Immediate Stabilization of Unstable Pelvic Fractures *Versus* Delayed Stabilization

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Abstract

To compare the immediate and long term outcome of immediate stabilization of the unstable pelvic fractures to delayed stabilization with simple external fixation, the study was carried out as a paralell trial with 2 year follow-up. There were 112 patients with 69 males and 43 females who had unstable pelvic fractures. They were allocated randomly into 2 groups. In group 1, 40 patients, conventional management was performed while in group 2, 72 patients, reduction and anterior stabilization of pelvic fractures with a simple external fixator were carried out immediately just after the unstable fractures were detected.

Blood transfusion, post operative pain, need of reconstructive surgery of the pelvic fractures and late deformities were less in the group 2. Immediate anterior reduction and stabilization of the unstable pelvic fractures gave encouraging results.

Key word : Pelvic Fractures, External Fixation, Post-operative Pain Control, Stabilization of Pelvic Fractures

The most important complication of unstable pelvic fractures is bleeding from the internal organs, venous plexus and fracture into the potential space around the pelvis, retroperitoneal space and intra peritoneal cavity[1-4]. To lessen blood loss, immediate reduction and stabilization with external fixation, pelvic clamp and pelvic stabilizer are used to fix the fracture in position and to provide a temponade effect on the venous plexus[5-9]. These instrumentations should be performed before exploratory laparotomy is carried out[10]. However, in particular conditions, pelvic instrumentation for reduction and stabilization has been delayed. This study was performed to find out the results of management in these unstable fractured pelvises with immediate instrumentation *versus* delayed instrumentation.

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PATIENTS AND METHOD

The study was designed as a parallel study with close observation at the perioperative period and long term follow-up. The inclusion criteria were patients who had unstable fractures, using Tile's classification, who came to our service within a few hours after the injuries. No fracture of other bones was observed. They were randomly allocated into 2 groups. In group 1, the patients underwent the conventional approach by general surgery. After complete physical examination and investigation, the patients were operated on to treat the associated internal organ injuries or transferred to the intermediate ward for close observation. Then, orthopaedic consultation was done. During the period, traction *via* lower extremity and/or pelvic sling was carried out to reduce and stabilize the pelvic fractures. In group 2, just after the unstable fractures of the pelvis were detected from physical examination and conventional plain radiograph, immediate external fixation, using 2 Shantz pin fixation at each anterior iliac crest and simple bars, was performed to reduce and stabilize the fractures as soon as possible before further investigation, observation or exploratory laparotomy. The fractures were reevaluated after general surgical intervention for readjustment and the possibility of performing more rigid fixation or reconstruction.

Post operative management and pain control of both groups, were similar. Intermittent doses of 0.2 mg/kg of morphine sulphate intramuscular every 6 hours were used for pain control. Vital signs and central venous pressure were monitored. Adequate intravenous fluid and blood transfusion were administered to keep the patients in optimum condition. Other nursing care was carried out as in conventional severe fracture patients. All patients were closely observed for 7 days, then reconstructive surgery was performed in particular patients while the others received conservative treatment. The type and results of the surgery of the 2 groups were evaluated. All patients were followed-up periodically for at least 2 years.

Patients' biographic data, types of fractures, associated internal organ injuries, perioperative condition, the need for reconstructive surgery, and the results of treatment were recorded and compared between the groups. The discrete data were analysed by Chi-square test and the continuous data were analysed by Student-T-Test.

RESULTS

The study was performed at Siriraj Hospital and Srivichai Hospital from 1989 to 1993. There were 112 patients with 69 males and 43 females. All patients came to our service within 3 hours after the injuries. The biographic data, general condition at arrival and types of fractures in both groups were comparable (Table 1). The associated internal organ injuries and general surgical intervention of both groups were also similar (Table 2).

Table 1. Biographic data of the patients. Their general condition on arrival and types of pelvic fracture were comparable.

		Group 1 n = 40	Group 2 n = 72	P-value
Sex :	Male	28	41	$x^2 = 1.34$
	Female	12	31	P>0.05
Age :	Average	35.67±12.2	35.83±18.7	
	Range	23 to 54	15 to 65	P=0.47
Vital signs at arrival :				
Heart rate above 120/min		19	42	$x^2 = 0.00013$
Systolic blood pressure below 70 mmHg		15	33	df = 1
				P>0.05
Types of pelvic fracture (Tile's classification)				
Rotational instability		10	15	
Rotational instability with acetabular fracture		4	8	
Rotational and vertical instability		14	20	$x^2 = 2.187$
				df = 4
Vertical instability with acetabular fracture		6	19	P>0.05
Vertical and rotational instrability with acetabular fracture		6	10	

Table 2. Associated internal organ injuries and treatments in the patients.

