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Original Research Article

Management of hemodynamically unstable patients with fracture pelvis Mafraq Hospital experience, UAE

Mohammed Alkatary[1]*, Jody Miller[2], Fawzi Al-Ayoubi[2]

[1]Department of Surgery, Mansoura University Hospital, Egypt
[2]Department of Trauma and Acute Care Surgery, Mafraq Hospital, Abu Dhabi, UAE

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***Correspondence:**
Dr. Mohammed Al Katary,
E-mail: mohammedkatary1@yahoo.com

ABSTRACT

Background: Multidisciplinary team and multiple approaches were introduced to improve the outcome after significant pelvic trauma. In present study, we are evaluating our institutional management modalities for unstable patients with unstable pelvic fractures using angio-embolization, pelvic packing with or without angio-embolization and conservative management with surgical intensive care unit (SICU) admission.
Methods: We reviewed 108 patients admitted with pelvic fractures from January 2013 to September 2014, 19 patients (17.5%) were hemodynamically unstable with pelvic fracture. Massive transfusion protocol was activated in all patients. FAST scan was done. Level 1 trauma CT for the responder and transient responder patients.
Results: Out of 19 patients, 7 patients (36.8%) were good responders to resuscitation with maintaining of their hemoglobin stable, with no extravasation of dye, admitted to SICU for conservative management. 4 patients (21%) were responders with CT trauma revealed dye leak so they underwent angio-embolization, SICU admission. 8 patients (42.1%) were non-responders underwent preperitoneal packing, one of them had additional angio-embolization.
Conclusions: Preperitoneal packing is an excellent choice for non-responder patients, while angio-embolization can be done for responder and transient responder patients with evident dye extravasation. This study needs more evaluation on a wider clinical scale.

Keywords: Angio-embolization, Hemodynamic instability, Pelvic fracture, Preperitoneal packing

INTRODUCTION

Pelvic girdle is the strongest musculoskeletal system that needs high velocity energy to cause its disruption which may be fall from greatest height or sever crush injury.[1] Management of abdominopelvic injuries must be cared for by multidisciplinary team that including trauma, orthopedic surgeons, intervention radiologist, anesthesiologist and at a time urologist and gynecologist.[2] In pelvic trauma, no correlation has been discovered to exist between the physiological status of the patient and the anatomical type of pelvic ring disruption. This can be observed during clinical practice on attending pelvic fracture patients where the first decision will be based on clinical condition of the patient and if there is concomitant injuries or no.[3]

Hemodynamic unitability is the main life threatening complication for the patient who has unstable pelvic fracture, such bleeding originates on 80% of the patients from venous plex and fracture site. 10% of such bleeding originates from arterial vessels.[4] Early recognition with

immediate pelvic and patient stabilization is the corner stone on the management as patient with bleeding from fracture pelvis can be easily entered in DIC so prompt decision of conservative, pelvic packing or angio embolization is one of the prognostic factors for the patient.[5]

The strategy of management of unstable patient with fracture pelvis differ from country to another for example in United States with the advance in interventional radiological procedures they prefer to go with interventional radiology but in Europe as most of trauma surgeons are orthopedic surgeons they preferred preperitoneal packing.[6]

The major difference between the 2 modalities of management is that with angio embolization you can control arterial bleeding but with pelvic packing the control will be for venous bleeding. With initial management pelvic stabilization is a crucial step which can be done by application of pelvic binder to decrease the volume of pelvic space. Subsequent stabilization can be done by fixation.[7-9]

Angio embolization procedure depends on the availability of the interventional radiology team and how much they are expert and on the level of their experience.[10] Since 1980 angio-embolization was used as an effective modality on the management of hemodynamically unstable patients with fracture pelvis.[11-13]

Pre-peritoneal pelvic packing (PPP) has become a popular technique to control bleeding in hemodynamically unstable fracture pelvis as it is a quick and easy technique. The first preperitoneal packing was described by Hannover and Zurich groups which were done through transabdominal pelvic packing.[14,15]

Direct preperitoneal packing was described in Denver, a surgical technique that was performed through suprapubic midline incision and allows direct retroperitoneal approach to the space of Rezius.[16] Single or multiple procedures can be considered on the management of the patient depending on patient stability after each procedure. 13 to 20% of patient will need angioembolization following preperitoneal packing.[17-19] Concomitant visceral injury may require abdominal exploration with a separate upper abdominal incision.

