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Use of An Aiming Device for Pin Fixation in External Fixation of Pelvic Fractures

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Abstract **To improve accuracy and lessen the operative time in immediate anterior stabilization with external fixator in unstable fractured pelvis, an aiming device has been designed according to the study of 50 flesh cadaveric iliac crests and iliac wings. The aiming device came in 2 sizes, 1.5 cm in diameter and 1.75 cm in diameter, for female and male patients, respectively. It could guide Shantz pin with 0.5 cm in diameter to fix anterior iliac crest promptly in 30 patients. All pins were in good position and no complication of the fixation was observed. The device could also shorten the operative time down to about 10 to 15 minutes, and immediate fixation was allowed to perform in the emergency room under local anaesthesis because this aiming device requires less exposure of the iliac crest.**

Key Words : *Pelvic fracture, External fixation*

Immediate external stabilization by external fixator at the iliac crest in unstable fractures of the pelvis can improve the survival rate and decrease morbidity of patients.[1-4] External fixation should be carried out as soon as possible to create a temponade effect on the venous plexus in the pelvis which is the major source of bleeding after unstable fractures of the pelvis.[1-3] External fixation can also reduce and stabilize the fracture which can result in decreasing pin and prevention of further injury.[4,5] However, to introduce the pin into the iliac crest is a technically demanding procedure. Most surgeons prefer to perform the fixation in the operating room with adequate exposure on the liac crest.[2] To facilitate this step and shorten external fixation time, an aiming device for pin fixation at the iliac crest has been designed and tried out on the patients.

Patients and Methods

The thickness of both iliac crests of 50 flesh cadavers with young and middle-aged adults were measured at the point 1 and 5 cm posterior to the anterior superior iliac spine with a vernier caliper

(TESA, Digital Cal 51, Switzerland). Thirty-five cadavers were male and the rest were female, all Thai. All soft tissues were removed to expose the iliac crests down to the acetabuli. The angles between the inner and outer tables of the iliac wings were also measured.

These data were used to design the aiming device and it was used to fix 5.0 mm Shantz pin in the patients who had unstable fractures of the pelvis. The result of pin fixation in terms of accuracy, stability and complication of pin fixation were monitored.

Results

The average thickness of the iliac crest in male cadavers was 17.6 ± 2.2 cm and 15.27 ± 1.1 cm in female cadavers. The inner table of the iliac wing slopes down from the iliac crest with a smooth surface and expands internally to the pelvic inlet. On the other hand, the outer table curves medially at about 1 cm below the crest and then curves laterally to become the upper part of the acetabulum. So, the designed aiming device consists of the thick sleeve with a 5.5 diameter tunnel at the center which can accommodate the commonly used 5.0 Shantz pin. The outer dimension of the sleeve comes in 2 sizes, 1.5 cm for female and 1.75 cm for male patients. The sleeve has a handle and the guide points which are made of a properly bent 3.0 Steinmann pin (Figure 1). The guide points are the 2 ends of the Steinmann pin. They are sharpened in divergent shapes. The straight and short point slides on the inner table of the iliac and the long and angulated point is designed to fit the curvatures of the outer surface of the iliac wing (Figure 2). These 2 guide points fix the sleeve of the iliac crest and allow proper introducing of the Shantz pin into the iliac crest.

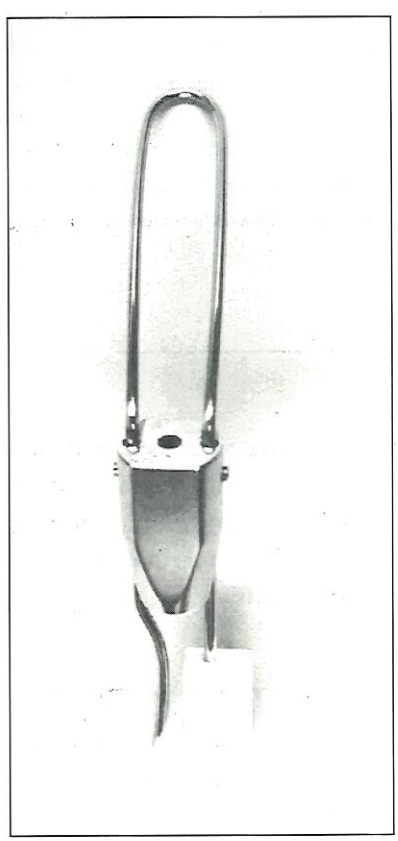


Fig. 1 The aiming device for guiding the Shantz pin fixation into the iliac crest.

