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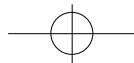
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**Table 1.** Classification of the Pelvic Fractures (by Young et al.)

Category	Characteristics
Lateral Compression(LC)	Transverse fracture of pubic rami, ipsilateral or contralateral to posterior injury
LC-I	Sacral compression on side of impact
LC-II	Crescent(iliac wing) fracture on side of impact
LC-III	LC-I or LC-II injury on side of impact; contralateral open book injury
Anteroposterior Compression(APC)	Symphyseal diastasis or longitudinal rami fractures
APC-I	Slight widening of pubic symphysis or anterior sacroiliac joint; stretched but intact anterior sacroiliac, sacrotuberous and sacrospinous ligaments; intact posterior sacroiliac ligaments
APC-II	Widened anterior sacroiliac joint; disrupted anterior sacroiliac, sacrotuberous and sacrospinous ligaments; intact posterior sacroiliac ligaments
APC-III	Complete sacroiliac joint disruption with lateral displacement; disrupted anterior sacroiliac, sacrotuberous and sacrospinous ligaments; disrupted posterior sacroiliac ligaments
Vertical shear(VS)	Symphyseal diastasis or vertical displacement anteriorly and posteriorly, usually through the sacroiliac joint, occasionally through the iliac wing or sacrum
Combined Mechanism(CM)	Anterior and/or posterior, vertical and/or transverse components Combination of other injury patterns; LC/VS being most common

**Table 2.** Clinical Analysis of Pelvic Bone Fracture Involving the Sacrum and Sacroiliac Joint

No	Sex /Age	Etiology	Type*	Associated injuries				Treatment		Time between Fx & Op(days)	Radiologic finding		Results§
				Other skeletal	Respiratory system	Genito-urinary	Gastro-intestinal	Head trauma	Anterior		Posterior	Union †	
Fx													
1	F/15	Fall down	VS	+	+	+	-	-	E/F	Screw	+	-	S
2	F/44	TA	VS	+	-	-	-	-	E/F	Screw	+	-	S
3	F/24	TA	APC	+	-	-	-	+	E/F	Screw	+	-	S
4	M/30	TA	LC	+	-	+	-	-	E/F	Screw	+	-	S
5	F/22	TA	APC	-	+	+	+	-	E/F	Screw	+	-	S
6	M/40	Fall down	VS	+	+	+	+	-	E/F→plate	Transiliac rod→Screw	+	-	S
7	M/38	TA	CM	+	+	-	+	+	E/F	Screw	Malunion ‡	+	U
8	M/35	TA	APC	+	+	-	+	-	E/F	Transiliac rod	+	-	S
9	M/40	Fall down	VS	+	+	+	+	-	E/F	Transiliac rod	Malunion	+	U
10	M/22	TA	LC	-	-	-	+	-	E/F	Transiliac rod	+	-	S
11	M/44	TA	APC	+	-	+	-	-	E/F		+	+	U
12	M/64	TA	APC	-	-	+	-	-	E/F→plate		Malunion	+	U
13	F/32	TA	LC	+	+	-	-	-	E/F		Malunion	+	U
14	F/45	TA	APC	+	-	-	-	-	E/F		Malunion	+	U
15	F/56	TA	APC	-	+	-	-	+		Traction	Malunion	+	U
16	F/20	TA	LC	+	-	-	-	+		Traction	Malunion	+	U

TA, traffic accident; Type\*, classified by Young et al.; VS, vertical shear; APC, anteroposterior compression; LC, lateral compression; CM, combined mechanism;

Fx, fracture; E/F, external fixator; screw, cannulated cancellous screw; Op, operation; Union †, separation(&lt;1cm); Malunion ‡, separation(&gt;1cm); Results§, analyzed by Matta's method; S, satisfactory; U, unsatisfactory.

