ORIGINAL ARTICLE
นิพนธ์ต้นฉบับ

Immediate Stabilization by External Fixator in Unstable Fractures of the Pelvis : Results in 214 Patients

*Saranatra Waikakul**
*Tossas Harnrungroj**
*Vichai Vanadurongwan**

Saranatra Waikakul, Tossas Harnrungroj, Vichai Vanadurongwan. Immediate stabilization by external fixator in unstable fractures of the pelvis : Results in 214 patients. Thai J Surgery 1997; 18 (2) : 59-65

This is the report of our experience in 214 patients with unstable fracture of the pelvis. External fixators could be used as definitive fracture management in 72 patients (35%), and combined with open reduction and internal fixation in 91 patients (45%). After external fixation of the pelvic ring, only 10/94 patients (11%) who had associated acetabular fractures still required open reduction and internal fixation of the acetabulum. External fixation can reduce the need for operations in patients with unstable fracture and acetabular involvement. This data provided encouraging results of external fixation on reconstructive surgery of pelvic and acetabular fractures with low levels of complications.

Index: Pelvic fracture, External fixator

Reprint request : Saranatra Waikakul, M.D.
Department of Orthopedic Surgery,
Faculty of Medicine, Siriraj Hospital,
Mahidol University, Bangkok 10700, Thailand

* *Department of Orthopedic Surgery, Faculty of Medicine, Siriraj Hospital*

Introduction

Severe loss of effective circulating blood volume is the most critical condition that may lead to death in patients with unstable pelvic fractures.[1-6] The causes of this bleeding are the fracture itself, tearing of venous plexus in the pelvis, arterial injury or injury of internal organs.[1-5] To lessen blood loss after the fracture, immediate stabilization of the pelvis should be used for temporary reduction and immobilization of the fracture, prevention of further injury to the internal organs and to create a tamponade effect on the venous plexus by decreasing the intrapelvic volume.[1-5] The most commonly used instrument in Thailand for such stabitization is the external fixator which can provide anterior stabilization. The purpose of this article is to report our experience and results of management of cases of unstable fractured pelvis by immediate reduction and stabilization with long-term follow-up.

Patients and Methods

The study was designed as a prospective research survey with 2 year follow-up. All patients who had fractures of the pelvis who came to our service within 3 hours after the injuries were included in the study. Orthopedic evaluation and management were carried out at a very early stage as a general surgical approach. All patients were promptly resuscitated with adequate intravenous fluid and blood transfusion if required. Immediate external fixation for reduction and anterior stabilization were performed when unstable fractures were detected. The procedure was carried out before the patients underwent further investigations to determine if there were associated internal organ and soft tissue injuries. This was done by exploratory laparotomy or close observation in the intermediate ward. Pain control was carried out promptly for every patient.

Records were made of the patients' biographic data, types of fractures using Tile's classification, associated internal organ and soft tissue injuries and management, results of the treatment, general condition of the patients in the perioperative period, condition following reconstructive surgery, and complications. All patients were followed up periodically for at least 2 years.

Results

There were 214 patients in our study, with 152 males and 62 females. All had unstable pelvic fractures which were Tile's type B in 139 patients and Tile's type C in the remaining 75 patients (Tables 1 and 2). Most of the patients were in their active life period and most of them had traffic related injuries (Table 1). Open fractures were found in 31 patients (14%) with 9 in the type B and 22 in the type C pelvic fractures. All patients had fractures at the anterior and posterior pelvic ring. Sacral fracture was found in 39 patients, (18%), 12 in type B and 27 in type C. Fracture acetabulum was found in 94 patients (44%) with 78 in type B and 16 in type C. Nerve injury was the most common associated injury, following by multiple trauma and genitourinary injury (Table 3). Associated injuries were found in 86 patients (40%) with 32 patients in type B and 54 patients in type C pelvic fracture (Table 3).

Eleven patients died because of the severe injuries and loss of blood (Table 4). All had open fractures with multiple trauma. Blood transfusions were needed more often in C type than B type pelvic fractures, and hospitalization was also prolonged for the C type (Table 4). An external fixator could be used as the definitive stabilizer in 163 patients (80%) However, 91 patients (45%) required both operations with open reduction and internal fixation (Table 5). Only 10/94 patients (11%) who had associated acetabular fractures needed open reduction and internal fixation (Table 5). Decompression of the sacral nerve root was needed in 12/39 patients (30.7%) who had fractures of the sacrum.