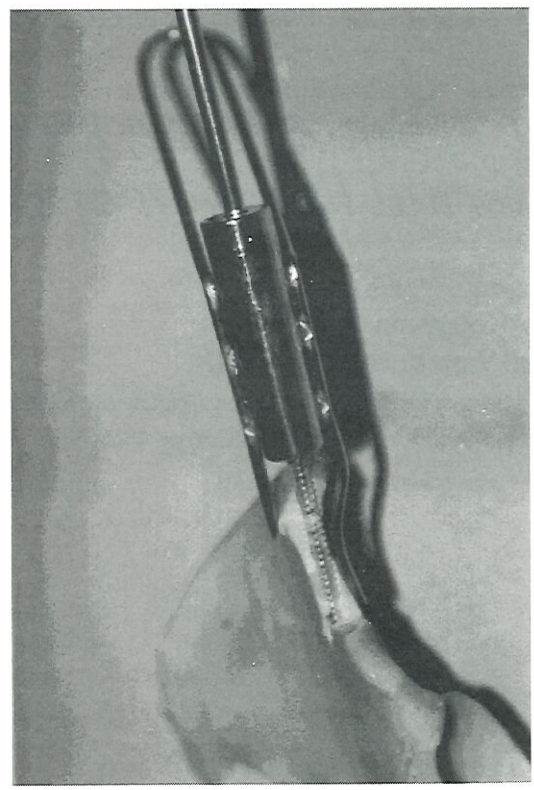


Fig. 2 The guide points of the aiming device fix the sleeve to the iliac crest in position.

The aiming device has been used in 30 patients, 18 males and 12 females (Table 1) for immediate anterior stabilization of unstable pelvic fractures[6] at the emergency room under sterile technique and local anesthesia. The average time for external fixation

Table 1 Biodata and type of the injuries of the patients which have been treated by anterior external fixator using the aiming device to guide pinning.

	Male n = 18	Female n = 12
Age (year)		
Average	23.6 ± 10.1	25.4 ± 11.0
Range	20 to 48	20 to 35
Tile's classification types of injuries[2]		
B1	10	-
B3	4	8
C1	4	4
Definitive treatment	12	-
Temporary stabilization	6	12

using the device was 10.0 ± 6.0 min. Clinical and radiographic examination showed all Shantz pins to be in proper positions. The displaced pelvic fracture of each patient was reduced until the distance between both anterior superior iliac spines was equal to the length of the patient's right foot to get the anatomical position.[7]

The external fixator was used as definitive treatment in 20 paitents, 10 males and 10 females without any complication of the pin fixation for an average of 8.0 ± 2.0 weeks. No pin loosening was observed. Operative treatment was performed on the rest of the patients, and no serious postoperative complication was encountered.

Discussion

Immediate stabilization with external fixator can decrease mortality and morbidity in patients who have unstable fractures of the pelvis.[1-5] Early reduction and stabilization of pelvic fracture can lessen the losts of effective circulating volume and allow the surgical team to have enough time to give appropriate management to the patients. Our aiming device can be used in patients with satisfactory results. It can promote immediate external fixation promptly in the emergency room. It can also shorten the operative time. All pins were in proper positions which were confirmed by radiograph. Stable pin fixation can also maintain reduction and lessen the need of open reduction and internal fixation. About two-third of our patients could have external reduction and fixation as the definitive treatment (Table 1). No pin loosening was found after external fixation until they were removed when the fractures healed.

The aiming device is a simple tool which can grasp the iliac crest and guide the pin in proper position. However, on the patients with fractures of the anterior iliac crest, this aiming device cannot be used.

References

1. Alonso JE, Lee J, Burgess AR, Browner PP. The management of complex orthopaedic injuries. Surg Clin North Am 1996; 7694):879-803.
2. Browner BP, Cole M. Initial management of pelvic ring disruption. In: Basselt FH, III, editor. Instructional Course Lecture, vol 37. Park Ridge: American Academy of Orthopaedic Surgeons Press; 1988.p. 129-37.
3. Burgess AR, Jones AL. Fracture of pelvic ring. In: Rockwood CA Jr, Bucholz RW, Heekinan JD, editors. Rookwood and Green's Fractures in Adults. Philadelphia: Lippincott Roven; 1996.p. 1575-616.
4. Waikakul S, Harnroongroj T, Vanadurongwan V. Immediate stabilization by external fixator in unstable fractures of the pelvis: results in 214 patients. Thai J Surg 1997; 18(2):59-65.

5. Riemer BL, Butterfield SL, Diamond DL, et al. Acute mortality associated with injuries to the pelvic ring: the role of early patient mobilization and external fixation. J Trauma 1993; 35(5):671-51.
6. Tile M, Pennal GR. Pelvic disruption: Pinciples of management. Clin Orthop 1980; 151:56-65.
7. Waikakul S, Vanadurongwan V, Sakarnkosal S. Relationship between foot length and the inter anterior superior iliac distance. Injury 1998; 29(10):763-7.