Associated injuries	Group 1 n = 40		Group 2 n = 72	
	Conservation treatment	Operative treatment	Conservative treatment	Operative treatment
KUB system	2 (5%)	4 (10%)	4 (5.5%)	5 (6.9%)
GI tract including liver and spleen	-	5 (12.5%)	-	8 (11.1%)
Lumbosacral plexus	4 (10%)	-	7 (9.7%)	-
Other systems	1 (2.5%)	2 (5.1%)	2 (2.7%)	4 (5.5%)
Negative exploration	-	6 (15%)	-	1 (1.4%)
Tatal	24		31	

Table 3. Results of the treatment at perioperative period.

	Group 1 n = 40	Group 2 n = 72	P-value
No of blood transfusions (Units)			
Average	10.7±6.3	4.9±3.9	P=0.0001
Range	5 to 21	0 to 10	
No of patients who needed blood transfusion			
No	-	10	
1 to 5	10	41	
6 to 10	9	15	$x^2 = 8.49$
11 to 15	9	6	P<0.05
16 to 20	10	-	
> 20	2	-	
Period of hospitalization in days			
Average	25.4±17.4	11.4±8.6	P=0.0014
Range	6 to 62	3 to 19	
Death	2	1	

Table 4. Numbers of patients who had pain in different levels which was defined by visual analog scale (VAS), 0 to 3 meant mild, 3 to 5 meant moderate and over 5 meant severe.

Groups	VAS	Post operative day						
		1	2	3	4	5	6	7
1 (n=38)	0-3	-	-	3	11	18	23	27
	3-5	12	26	29	25	20	15	11
	>5	26	12	6	2	-	-	-
2 (n=71)	0-3	-	20	36	49	58	63	69
	3-5	51	40	31	22	13	8	2
	>5	20	11	4	-	-	-	-
x^2 =		14.83	3.84	9.27	14.48	12.23	10.19	13.69
P-value		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

The average time for immediate external fixation in group 2 was 12.6±2.6 minutes, ranging from 7 to 15 minutes.

Blood transfusion was less in group 2, both with regard to numbers of patients who needed blood transfusion and the amount of blood (Table 3). The period of hospitalization of group 2 was significationly less than group 1. Two patients in group 1 and 1 patient in group 2 died because of severe injury. The severity of post operative pain in group 2 was significantly less than group 1 (Table 4). Post operative complications in group 2 were also less than group 1 (Table 5). The need for reconstructive surgery of the acetabulum and pelvis was also less in group 2 (Table 6). Late deformities and disability in group 2 were less than group 1 at the 2 year follow-up (Table 7).

Table 5. Post operative complications of the patients.

	Group 1 n = 38	Group 2 n = 71
Respiratory system	14 (36.8%)	2 (2.8%)
GI tract	3 (7.9%)	1 (1.4%)
KUB	7 (18.4%)	1 (1.4%)
Bed sore	3 (7.9%)	-
Others	2 (5.2%)	2 (2.8%)

$x^2 = 23.26$
$P<0.05$

DISCUSSION

Immediate stabilization of the unstable fractured pelvis by external fixator is now a common procedure[1-7]. However, in many hospitals in Thailand, this instrumentation is still ignored. Many general surgeons feel unhappy in doing abdominal or perineal surgery in patients who had pelvic stabilization by external fixator. Actually, the external fixator

Table 6. Following reconstructions of the pelvis and acetabulum.

	Group 1 n = 38	Group 2 n = 71	P-value
Closed reduction and external fixation and readjustment of external fixator	12	2	$x^2=6.96$
Open reduction and internal fixation	22	26	$P<0.05$
Total	34	28	

Table 7. At the 2 year follow-up residual deformities and disability of the patients in group 2 were less than group 1.

