Journal reading

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Original Contribution

Higher glucose on admission is associated with need for angioembolization in stable pelvic fracture

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Background

- Angioembolization is an effective management of retroperitoneal hemorrhage.
- Stable-type pelvic fracture are treated conservatively.
- In some stable pelvic fracture cases, still need hemostasis.
- In this study, we attempted to define the characteristics of patients with stable pelvic fracture requiring angioembolization.

Pelvic fracture

- Machanism: blunt trauma with high kinetic energy.
- Bleeding from venous or arteries.
- Artery: from major ligamentous disruption.
- Might be related to thefracture type and the stability of the pelvis.
- Mortality rates range from 6% to 18%

Hyperglycemia

- Associated with poor outcome, prolonged hospital stay, and increased infection rates.
- Same in the trauma setting, esp. traumatic brain injury.
- Might result in stress-induced hyperglycemia

Stable, unstable

- The reported rate of hemorrhage in unstable pelvic fractures ranges from 18% to 62.5%
- Stable pelvic fractures 7% to 10% require transarterial embolization (TAE)

Materials and methods

- reviewed the trauma registry and medical records of patients with pelvic fracture at the China Medical University Hospital (CMUH) from January 2005 to November 2009.

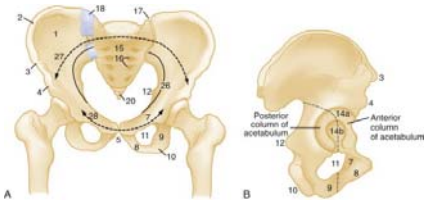
Materials and methods

- Treated according to our established program
- The pelvic x-ray (PXR)
- Patients with concomitant unstable
- Hemodynamics (SBP <90 mm Hg) and unstable pelvic fracture received immediate TAE was excluded.

Materials and methods

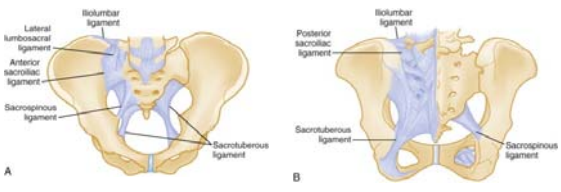
- A routine CT scan was performed in patients with stable hemodynamics (SBP ≧90 mm Hg) who had unstable pelvic fracture identified by PXR.
- Stable pelvic fracture were treated conservatively and observed closely in ward or outpatient department <u>at least 1 week</u> for the probability of delayed or missed hemorrhage.
  - Some patients received CT scans

Pelvic anatomy

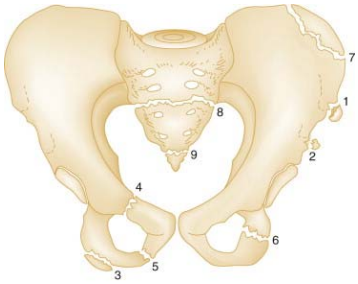


. **A,** Anterior view of pelvis. **B,** Lateral view of right innominate bone. (*1*) Iliac fossa, (*2*) iliac crest, (*3*) anterior superior iliac spine, (*4*) anterior inferior iliac spine, (*5*) symphysis pubis, (*7*) superior ramus of pubis, (*8*) inferior ramus of pubis, (*9*) ramus of ischium, (*10*) ischial tuberosity, (*11*) obturator foramen, (*12*) ischial spine, (*14*) acetabulum ([*14a*] articular surface, [*14b*] fossa), (*15*) sacrum, (*16*) anterior sacral foramina, (*17*) sacroiliac joint, (*18*) anterior sacroiliac ligament, (*20*) coccyx, (*26*) arcuate line, (*27*) posterior or femorosacral arch, through which main weight-bearing forces are transmitted, (*28*) anterior arch.

