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Original Research Article

Effectiveness of antishock garment in acute management of open-book injuries of pelvic fractures in hemodynamically unstable patients

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ABSTRACT

Background: Stabilizing unstable pelvic fractures with rapidly applied pelvic binder or the garment has long been a standard practice in patients suspected to be bleeding from their pelvic injuries. External fixation is believed to provide better tamponade, by decreasing the pelvic volume and, thereby, the space for blood loss.
Methods: Prospective case control randomized study. A total of 30 patients were enrolled in this study. They were recruited from Suez Canal University hospital (Ismailia). They were categorized into two groups. They were selected by simple randomization method using the table of random number. Group I: patients were subjected to antishock garment (15 patients). Group II: patients were subjected to external pelvic fixation (15 patients).
Results: Data analysis of the 30 patients showed that symphysis pubis diastasis was decreased from (3.2 to 2.8 cm) in binder group in comparison to (3.8 to 2.2cm) in EX-FIX group with statistically significant different (p value = P = 0.04). But there were no marked difference in the degree of shock index improvement between the two groups (p-value >0.05).
Conclusions: Although EX-FIX is showing significant improvement in pelvic stability and more decreasing diastasis in comparison with binder, there was no difference in improving the haemodynamic state between both maneuvers.

Keywords: Anterior external fixator, Haemodynamic state, Open book fracture pelvis, Pelvic binder

INTRODUCTION

The major aim of the trauma surgeon in controlling pelvic bleeding is stabilization of the unstable pelvic injury. Stabilization of the pelvic injury decreases retroperitoneal volume, and therefore, decreases blood loss as it act as tamponade of the bleeding vessels. Stabilization of a disrupted pelvis can be handled in several ways. This decrease in motion prevents further disruption of the pelvic veins or the clots that have formed. The pelvic binder or the garment is the most expeditiously accomplished with a longitudinally folded bed sheet wrapped circumferentially around the pelvis, placed in-between the iliac crests and greater trochanters, and secured anteriorly by clamping (Figure 1). Once the garment is applied in the emergency, it should not be removed until the patient is receiving fluids in the operating room so that the bleeding can be controlled surgically.[1,2]

Standard method of controlling the hemipelvis is the application of an anterior external fixation frame (Figure 2). The Pelvic external fixator designed to be used in the resuscitation room, to be applied quickly. The anterior frame will reduce the volume of the pelvis, thereby reducing venous and bony bleeding. An added beneficial effect is a major reduction in pain and the ability to induce the upright position to more better ventilate the

patient in the intensive care unit.[4] Currently, the definitive treatment of pelvic fractures and their complications remains controversial.[6,7]

Figure 1: Photograph of sheeted pelvis (3).

Figure 2: Photograph external fixator in situ (5).

METHODS

Study design

Prospective case control randomized study. A total of 30 patients were enrolled in this study. They were recruited from Suez Canal University Hospital (Ismailia) form Jan 2012 to June 2013. They were categorized into two groups. They were selected by simple randomization method using the table of random number. Group I: patients were subjected to antishock garment (15 patients). Group II: patients were subjected to external pelvic fixation (15 patients).

Study population

Patients with open-book injuries of pelvic fractures admitted to the Emergency Department at Suez Canal University Hospital.

Inclusion criteria

- Adult patients aged ≥ 18 years.
- Both sexes are included.
- All major blunt trauma patients with open book pelvic fracture.
- Patients with open book pelvic fracture and hemodynamic instability.
- Equal numbers of each group share the same fracture type.

Exclusion criteria

- The presence of penetrating injuries.
- Multiple uncontrolled injuries of upper limbs, chest or back.
- Patients with severe head trauma need interventions.
- Intrahospital transfers.
- Patients with uncontrollable thoracic hemorrhage.
- Open book pelvic injury with posterior ring disruption and retroperitoneal heamatoma.

Surgical technique

- Patient under general anesthesia.
- Supine position.
- Sterilization from upper abdomen to middle thigh.
- Tip skin incision one finger from anterior superior iliac spine.
- Identification of inner and outer table of iliac wings by inserting two cannulas just sliding on inner and outer table.
- Insertion of six mm pin by power drill without tapping just in between and barrel to the two cannulas up to disappearance of the serrations of the pin.
- Inserting three pins on each sides and distance as shown by the assembly.
- Try to make side to side compression to decrease the diastasis guided by C arm image.
- Hold the fixator in the desired position and tighten the connector screw.
- Stitch the pin opening and dressing.

