ischium, and through pubic symphysis and sacroiliac joint form solid scleroma [1]. Pelvic fracture often breaks off ilium and sacrum. Classification methods of pelvic fracture are relatively various. Clinical common classification methods according to pelvic stable can be divided into stable type, partial stable type and unstable type [2]. Among the others, the unstable injury is serious in degree, wide in range and is mainly caused by direct violence greatly. So it often needs urgent surgery. Routine treatment method for unstable pelvic fracture is open reduction and internal fixation. However, clinical study finds that wound of open reduction and internal fixation is big and recovery time is long [3]. Percutaneous internal screw fixation is a new treatment method for treating unstable pelvic fracture. This

study is designed to explore its effect on operating time and post-operation recovery condition of the patients. Details in this study are reported as follows.

### Materials and Methods

#### *Clinical data*

80 patients with unstable pelvic fracture from January 2013 to 2015 were selected and then divided into the study group and the control group according to random number table. There were 40 patients in the study group, 23 male patients and 17 female patients. The age was from 17-58 y old. The average age was  $30 \pm 1.5$  y old. There were 40 patients in the control group, consisting of 21 male patients and 19 female patients. The age was from 20-60 y old. The average age was  $32 \pm 2.5$  y old. General data of patients in two groups are compared in Table 1.

**Table 1.** Statistical table of general data of patients in two groups.

Group	Case number (n)	Age (y)	Sex (n)
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		Ranges of age	Average age	Male	Female
The study group	40	17~58	30 ± 1.5	23	17
The control group	40	20~60	32 ± 2.5	21	19
X <sup>2</sup> value		0.946		1.032	
P value		0.073		0.084	

Among the others, the study group included 27 car accident patients, 9 high fall injuries and 4 fall damages. The control group was composed of 25 car accident patients, 10 high fall injuries and 5 fall damages. There were no statistical differences in fracture reason distribution of patients in two groups ( $P>0.05$ ).

This study content informed patients and their families and signed informed consent. This study was approved by Ethics Committee in our hospital.

### ***Exclusive standards***

The selected patients of this study, who met any item in following, should be excluded from this study: First, patients who had been diagnosed as unstable pelvic fracture accurately (combined with trauma history, symptoms, signs and manifestations of iconography); Second, patients with severe heart, liver, kidney function failure; Third, patients able to tolerate anesthesia and surgery risk; Fourth, patients without osteoporosis, bone tumors and similar diseases; Fifth, the injury time of patients are shorter than one week.

### ***Emergency management methods***

All patients, after admitted into hospital were given vital signs monitor and vital signs injury observation. If there were visceral injury, we should visit relative department to give urgent consultation and management.

Partial acute injury patients with severe injury and even with life risk should be given urgent surgery after life signs and hemodynamics became stable, and about one week after trauma.

### ***Surgery methods of patients in the control group***

Patients in the control group were given open reduction internal fixation. The methods: Patients were given venous general anesthesia, open reduction internal fixation after complete anesthesia.

Penannular and posterior loop of pelvis were given reduction. Proper internal fixation bolt was implanted after reduction completed. Then, scleroma in fracture part was fixed. Wound was sutured after conformation.

### ***Surgery methods of patients in study group***

Patient were given general anesthesia before surgery and then lied down on operating table. 0.8 cm incision behind 2 cm of anterior superior spine was made with blunt dissection. This

study used drill (3.2 mm) to drill through cortex of iliac crest, and then put into first external fixed bolt along inner wall of ilium. The same incision in anterior inferior spine was given with blunt dissection. Then this study used drill to drill through cortex, put into second bolt paralleling to first bolt, implant external fixation bolt according to the same methods of lateral iliac spine. Furthermore, then patients were given external fixation bolt correction, which mainly included entropion and ectropion of pelvis, anterior and posterior rotation, external fixation connection pole and lateral fixation part after reduction completion. This study adopted bedside X ray to perspective whether pelvis of patients were good, lock external fixation bolt after conformation, then 0.8 cm incision was cut off in pubic symphysis and given blunt dissection. We put into hollow screw to fix fracture part of pubic symphysis, if there were fracture in sacroiliac joint, implanting hollow bolt into sacroiliac joint.