Immediate complications were found in 73/203 patients (36%). The more common complications were 1) inadequate reduction with residual displacement of

Table 1. Biographic data and the types of unstable pelvic fractures.

Tile's classification	B n = 139	C n = 75	Total n = 214
Sex : Male	99	53	152 (71%)
: Female	40	22	62 (29%)
Age (years)			
: Average	31.8	25.1	
: Range	16 to 56	13 to 42	
Causes of injury			
: Traffic related accident	130	73	203 (95%)
: Falling from a height	9	2	11 (5%)
Open fracture	9	22	31 (14%)
Fracture acetabulum	78	16	94 (44%)
Sacral fracture	12	27	39 (18%)

Table 2. Types of pelvic fracture and the numbers of the patients.

Tile's classification	Male	Female	Total
B_1	12	14	26
B_2	49	29	78
B_3	29	6	35
C_1	27	2	29
C_2	22	8	30
C_3	13	3	16
Total	152	62	214

Table 3. Associated injuries and types of pelvic fractures.

Tile's classification / Associated injuries	B			C			
	B_1 n = 26	B_2 n = 78	B_3 n = 35	C_1 n = 29	C_2 n = 30	C_3 n = 16	Total n=214
Genitourinary system	1	2	3	1	2	1	10
Gastrointestinal system	-	2	1	1	1	1	6
Head injury	-	1	-	-	-	1	2
Peripheral nevous system	1	2	7	7	11	3	31
Cardiovascular and pulmonary systems	-	-	1	-	1	-	2
Spinal injury	-	-	-	-	1	1	2
Extremity injury	-	1	1	-	2	1	5
Skin	-	-	-	-	1	1	2
Multiple trauma	1	2	6	2	8	7	26
Total	3(11%)	10(13%)	19(54%)	11(38%)	27(90%)	16(100%)	86(40%)

Table 4. Immediate results of the treatments.

Tile's classification	B n = 139	C n = 75	Total n = 214
Death	4	7	11
Numbers of blood transfusion (units)			
: Average	4.9 + 3.8	12.9 + 7.1 ($p < 0.0001$)	
: Range	1 to 11	3 to 25	
Hospitalization (days)			
: Average	16.9 + 7.9	28.1 + 16.9 ($p < 0.001$)	
: Range	3 to 29	6 to 52	
Negative exploratory laparotomy	5	11	16

Table 5. Management of fractured pelvis.

Tiles classification	B n = 135			C n = 68			Total
	B_1 n = 26	B_2 n = 78	B_3 n = 31	C_1 n = 29	C_2 n = 28	C_3 n = 11	n = 203
Continued using external fixation as the definitive treatment with some readjustment	15	37	14	6	-	-	72
Combined external fixation and open reduction and internal fixation of pelvic ring and acetabulum	6	27	13	12	17	6	81
Removed external fixation and changed to open reduction and internal fixation of pelvic ring and acetabulum	3	10	2	9	11	5	40
Continued using external fixation as the definitive treatment and open reduction and internal fixation of the acetabulum	2	4	2	2	-	-	10

more than 0.5 cm, 2) infection of the pelvic fractures, 3) pulmonary complications and 4) complications in other systems and organs. Nineteen patients (27%) had only 1 immediate complication, while 39 (53%) had 2, 10 (13%) had 3, and 5 patients (7%) had all 4 of the immediate complications, just mentioned. Patients with type B pelvic fractures had a smaller number of complications (Table 6). Nine patients had infection of the pelvic fracture, and all of these had open fractures. Six patients responsed well to drainage and debridement; however, 3 patients had associated septic arthritis, and hip fusion was needed later. Forty two patients (19%) had at least 1 pin tract infection at the external fixation side; however, all healed after removal of the pins when the fracture healed. Pin loosening was found in 39/42 patients who had pin tract infection.

At the 2 year follow-up, there were 33 patients (16%) who had residual complications. These complications were

1) severe chronic pelvic pain with visual analog scales larger than 5,

2) limb length discrepancy,

3) a decrease in sexual activity,

4) arthritis of the involved hip, and

5) complications of other systems.

Thirteen patients (39%) had 1 complication, while

9 (27%) had 2, 9 (27%) had 3, and 2 patients (7%) had 4 residual complications. No chronic infection was observed. The patients with type B pelvic fracture had fewer residual compli- cations than those with type C fractures.