Confidentiality and anonymity were maintained according to the regulations mandated by Research Ethics Committee of Faculty of Medicine Suez Canal University. The study subjects were explained the purpose of study, assured privacy and a written consent was obtained from them.

Data analysis

The data were entered, cleaned and analyzed using SPSS software version 18.0. Descriptive statistics like frequency distribution and percentage calculation was made for most of the variables. Chi-square and odds ratios (OR) test was used to examine the relationship

between two qualitative variables. A P<0.05 was considered statistically significant.

RESULTS

Figure 3 shows that percent of mortality are directly proportional with the delay in arrival. As we found that mortality increased up to 50% in binder group and 90 % in EX-fix group after two hours of delay.

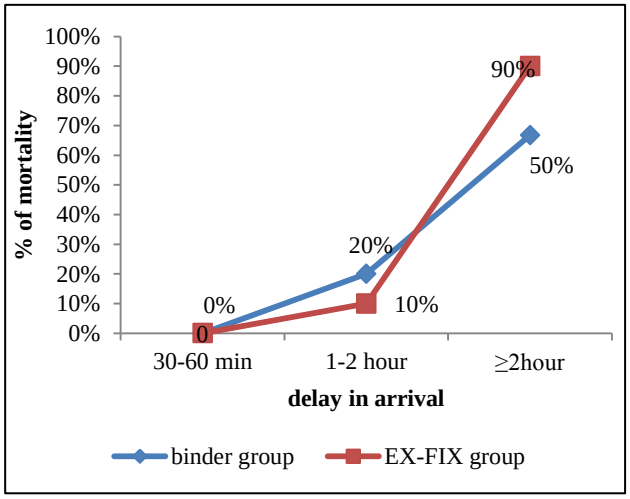

Figure 3: Relation between mortality in proportional with the delay in arrival in both groups.

Table 1 shows that pelvic binder could be started very early (mean time interval = 10 min) in comparison to EX-FIX group (mean time interval = 25 min). And duration of intervention also was very small in group 1 (about 3 min) in comparison to 20 min in group 2 with statistically significant difference.

Table 1: Binder and EX-FIX groups in relation to (arrival and intervention time) and duration of intervention time.

Mean ± SD Rang	Binder group N=15	EX-FIX group N = 15	*T test*
Time between arrival and intervention in minutes	0±8 5 -18	35±10 25 - 50	*P = 0.04**
Duration of intervention in minutes	3±5 2 - 5	29±8.5 20 - 39	*P = 0.00**

Table 2 suggests that fracture type should not be used alone as a predictor of haemodynamic stability no statistically significant relation (p>0.05).

Figure 4 shows that the mean symphysis pubis diastasis decreased from 3.2 to 2.8 cm in binder group in comparison to marked improvement in EX-FIX group from 3.8 to 3.2 cm with statistically significant difference (p value = 0.045).

Table 2: Relation between fracture type and shock index.

Young and burgess	Shock index	
	0.8-0.9	>0.9
AP1	4(13.3%)	6 (20%)
AP2	6 (20%)	8 (26.6%)
LC3	2(6.6%)	4 (13.3%)

X2 test P = 0.8 (not statistically significant).

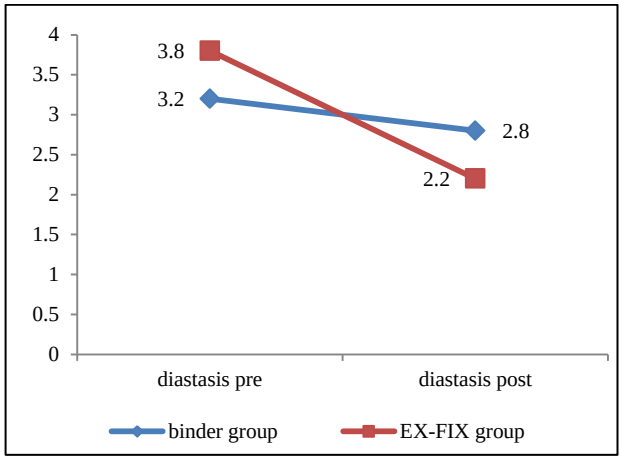

Figure 4: Mean symphysis pubis diastasis (in cm) changes in binder and EX-FIX groups, pre and post intervention.

Figure 5 both groups showed improvement in shock index but without marked difference in the degree of shock index improvement between the two groups. Binder group decreased from 1 to 0.9 and 0.7 after 1hour and 2 hour respectively. EX-FIX group showing improvement from 1 to 0.8 and 0.65 after 1 hour and 2 hour respectively.