Ligaments

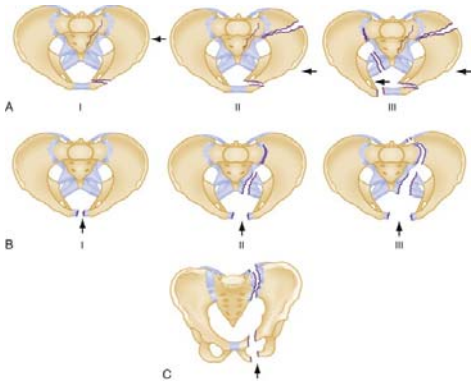


Stable Injuries (Tile Type A)

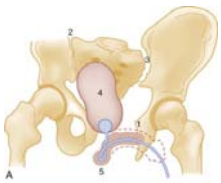


Fractures of individual pelvic bones.
(1) Avulsion of anterosuperior iliac spine,
(2) avulsion of anteroinferior iliac spine,
(3) avulsion of ischial tuberosity,
(4) fracture of superior pubic ramus,
(5) fracture of inferior pubic ramus,
(6) fracture of ischial ramus,
(7) fracture of iliac wing,
(8) transverse fracture of sacrum,
(9) fracture of coccyx.

Partially Stable and Unstable Injuries (Tile Types B and C)

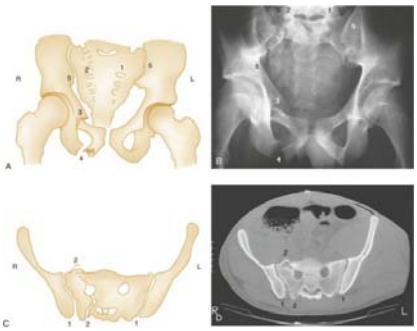


Open book



(1) Separated pubic symphysis with asymmetry of hemipelvis,
(2) normal sacroiliac joint,
(3) separated sacroiliac joint,
(4) cystogram with displacement and abnormally elongated shape of bladder caused by retroperitoneal hematoma associated with separated left sacroiliac joint, which has pushed the bladder to the right,
(5) extravasated contrast into perineum from urethral rupture,
(6) soft tissue air indicating an open fracture.

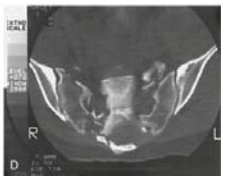
Lateral compression



(*4*) is the "bucket-handle" fracture

Vertical shear

note loss of definition and symmetry of sacral foramina,



Transverse process fragment from right L5 (iliolumbar ligament attachment) is pathognomonic

The Young-Burgess classification system

- Lateral compression type I, type II, and anteroposterior compression type I fractures were defined as stable.

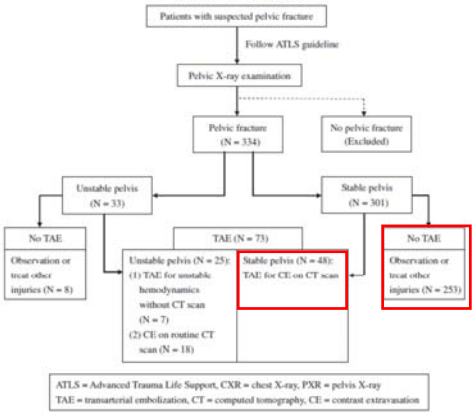
Focus groups

- Some patients who received CT scans Contrast extravasation was incidentally seen in CT scans, resulting in TAE.
- These patients were compared to those with stable pelvic fracture who were treated conservatively.
  - The demographic characteristics,
  - initial SBP,
  - Abbreviated Injury Scale (AIS) score,
  - Injury Severity Score (ISS),
  - admission blood glucose level,
  - prothrombin time (PT)/international normalized ratio (INR)

Stastics method

- We used χ2 tests and Wilcoxon 2-sample exact tests to conduct univariate analyses.
- A P value less than .05 was considered to be significant.
- A multivariate logistic regression analysis was performed to determine whether
  - age, male sex, AIS score less than 3, admission blood glucose level less than 180 mg/dL, or ISS less than 25 (score) were
- independently related to patients with stable pelvic fracture who received TAE.