	Group 1 n = 38	Group 2 n = 71	P-value
Limb length discripancy more than 1.5 cm	6	2	$x^2 = 4.36$ $P>0.05$
Limitation in hip motion more than 20 degrees	15	2	$x^2 = 22.55$ $P>0.05$
Hip arthritis	4 (10.5%)	1 (1.3%)	
SI arthritis which needed fusion	5 (13.1%)	1 (1.3%)	
Residual nerve palsy	3	5	$x^2 = 2.22$ $P>0.05$
Decrease in sexual activity	10	2	$x^2 = 11.6$ $P>0.05$
Chronic pelvic pain (VAS>5)	6	2	$x^2 = 4.36$ $P>0.05$

can be adjusted to allow adequate room for general surgery. Although pelvic clamp and pelvic stabilizer can provide more space for general surgery and provide more stability to the posterior pelvis than the external fixator[11,12], these instruments are not suitable for some types of pelvic fracture such as lateral compression injuries[6,7]. External fixator is more flexible and can be used in most types of pelvic fractures[9].

In unstable fractured pelvis, the abdominal muscles can provide some stability to the fractures and also provide temponade effect on the venous plexus in the pelvis. If exploratory laparotomy is performed without fixation of the unstable pelvic fracture, more blood loss and higher mortality and morbidity of the patients may be the result[10]. Although, most previous studies preferred immediate stabilization of the fracture pelvis, there were very limited parallel studies with long term follow-up[13,14]. The details about the patients in the critical period were also not stated clearly.

In our study, the patients in both groups were similar at the pretrial period (Table 1 and 2). In group 2, negative exploratory laparotomy was found in only 1/72 patients or 1.3 per cent compared to 6/40 patients or 15 per cent in group 1. Immediate external fixation could prevent unnecessary exploratory laparotomy because it restored effective circulation volume and the surgeons in charge could have enough time to perform proper decision making and diagnosis.

After the definitive primary treatment, the patients in group 2 had better results in terms of hemodynamic, pain control, complications, and early ambulation (Table 3, 4 and 5). Fewer lung complications were found in group 2 as the patients could sit and ambulate very early[15]. Orthopaedic reconstruction of the pelvic and acetabulum were also less in group 2 than group 1 because the pelvic ring had been stabilized (Table 6). Twelve patients who had associated fractured acetabulum with marked displacement could be treated conservatively by closed reduction after pelvic rings had been stabilized by the external fixator.

At the 2 year follow-up there was also less residual deformity in group 2 than group 1, except residual nerve palsy (Table 7). External fixation could bring the fragments into better position before definite stabilization was performed. This condition made it easier for open reduction and internal fixation. In 45 patients, external fixation could be used as definitive treatment for the fractures, which resulted in less surgery and hospitalization day.

SUMMARY

Immediate external fixation in unstable pelvic fractures gave better immediate and long term results than delayed pelvic stabilization.

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เปรียบเทียบผลการรักษากระดูกเชิงกรานหักชนิดไม่มั่นคง ด้วยการยึดตรึงกระดูกเชิงกรานจากภายนอกทันทีหลังได้รับการวินิจฉัยกับยึดตรึงกระดูกหักหลังการรักษาทั่วไปและการผ่าตัดรักษาอวัยวะภายใน

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เปรียบเทียบผลการรักษาในระยะแรกและเมื่อติดตามผลการรักษาเป็นเวลาอย่างน้อย 2 ปี ในผู้ป่วยกระดูกเชิงกรานหักชนิดไม่มั่นคงด้วยการยึดตรึงกระดูกจากภายนอกทันทีกับการยึดตรึงกระดูกหลังการรักษาทั่วไปและการผ่าตัดรักษาการบาดเจ็บภายในช่องท้องในผู้ป่วย 112 ราย เป็นชาย 69 ราย และหญิง 43 ราย กลุ่มที่ 1 ได้รับการยึดตรึงกระดูก หลังจากการรักษาทั่วไป มี 40 ราย และกลุ่มที่ 2 ได้รับการยึดตรึงกระดูกหักทันที มี 72 ราย ผลการศึกษาพบว่าความต้องการเลือด, ความเจ็บปวดหลังผ่าตัด, ความจำเป็นต้องผ่าตัดแก้ไขภาวะกระดูกหัก และความพิการผิดรูปในกลุ่มที่ 2 ซึ่งได้รับการยึดตรึงกระดูกเชิงกรานหักชนิดไม่มั่นคงทันที มีน้อยกว่ากลุ่มที่ 1

คำสำคัญ : การรักษากระดูกเชิงกรานหัก, การใช้เครื่องตรึงกระดูกจากภายนอกในกระดูกเชิงกรานหัก, การควบคุมความเจ็บปวดหลังกระดูกหัก

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