### ***Treatment after surgery and rehabilitation***

Patients after surgery were given routine broad-spectrum antibiotics for 5 d, dressing change every day in bolt implantation place to prevent infection. Incisions of patients in the control group were given dressing change every day. They can do subtle activity under the help of auxiliary device and families support after three weeks. Patients in the study group were removed external fixation supporter about six weeks, bolt in one year after surgery.

### ***Evaluation indexes***

Compared surgery time, blood loss of operation, iconography complete recovery time, complete load walk time, comprehensive clinical effects and complications of patients in two groups. The evaluation methods of clinical effects were as follow: Four grades of superior, good, fair and poor. Specific standards were, first, excellent, anatomic reduction was good. There were no malformations in pelvis after surgery. The lengths of two lower limbs were equal. Hip bone can move freely. Walking gait had no abnormality. Second, good, anatomic reduction was good. Pelvis had pain one in a while after surgery. The lengths of two lower limbs were unequal. But the difference was under 0.5 cm. Hip bone can move freely. Walking gait was normal. Third, fair, anatomic reduction was good basically. Pelvis had slight pain after surgery. The lengths of two lower limbs were unequal. Differences were from 0.5 to 2.0 cm. Hip bone activity, jogging and brisk walk were limited. Fourth, poor, anatomic reduction was poor. Pelvis often had pain after surgery and

pain feeling was obvious. Limb shortening was over 2.0 cm. Activity of hip bone was limited obviously, which caused limitation of slow walking. Good rate of therapeutic effects=(excellent number+good case number)/total cases × 100%. Postoperative complications after surgery were compared, including infection, deep venous thrombosis in lower limbs and osteoarthritis etc.

**Statistical methods**

Data of this study used SPSS 19.0 to analyze. Measurement data used t-test. Enumeration data used x<sup>2</sup> test.

**Table 2.** General conditions comparison of patients in two groups.

Group	Cases (n)	Surgery time (min)	Bleeding in surgery (ml)	Iconography complete recovery time	Complete load walk
Study	40	58.6 ± 10.2	172.5 ± 36.0	124.6 ± 12.5	154.9 ± 9.4
Control	40	109.2 ± 12.9	595.1 ± 85.3	184.7 ± 20.1	224.1
χ <sup>2</sup>		5.842	5.194	4.742	6.032
P		0.021	0.026	0.032	0.018

From Table 2, we can see the surgery time, blood loss of operation, iconography complete recovery time, complete load walk time of patients in the study.

**Table 3.** Comparison table of surgery effects of patients in two groups.

Group	Cases (n)	Excellent (n(%))	Good (n(%))	Fair (n(%))	Poor (n(%))	Good rate (%)
Study	40	23 (57.5)	15 (37.5)	2 (5.0)	0 (0)	95
Control	40	16 (40.0)	12 (30.0)	10 (25.0)	2 (5.0)	70
χ <sup>2</sup>						4.932
P						0.033

**Complications occurrence conditions of patients in two groups after surgery**

There were 5 cases with complications in the study group after surgery, including: 2 cases with infection, 1 case with deep venous thrombosis of lower limb and 2 cases with osteoarthritis.

**Table 4.** Comparison of adverse reactions of patients in two groups.

Group	Case number (n)	Infection (%)	Deep venous thrombosis of lower limb (n (%))	Osteoarthritis (n (%))	Occurrence rate of adverse effect (n (%))
Study group	40	2 (5.5)	1 (2.5)	2 (4.0)	5 (12.5)
Control group	40	7 (17.5)	3 (7.5)	3 (7.5)	12 (30.0)
χ <sup>2</sup>					4.692
P					0.024

There was statistical difference for comparison of two groups (P<0.05).