Results



Demographics

Table 1 Demographics of patients with pelvic fracture and comparison between patients who did and did not receive TAE

Variables	All patients (N = 334)		*P*
	Patients receiving TAE (n = 73)	Patients not receiving TAE (n = 261)	
Age	43.9 ± 20.5	44.0 ± 18.6	.98
Sex (n)			.44
Female	34 (46.6%)	134 (51.3%)	
Male	39 (53.4%)	127 (48.7%)	
SBP (mm Hg)	108.4 ± 32.9	130.0 ± 30.2	<.01
PT/INR	1.3 ± 0.3	1.2 ± 1.3	.34
Admission blood sugar (mg/dL)	199.4 ± 84.1	150.5 ± 58.5	<.01
AIS (score)	3.3 ± 0.9	2.4 ± 0.6	<.01
ISS (score)	25.0 ± 13.1	11.4 ± 10.2	<.01

In all TAE group

Table 2 Comparison between TAE patients with stable and unstable fractures

Variables	Patients receiving TAE (n = 73)		*P*
	Stable pelvis (n = 48)	Unstable pelvis (n = 25)	
Age	44.0 ± 21.3	43.8 ± 19.4	.97
Sex (n)			.10
Female	19 (39.6%)	15 (60.0%)	
Male	29 (60.4%)	10 (40.0%)	
SBP (mm Hg)	115.0 ± 33.1	98.7 ± 31.0	.11
PT/INR	1.3 ± 0.4	1.3 ± 0.3	.78
Admission blood sugar (mg/dL)	196.4 ± 80.5	205.0 ± 80.5	.69
AIS (score)	3.1 ± 0.9	3.7 ± 0.8	.05
ISS (score)	24.0 ± 12.6	26.8 ± 14.3	.50

Stable fracture

Table 3 Comparison between patients with stable pelvic fracture who did and did not receive TAE

Variables	CE on CT scan, then received TAE (n = 48)	Observation (n = 253)	*P*
Age	44.0 ± 21.3	44.1 ± 18.7	.96
Sex (n)			.18
Female	19 (13.0%)	128 (87.0%)	
Male	29 (18.7%)	125 (81.3%)	
SBP (mm Hg)	115.0 ± 33.1	130.5 ± 30.4	.01
PT/INR	1.3 ± 0.4	1.1 ± 0.3	.07
Blood sugar (mg/dL)	196.4 ± 86.7	150.9 ± 58.4	.01
Blood sugar (n)			<.01
≥180 (mg/dL)	34 (70.8%)	46 (21.7%)	
<180 (mg/dL)	14 (29.2%)	198 (78.3%)	
AIS (score)	3.1 ± 0.9	2.4 ± 0.6	<.01
ISS (score)	24.0 ± 12.6	11.3 ± 10.3	<.01
ISS (n)			<.01
≥25	30 (62.5%)	24 (9.5%)	
<25	18 (37.5%)	229 (90.5%)	

multivariate logistic regression analyses

Table 4 Factors independently associated with stable pelvic fracture patients who need for TAE

Variable	Odds ratio (95% CI)	*P* [a]
Age ≧65 y	2.41 (1.16-2.87)	.477
Sex (male)	3.30 (0.05-1.15)	.096
AIS score≧3	1.71 (0.96-6.88)	.051
Admission blood glucose ≧180 mg/dL	3.51 (2.49-12.80)	.044
ISS ≧25	8.21 (2.34-42.77)	.016

CI indicates confidence interval.
[a] Multivariate logistic regression.

Discussion

- CT has become a universally for the further assessment of most abdominal and pelvic injuries.
- FAST is an operator dependent, limitations of retroperitoneal hemorrhaging.
- Lactate or arterial base excess could be an indicator of hypoperfusion

Stress diabetes

- Trauma and critical illness increase hepatic gluconeogenesis despite hyperglycemia and abundantly released insulin.
- Glucose metabolism is further affected by counterregulatory hormonal responses and signals from the nervous system.
- Impairment of glucose uptake in skeletal and cardiac muscles.

Conclusion

- 70.8% of patients with stable pelvic fracture who received TAE had an admission blood glucose level higher than 180 mg/dL.
- A CT scan may be necessary.

Limitation

- Small number, retrospective nature.
- Sen: 34/48 = 70.8%, Spe= 198/253 = 78.3%

Thank you for attention