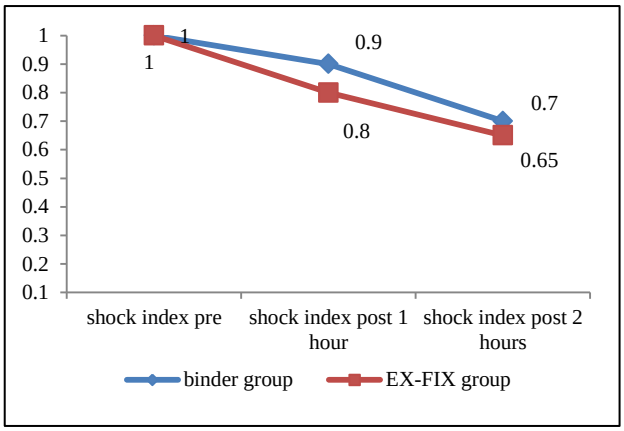

Figure 5: Comparison of both binder and EX-FIX groups in relation of shock index at different times (pre, post 1hour, post 2 hour).

DISCUSSION

As regard to delay in arrival Totterman et al, stated that the mean time from injury to ED arrival was 98 minutes, our result support that as we found that half of the patients in both groups were transferred to the hospital within 60-120 minutes from trauma time (50%) (Figure 3).[8] Singh J et al, (38.3%) reached between 4-12 hours after sustaining injury of which 21 patients died. 25.1% reached 2-4 hours following injury of which 10 patients died, and (13.6%) reached between 1-2 hours following injury of which 8 patients died.[9,10] Only (<10%) reached within 1 hour of sustaining injury indicating some delay in receiving medical aid. In agreement with our results, mortality increased up to 90% percent in b EX-FIX group and 50 % in binder group after two hours of delay (Figure 3).

According to Clarke et al, every 3 minutes of delay in the resuscitation room leads to a 1% mortality increase in a patient with hemodynamic instability and blunt trunk trauma during the first 90 minutes of treatment at a Level I trauma center.[11] In this study pelvic binder could be started very early (mean time interval in-group 1=10 min) in comparison to EX-FIX group (mean time interval in-group 2 = 25 min). According to Ben-Menachem Y et al, duration of external fixation in pelvic fracture can be in 15-20 min by an orthopedic surgeon experienced in this procedure.[12] In this study duration of intervention was very small in group 1 (about 3 min) in comparison to 20 min in group 2 with statistically significant difference (Table 1).

Figure 6(a): Marked decrease in symphysis pubis diastasis before EX-FIX.

Brenneman FD et al, stated that average symphysis pubis diastasis at the point of anterior sacroiliac ligament failure was 2.2 cm (n = 20; range, 1-4.5 cm); however, 80% of the values were outside the range of 2 to 3 cm. Symphysis pubis diastasis in male specimens averaged 2.5 cm and in female specimens 1.8 cm.[13] In our results, most patients (73.3%) of both groups had a diastasis more than 3 cm without any statistically significant difference between two groups with mean of 3.2 and 3.8 cm in-group 1, 2 respectively (Figure 4, Figure 3a, 3b, 4a, 4b).

Figure 6(b): Marked decrease in symphysis pubis diastasis after EX-FIX.

Figure 7(a): Little decrease in symphysis pubis diastasis before pelvic binder.

Figure 7(b): Little decrease in symphysis pubis diastasis after pelvic binder. (Figure 4a before pelvic binder and figure 4b after pelvic binder

Galois L et al, It enabled good reduction of the symphyseal separation to be achieved, whatever the type of injury (tile type B or C), with an average gap of 8 millimeters in the immediate post-operative period. The results in terms of function were good in 73% of cases in the short and medium term, which makes this external fixation a method of choice.[14] In agreement with our results, symphysis pubis diastasis was decreased from 3.2 to 2.8 in binder group in comparison to 3.8 to 2.2 in EX-FIX group with statistically significant different (Figure 7).

Galois L et al, The pelvic volume is reduced by around 10% by this osteosynthesis, which helps to overcome the most severe bleeding[14] In our study Shock index showing marked improvement in the first hour after intervention (1 to 0.8) in EX-FIX group in comparison to relative improvement in binder group (1 to 0.9) with no statistically significant different. After 2 hours, there is marked improvement but also without significant difference between the two groups (Figure 5).

CONCLUSION

Although EX-FIX is showing significant improvement in pelvic stability and more decreasing symphysis diastasis in comparison with binder, but there was no difference in improving the haemodynamic state between both maneuvers.

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Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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