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ORIGINAL STUDY

Percutaneous iliosacral screw placement using a radiolucent drive

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Percutaneous iliosacral screw placement is a standard stabilisation technique for pelvic fractures. It is a demanding operative technique. Various methods of guidance are currently available. We present a quick and simple fluoroscopy-guided technique using a radiolucent drive designed for distal locking of intramedullary nails. From January 2008 to December 2009, 27 screws were inserted using this technique in 21 patients with a pelvic fracture. The rate of incorrect placement was 11%. This technique does not require highly specialised equipment and is precise in determining both the entry point and drill track.

Keywords : iliosacral screw ; percutaneous ; pelvis ; fracture.

INTRODUCTION

Percutaneous iliosacral screw placement is a common stabilisation technique for posterior pelvic ring disruption. Screw insertion is a demanding operative technique due to the narrow bony corridor and risk of neurologic injury (*3,14*). Reported data on screw malposition and incidence of neurologic injury is variable (*1,3,9,13,14*).

Currently, many techniques for screw placement exist, including fluoroscopy-guided, computed tomography-guided, and computer-assisted (navigated) (*3,12,14*). The fluoroscopy-guided technique is performed in most hospitals, but it carries a high rate of screw malplacement. With this technique, visualisation is possible in only one plane at a time, which can be a limiting factor for the operating surgeon (*14*). In contrast, navigated techniques are time-consuming and require costly equipment (*3*).

Here we present a fluoroscopy-guided technique using a radiolucent drive (Synthes, Switzerland) designed for distal locking of intramedullary nails (Fig. 1). No special equipment is necessary for this freehand technique. We evaluated the rate of screw malposition with this method.

PATIENTS AND METHODS

Twenty-one patients were treated with percutaneous iliosacral S1 screw placement (27 screws) from January 2008 to December 2009. All screws were placed under fluoroscopy-guided control using the radiolucent drive (Synthes, Switzerland). The indication for treatment was pelvic fracture in all cases. The distribution of B and C fracture types according to Tile (*11*) was 11 (52%) and 10 (48%) cases, respectively. Eleven screws (10 patients) were inserted as early definitive posterior pelvic ring fixation on the day of injury. The standard patient position

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Fig. 1. — Percutaneous drilling into the S1 bony corridor using a radiolucent drive under fluoroscopy control. The patient is positioned in the supine position (head on the left) and the image intensifier is in the inlet plane position.

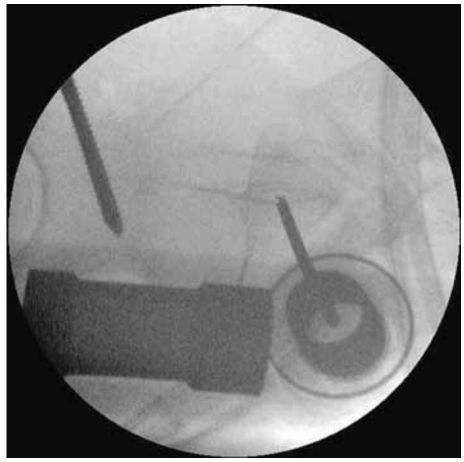

Fig. 2. — True lateral fluoroscopic view demonstrating the drill bit aiming into the S1 bony corridor using a radiolucent drive. The drill bit is oriented cephalad-anteriorly to be perpendicular to the disrupted sacroiliac joint.

was supine. In one case two screws were inserted in the prone position, as the patient simultaneously underwent lumbopelvic stabilisation. All patients were evaluated postoperatively by computed tomography. Malplacement of screws was classified according to Smith *et al* (*10*).

Surgical technique

The patient was placed on a radiolucent operating table. Draping technique depended upon the dislocation. If reduction by lower limb manipulation was required, a freely draped leg was necessary. The true lateral view was obtained by superimposition of the femoral heads (*12*). Location of the skin incision was identified under the image intensifier. After skin incision and blunt dissection, a radiolucent drive with 3.2-mm drill bit (Synthes, Switzerland) was put on the lateral table of the iliac wing. The exact location of the entry point was found under fluoroscopy in the lateral view (Fig. 2) and the drill was bored into the bone. Then, the drill bit was aimed at the required screw track. In sacroiliac joint disruption the screw was placed perpendicular to the joint plane and in sacral fractures it was oriented perpendicular to the fracture line (*2,12*). Drilling with the radiolucent drive into the S1 body was possible in thin patients (Fig. 3). The drilling was checked by the image intensifier via inlet and outlet views (*2,4,12*). After drilling, the drill bit was replaced by a 2.8-mm guide wire and a cannulated screw from the 6.5/7.3 Cannulated Screws set (Synthes, Switzerland) was inserted in the routine manner.

The depth of drilling was limited in obese patients due to the length of the drill bit. If the entire length of the bit was used up, the 2.8-mm guide wire was inserted into the canal made by the drill bit. The guide wire was then placed in the usual manner under fluoroscopy control.

RESULTS

All screws (N = 27) were placed into the S1 sacral body using the radiolucent drive without intraoperative complication. We found grade 1 and grade 2 malplacements in two (7%) and one (4%) patients, respectively. All malplacements involved perforation of the anterior sacral border and were without postoperative neurologic deficit. We had no perforation into the sacral canal.

Fig. 3. — Fluoroscopic intraoperative outlet view showing the drill bit aiming at the centre of the S1 body.

DISCUSSION

Most studies report malposition rates with conventional fluoroscopy-guided techniques from 2 to 15%, which is comparable to our findings (*2,5,14*). Zwingmann *et al* reported a malposition rate of 58% (*14*). This variation may be due to the use of different imaging techniques for placement evaluation. Studies using computer-assisted (navigated) iliosacral screw placement reported a lower rate of malplacement (*1,3,6,14*). Although computer assisted techniques seem to be growing in popularity, they are not suitable for acute procedures due to a longer operation time (*1*). In our study we placed 11 screws (10 patients) as early definitive stabilisation during primary surgery on the day of injury.

Exact determination of the entry point is necessary for correct screw placement. A common technique to locate the entry point is its determination under fluoroscopy control by K-wire. The K-wire is then hammered into the bone (*2,12*). Due to the incline plane of the outer border of the iliac bone, there is a risk of the entry point dislocating dorsally. Real-time determination and drilling of the entry point under fluoroscopy control is possible using a radiolucent drive. The image intensifier does not collide with the radiolucent drive during aiming and drilling. Real-time entry point determination is comparable to computer assisted surgery techniques.

The intraoperative position of the patient depends on the fracture type and the surgeon's preference (*7-9*). This freehand technique is suitable for patients in both the prone and supine position.

Percutaneous placement using a radiolucent drive is an alternative technique for iliosacral screw insertion. No expensive equipment is necessary, an advantage over computer-assisted techniques. The malposition rate is comparable to that of conventional fluoroscopy-guided techniques. A prospective study with more patients is warranted to provide more definitive data on malposition rate, operating time, and fluoroscopy time with this technique.

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