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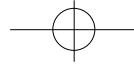
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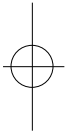
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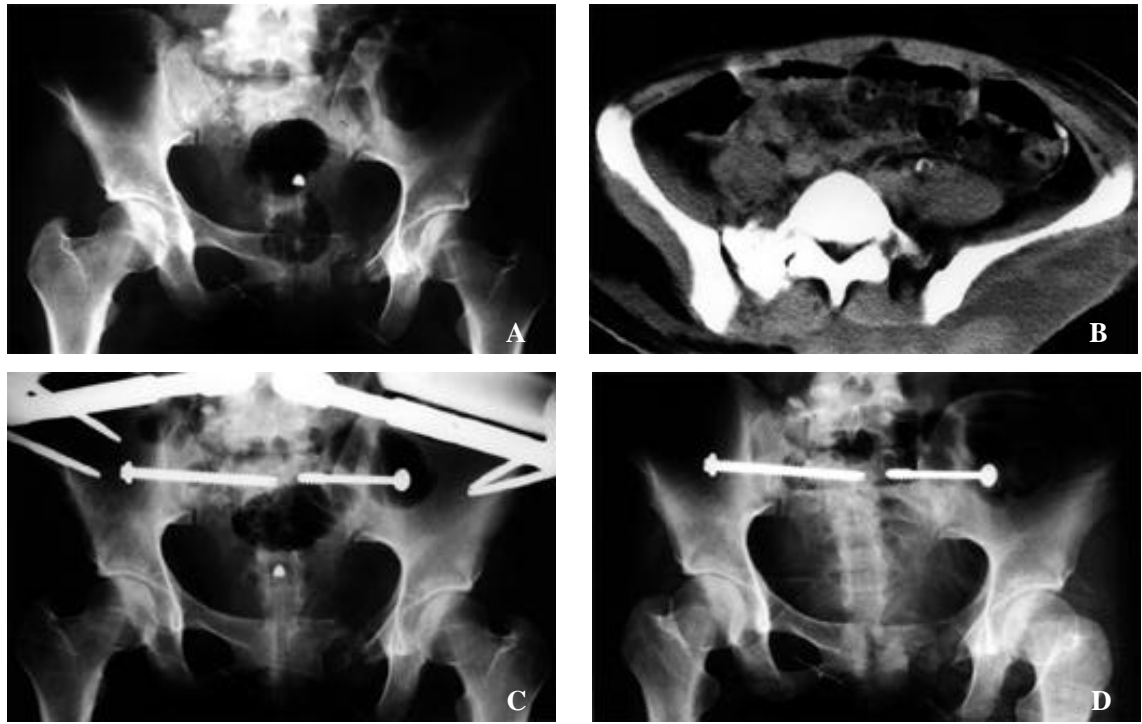
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**Fig 1A.** AP radiograph of unstable pelvic bone fracture in a 22-year-old female(left superior and inferior rami fracture and sacroiliac joint separation, right sacral fracture - AP compression type).

**1B.** CT image showing right sacral fracture and left sacroiliac joint separation.

**1C.** Post-operative AP radiograph after anterior external fixation and posterior internal fixation with cannulated cancellous screws on both sides.

**1D.** AP radiograph taken 8 months after operation. It shows stable reduction of the posterior pelvic ring structure. The clinical rating was satisfactory.