METHODS

We reviewed 108 patients admitted with pelvic fractures on the period from January 2013 to September 2014. The age group of our patients was between 12 to 57 years old. There was no patient selection criteria regarding mechanism of injury, patient genders or the type of pelvic fracture. 19 patients (17.5%) were hemodynamically unstable with diverse types of pelvic fracture. The patients categorized as hemodynamically unstable if they have persistent systolic blood pressure less than or equal to 90 mmHg despite resuscitation with 2 liters of crystalloids. Massive transfusion protocol was activated in all unstable patients. Pelvic binder was applied for all unstable patients. An initial chest and pelvis X-ray was obtained to confirm fracture pelvis and confirm or exclude concomitant pneumothorax or hemothorax. Initial arterial blood gases were obtained. FAST scan was done. CT trauma with angio obtained for responder patients and transient responder patients on their window period of stabilization. Delayed CT films and cystogram were also obtained in selected patients.

Decisions about stability of the patients were depending on vital signs monitoring (pulse, blood pressure, peripheral perfusion) and urine output taking in consideration permissive hypotension was our goal.

Preperitoneal packing was performed through lower midline incision that extended from umbilicus down to symphysis pubis opening skin and subcutaneous tissues till peritoneum that left intact. The peritoneum was manually freed from the inner aspect of osseous symphysis pubis and pelvic ring.

The linea terminalis is followed by palpation to the sacroiliac (SI) joint, exposing the inner aspect of the quadrilateral plate. At least 3 large radio-opaque swabs were placed on the space between peritoneum and bony pelvic wall starting posteriorly at sacroiliac joint till retropubic area anteriorly. Packs were removed after 48 hours of stabilization.

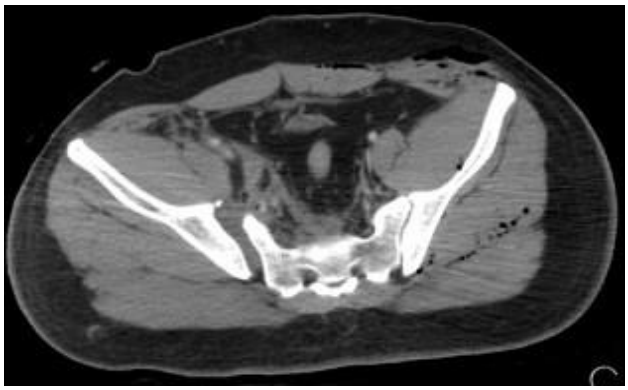

Figure 1: Diastasis with hematoma and free air.

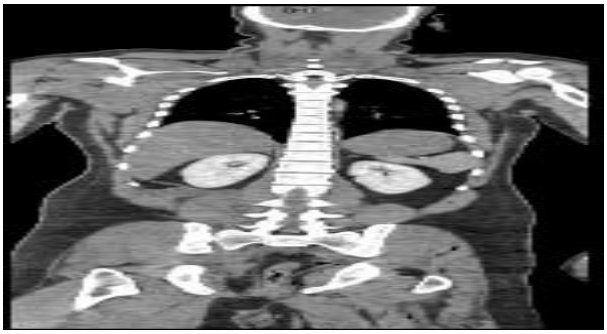

Figure 2: Fracture related psoas hematoma.