Discussion

Unstable pelvic fractures have high mortality and morbidity rates.[1-6] With the use of an external fixator, pelvic stabilizer and pelvic clamp for immediate stabilization of the pelvic fractures, the survival rate of these patients is increased.[1,2,4,5,7,8] Early reduction and stabilization of the unstable pelvic fractures can lessen bleeding and allow the surgical team to have sufficient time for management planning.

Most of our patients had high speed traffic injuries and a very few patients had the fractures due to falling from a height. The latter patients had a higher incidence of associated injuries and had high motality rates. All patients who died had open fractures and multiple trauma. Associated head injury was found in only 2 patients. They had pelvic fractures due to falling from a height. This data may support required use of helmets for motorcyclists and their passengers. Peripheral nerve injury was the most common associated injury which can result in chronic pelvic pain. Pain control in these patients was performed consciously and at a very early phase; however,17 patients (8%), 7 in type B and 10 in type C fracture, still had chronic pelvic pain.

Our mortality rate was 5% (11 patients) of which were 3% were in type B and 9% were in type C pelvic fractures. These figures are lower than in other reports and this may be a result of our early active resuscitation, reduction and stabilization of the pelvic fracture and inducement of pain control.[1-6]

External fixators could be used as definitive fracture management in 72 patients (35%), and combined with open reduction and internal fixation in 91 patients (45%). After external fixation of the pelvic ring, only 10/94 patients (11%) who had associated acetabular fractures still required open reduction and internal fixation of the acetabulum. External fixation can reduce the need for operations in patients with unstable fracture and acetabular involvement. This data provided encouraging results of externa fixation on reconstructive surgery of pelvic and acetabular fractures with low levels of complications. There were no serious complications which related directly to the external fixation, as has previously been reported.[6,9] Moreover, there was no chronic pin tract infection. However, as there were 39 patients (19%) who had pin loosening, better pinning of the iliac crest should be carried out with better guiding. The immediate and residual complications at 2 year follow-up were still high in type C pelvic fractures, which is similar to other reports.[6,10] Management of this fracture should be studied and it can be improved with better evaluation, treatment and instrumentation.

References

1. Alonso JE, Lee J, Burgess AR, Browner BP. The management of complex orthopaedic injuries. Surg Clin North Am 1996 Aug; 76(4) : 879-903
2. Browner BP, Cole JD. Initial management of pelvic ring disruption. Instructional Course Lecture 1988; 37 : 129-37
3. Pohlemann T, Tscherne H, Baumgortel F, Egbers HJ, Evler E, Maurer F, Fell M, Mayr E, Quirini WW, Schlickewei W, Weinberg A. Pelvic fractures : epidemiology, therapy and long-term outcome. Overview of the multicenter study of the Pelvic Study Group. Unfallchirug 1996 Mar; 99(3) : 160-7
4. Riemer BL, Butterfield SL, Diamond DL, Young JC, Raves JJ, Cottingtion E, Kislan K. Acute mortality associated with injuries to the pelvic ring: the role of early patient mobilization and external fixation. J Trauma 1993 Nov; 35(5) : 671-51
5. Agnew SG. Hemodynamically unstable pelvic fractures. Orthop Clin North Am 1994 Oct; 25(4) : 715-21
6. Draijer F, Egbers HJ, Havemann D, Zimmermann M. Results of follow-up of conservatively and surgically treated injuries of the pelvic ring within the scope of a prospective study. Unfallchirug 1995 Jul; 98(7) : 355-60
7. Ghanayem AS, Stover MD, Goldstein JA, Bellon E, Wilber JH. Emergent treatment of pelvic fracture. Comparison of methods for stabilization. Clin Orthop 1995 Sep; 318 : 75-80
8. Ganz R, Krushell RJ, Jakob RP, Kuffer J. The antishock pelvic clamp. Clin Orthop 1991 Jun; 267 : 71-8
9. Tillman RM, Kenny NW. Small bowel obstruction as a complication of the use of an external fixator in a pelvic fracture. Injury 1991 Jan; 22(1) : 71-2
10. Pohlemann T, Bosch U, Gansslen A, Tscherne H. The Hanover experience in management of pelvic fractures. Clin Orthop 1994 Aug; 305 : 69-80