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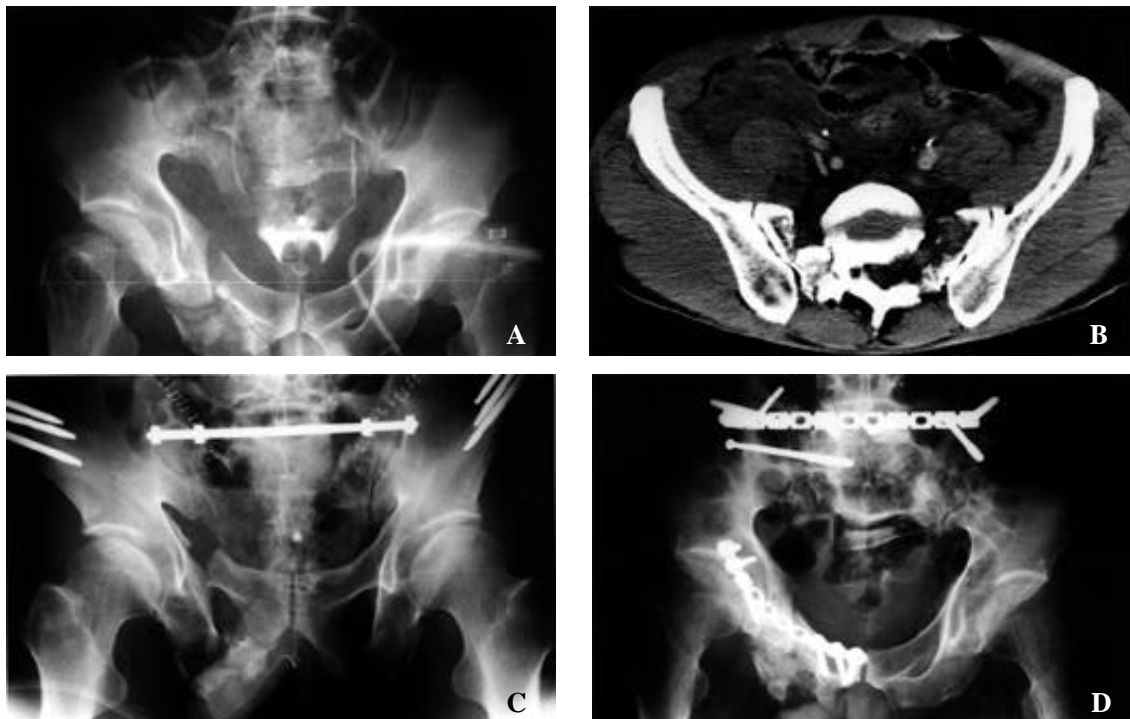
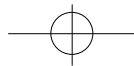
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**Fig 2A.** AP radiograph of unstable pelvic bone fracture in a 40-year-old male(both sides of sacrum and right superior and inferior rami fractures - vertical shear type).

**2B.** CT image showing displaced sacral fractures on both sides.

**2C.** Post-operative radiograph after anterior external fixation and posterior internal fixation with transiliac rod. However, posterior fixation was not enough to stabilize the unstable fracture. The patient complained of persistent pain and a snapping sound on the right side of posterior pelvic ring.

**2D.** AP radiograph taken 12 months after 2nd operation : internal fixation with plate, cortical screws, cannulated cancellous screw and bone graft on both anterior and posterior non-union site. It shows stable reduction. The clinical rating was satisfactory.

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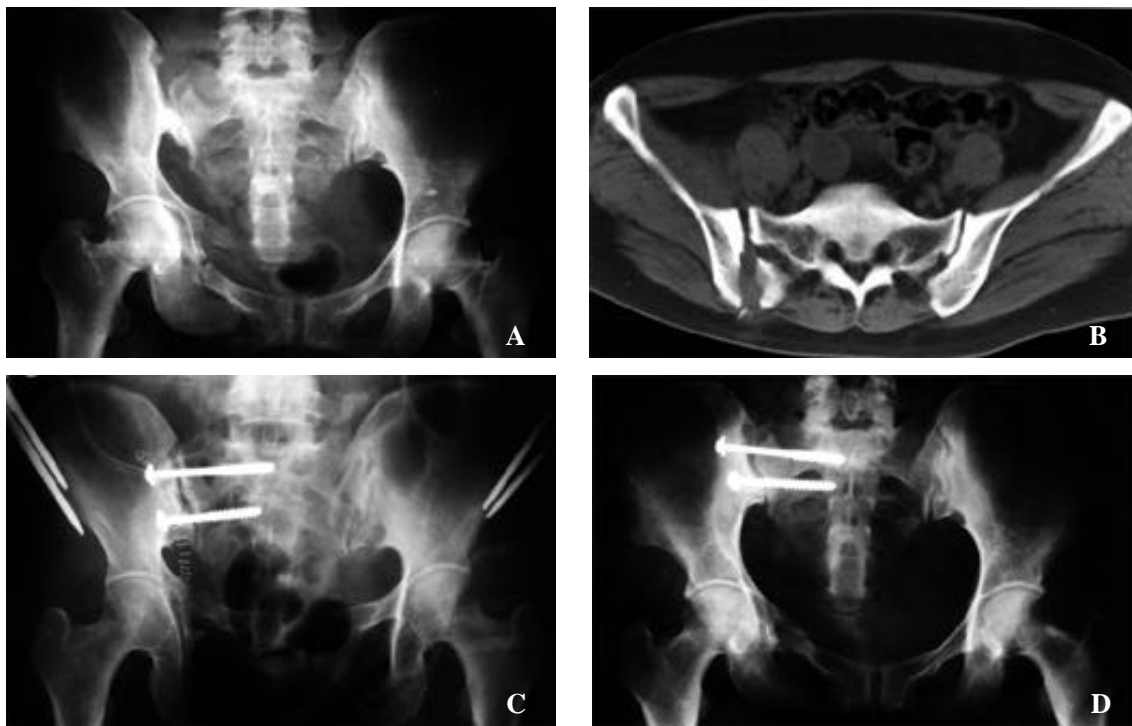
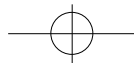
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(Fig. 2A-D).