RESULTS

Out of 19 patients, 7 patients (36.8%) were good responders to initial resuscitation with 2 liters of intravenous crystalloids maintaining their hemoglobin and vitals (pulse, blood pressure and urine output) stable on serial monitoring. Their CT with contrast revealed no extravasation of dye, admitted to surgical intensive care unit for conservative management.

4 patients (21%) were responders for the initial resuscitation with 2 liters of intravenous crystalloids but their CT trauma revealed dye extravasation so they underwent angio-embolization. One of them massive transfusion protocol (MTP) was activated and the patient received only one cycle of MTP.

8 patients (42.1%) were non-responders after initial resuscitation with 2 liters of intravenous crystalloids. Massive transfusion protocol was activated. Each cycle in our massive transfusion protocol including delivery of 4 packed red blood cell, 4 fresh frozen plasma and 4 platelets. Each patient of the 8 patients received 2 cycles of MTP with fibrinogen and tranexamic acid. All the 8 patients were sent to the operation room for preperitoneal packing. One of the 8 patients had additional angio-embolization after operation. Another patient of the non-responder underwent abdominal exploration for concomitant mesenteric and intestinal injuries. All underwent CT trauma within 24 hours.

All patient during resuscitation with MTP received 1gm tranexamic acid and fibrinogen. Monitoring of the patients during resuscitation and SICU admission was through vital signs monitoring, monitoring of urine output and serial arterial blood gases for hemoglobin and lactate level and early detection of acidosis.

All patients that need resuscitation were resuscitated using permissive hypotension as the systolic blood pressure kept around 100mmHg.

Table 1: Demographic data of the patients involved in present study.

Variables	Responder patients		Non-responder patients
	Without dye leak	**With dye leak**	
Number of patients	7 (36.8%)	4 (21%)	8 (42.1%)
Sex of patients/total number of patients	2 females (10.5%) 5 males (26.3%)	Males	Males
Age of the patients	35-45	25-50	22-48
Mechanism of injury/patients	Quadricycle	3 motor vehicle collision	3 falls from height
		1 fall from height	5 motor vehicle collision
Intravenous crystalloid	2 liters	2 liters	2 liters
Patient received MTP	-	1	All
Initial pelvic binder application	-	Applied for all	Applied for all
Angio-embolization	-	All	1 patient
Abdominal exploration	-	-	1 patient
Preperitoneal packing	-	-	All patients

DISCUSSION

Pelvis fracture is still a challenging problem in terms of morbidity and mortality as it carries mortality rate up to 40 to 60 %.[15,20] The most common cause of death especially on the first 24 hours is the bleeding; on the other hand, multiple organ failure is the second most common cause of death.

Associated injuries should be considered in all patients with fracture pelvis as concomitant injuries can be detected in up to 90% of patients. In present study one case associated with internal hemorrhage due to mesenteric injury with free abdominal air from intestinal injury. Other 2 case intercostal drains were inserted for hemo-pneumothorax.[21]

In 1970 pelvic fracture bleeding was managed by internal iliac artery embolization. Later, selective angio-embolization was introduced with reported success rate up to 80-100%.[20-22] Several protocols were published for the management of hemodynamically unstable patient with fracture pelvis, which varies according to feasibility, and availability of multidisciplinary team.

In present study, the stable patients without dye extravasation were admitted to surgical intensive care for proper vital and serial hemoglobin monitoring. Stable patients with dye extravasation were managed by angio-embolization. Operative management was conducted to unstable patient. Pelvic binder was applied to all patients on initial presentation in emergency department, which was done on the study by Krieg et al 2005.[22,23] Pelvic

fixation was done in our patients 2-3 days after admission, which was done by Gruven 1994.[21,24,25]

CONCLUSION

Initial recognition of unstable patient with fracture pelvis is the most import initial step in the management. Pelvic binder can do initial pelvic stabilization.

Preperitoneal packing is an excellent choice for non-responder patients, while angio-embolization can be done for responder and transient responder patients with evident dye extravasation. This study needs more evaluation on a wider clinical scale.

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