Detection standards were a=0.05. When P<0.05, there were statistical differences.

**Results**

**General conditions of surgery of patients in two groups**

Compared surgery time, blood loss of operation, iconography complete recovery time, complete load walk time in two groups, seen in Table 2.

**Surgery effects conditions of patients in two groups**

Surgery effects of patients in two groups seen in Table 3.

There were 12 cases with postoperative complications in the control group, including 7 cases with infection, 2 cases with deep venous thrombosis of lower limbs and 3 cases with osteoarthritis.

Detailed conditions were compared in the following Table 4.

## Discussion

Pelvic fracture is one kind of common in traumatic fracture. Reasons are sudden strong violence mostly. Unstable fracture is the most common in pelvic fracture [4,5]. Discussion above, pelvis is circular structure. When people are upright, gravity line through sacroiliac joint and body of ilium to bilateral hip joints, it is sacrum bow; when people are sitting, gravity line through sacroiliac joint and body of ilium, ramus of ischium to bilateral ischial tuberosity, it is ischiosacral arch. There are another two assistant arch, one assistant arch goes through pubic superior branch and pubic symphysis to bilateral hip joints for connecting sacrum arch and another assistant arch; another assistant arch goes through ischium ascending branch and pubic symphysis to bilateral ischial tuberosity for connecting ischial tuberosity [6]. When fracture occurs, assistant arch breaks off first, next, main arch breaks off, assistant breaks off in advance, unstable fracture occurs, posterior arch has complete injury and with unstable rotation and vertical bits [7]. Tile divides unstable fracture into following types: unilateral injury, ilium fracture, dislocation and fracture of sacroiliac joint, sacrum fracture, bilateral injury [8]. Unstable fracture has severe illness state, accompanying with complications and even threat patient's life because the fracture range is wide, stable data statistics, clinical fatality rate of patients with pelvic unstable fracture is about 15% [9,10].

For unstable fracture, traditional surgical treatment is open reduction internal fixation, including internal fixation materials of bolt of cancellous bone of sacroiliac joint, front four-hole plates of sacroiliac joint, which can provide powerful internal fixation for anterior and posterior loop of pelvis. But traumatic surgery has bigger trauma for patients. It has limitations for patients who cannot tolerate open pelvis treatment. At the same time, open surgery also increases chances of vessels, neurological injury and infection. Joint function of patients after surgery is limited. Percutaneous iliosacral screw provides new thinking way for internal fixation. To definite fracture part of patients by X-ray and CT scanning before surgery, and formulate implant and fixation methods of percutaneous iliosacral screw based on this. Tosounidis et al. thinks that using percutaneous iliosacral screw to do internal fixation for pelvic fracture, which can reduce infection and osteoarthritis rate greatly [11]. But unstable pelvic fracture, because of unstable perpendicularity and rotation, adopting percutaneous iliosacral screw will cause transposition of fracture broken ends and rotation malformation of patients after surgery. Therefore, some scholars come up with the basis of internal fixation bolt, using internal fixation supporter to do fixation [12].

This study finds that, using percutaneous screw to do closed reduction fixation and external fixation, its surgery time, blood loss of operation, iconography complete recovery time, complete load walk time all better than traditional open reduction fixation patients ( $P<0.05$ ); in follow-up survey,

comprehensive clinical effects of patients in the study group with combination treatment also better than patients in the control group with traditional surgical methods obviously ( $P<0.05$ ). Comparing incidence rate of complications after surgery, also patients in the study group is better ( $P<0.05$ ).

In conclusion, closed reduction and internal fixation with external fixation in treating unstable pelvic fracture is good. Surgical time is short, wound is small and bleeding is less, which meets modern surgical minimally invasive concept that can be applied to clinic working.

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