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**Fig 3A.** AP radiograph of unstable pelvic bone fracture in a 44-year-old female(fractures involving the right sacrum and sacroiliac joint - vertical shear type).

**3B.** CT image showing a more detailed nature of the sacral fracture and separation of sacroiliac joint.

**3C.** Post-operative radiograph after anterior external fixation and posterior internal fixation with two cannulated cancellous screws.

**3D.** AP radiograph taken 12 months after operation. It shows stable reduction of the posterior pelvic ring structure. The clinical rating was satisfactory.

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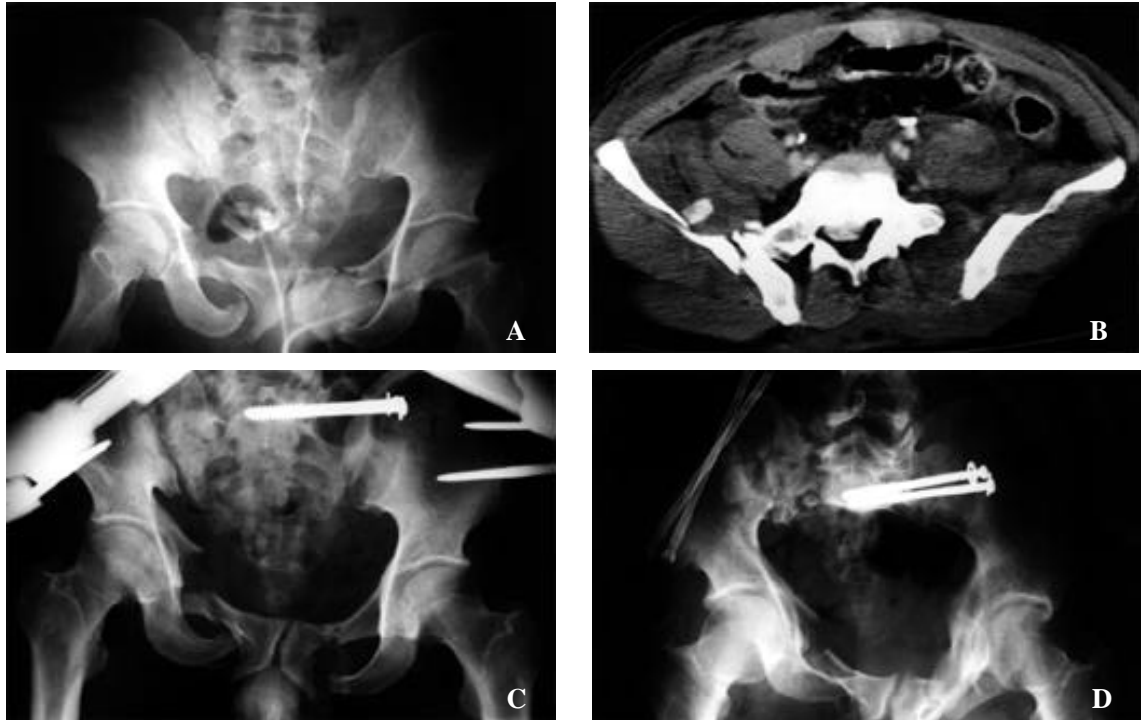
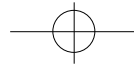
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(Fig. 3A-D).



**Fig 4A.** AP radiograph of unstable pelvic bone fracture in a 38-year-old male(fractures involving the right sacrum and iliac wing, bilateral superior and inferior rami, and the left sacroiliac joint separation - combined type of injury mechanism).

**4B.** CT image showing a large gap in left sacroiliac joint and fracture of the ilium involving sacroiliac joint on the right side.

**4C.** Post-operative radiograph after anterior external fixation and posterior internal fixation with two cannulated cancellous screws on the left side.

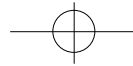
**4D.** Radiograph taken 6 months after 2nd operation(removal of external fixator and internal fixation with two long screws for iliac wing fracture). It shows a rotational tilting of the pelvis and leg length discrepancy. The clinical rating was unsatisfactory.

(Fig. 4A-D).

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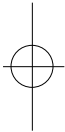
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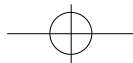




## REFERENCES

- 1) **Brooke R** : The sacroiliac joint. *J Anat*, 58:298, 1924.
- 2) **Browner BD and Cole JD** : Initial management of pelvic ring disruptions. *Instr Course Lect*, 37:129-137, 1988.
- 3) **Browner BD, Cole JD, Graham JM, Bondurant FJ, Nunchuck-Burns SK and Colter HB** : Delayed posterior internal fixation of unstable pelvic fractures. *J Trauma*, 27:998-1006, 1987.
- 4) **Burgess AR, Eastridge BJ, Young JWR et al.** : Pelvic ring disruptions : Effective classification system and treatment protocols. *J Trauma*, 30:848-856, 1990.
- 5) **Faillinger MS and McGanity PLJ** : Unstable fractures of the pelvic ring. *J Bone Joint Surg*, 74-A:781-791, 1992.
- 6) **Kellam JF, McMurtry RY, Paley D and Tile M** : The unstable pelvic fracture : Operative treatment. *Orthop Clin North Am*, 18:25-41, 1987.
- 7) **Matta JM and Saucedo T** : Internal fixation of pelvic ring fractures. *Clin Orthop*, 242 :83-97, 1989.
- 8) **McMurtry R, Walton D, Dickinson D, Kellam J and Tile M** : Pelvic disruption in the polytraumatized patient : A management protocol. *Clin Orthop*, 151:22-30, 1980.
- 9) **Pennal GF, Tile M and Waddell JP** : Pelvic disruption : Assessment and classification. *Clin Orthop*, 151:12-21, 1980.
- 10) **Routt ML, Meier MC, Kregor PJ and Mayo KA** : Percutaneous iliosacral screws with the patient supine technique. *Operative Techniques in Orthopedics*, Vol 3 No 1:35-45, 1993.
- 11) **Tile M** : Pelvic fracture : Operative versus nonoperative treatment. *Orthop Clin North Am*, Vol 11 No3:423-464, 1980.
- 12) **Young JWR, Burgess AR, Brumback RJ and Paka A** : Pelvic fractures : Value of plain radiography in early assessment and management. *Radiology*, 160:445-451, 1986.





## Abstract

## Treatment of pelvic bone fracture involving the sacrum and sacroiliac joint

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**Purpose** : To evaluate the usefulness of early posterior internal fixation(I/F) by cannulated cancellous screw(CCS) in unstable pelvic bone fractures involving the sacrum and sacroiliac joint.

**Materials and methods** : Sixteen cases were evaluated retrospectively. Classification according to the injury mechanism, using Young 's criteria, was as follows: 7 anteroposterior compression, 4 lateral compression, 4 vertical shear and 1 combined mechanism. With respect to treatment, 9 cases were treated by combined anterior external fixation(E/F) and posterior I/F with CCS(7 cases) and transiliac rod(2 cases). Five cases were treated by anterior E/F only, and 2 cases were treated without surgery. We analyzed clinical results using Matta 's criteria, and radiologic abnormalities.

**Results** : The management by posterior I/F with CCS and transiliac rod including anterior E/F has shown superior clinical results(7 satisfactory, 2 unsatisfactory) over the management by only anterior E/F(1 satisfactory, 4 unsatisfactory) or conservative methods(2 unsatisfactory). The rate of malunion and nonunion was also low in the former method in the radiographic analysis.

**Conclusion** : Posterior I/F using CCS is an excellent surgical procedure in the treatment of unstable pelvic bone fracture due to its lessened invasiveness, early applicability, simple surgical technique and its direct effects on the prevention of several complications.

**Key words** : sacral fracture, dislocation of sacroiliac joint, cannulated cancellous screw

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