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Open reduction and internal fixation of osteoporotic acetabular fractures through the ilio-inguinal approach: use of buttress plates to control medial displacement of the quadrilateral surface

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KEYWORDS

Acetabular fracture
Osteoporotic fracture
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ABSTRACT

The number of acetabular fractures in the geriatric population requiring open reduction and internal fixation is increasing. Fractures with medial or anterior displacement are the most frequent types, and via the ilio-inguinal approach buttress plates have proved helpful to maintain the quadrilateral surface or medial acetabular wall. Seven to ten hole 3.5 mm reconstruction plates may be used as buttress plates, placed underneath the usual pelvic brim plate. This retrospective study presents our results with this technique in 13 patients at a minimum follow-up of 12 months (average, 31 months). 85% of the patients had a good result. The early onset of post-traumatic osteoarthritis necessitated total hip arthroplasty in two patients (15%) at 12 and 18 months follow-up, respectively. This treatment option should be considered in the surgeon's armamentarium when fixing these challenging cases.

Introduction

Open reduction internal fixation (ORIF) remains the gold standard for the treatment of displaced acetabulum fractures [1]. The largest published series of acetabulum fractures have demonstrated the close relationship between the accuracy of reduction and long-term outcome [2]. Results were also correlated with other variables including fracture type and patient age [2-5]. Even in the most experienced hands, high failure rates ranging between 15-47% were observed with fractures involving the posterior wall [1]. More advanced age was also identified as a negative prognostic factor [1,6,7].

In most large published series reporting on long-term outcomes after ORIF of acetabular fractures, patients above the age of 60 were the minority. This may be partially explained by a reluctance to operate on older patients due to their general condition, their bone quality, or assumptions of modest activity requirements. The increased complexity and risks of ORIF of acetabulum fractures were additional arguments for a non-operative approach in these older patients.

With the increasing age of our patient population over recent years, we noticed a more frequent occurrence of acetabulum fractures among older patients. In a recent retrospective analysis of the age distribution of patients admitted to our institution with an acetabular fracture, we observed a double-peaked pattern, with the highest incidence at ages 30-40 and a second peak of occurrence between 70-90 years of age. We also found that fracture type distribution, according to the Judet-Letournel classification, was completely different between younger and older patient groups. While fractures involving the posterior wall are known to be most frequent in younger patients, fractures with medial or anterior displacement were predominant in the older population. These included anterior column, anterior wall, anterior column plus posterior hemitransverse, and both column fracture patterns. Contrary to the traditional belief that geriatric patients presenting with such fractures would do reasonably well when treated non-operatively, a retrospective outcome analysis of our geriatric patients treated non-operatively with displaced acetabular fractures, demonstrated that results were frequently poor, with only 60% of patients able to ambulate with or without external support at one-year follow-up.

Our perception of these "typical" geriatric acetabular fracture patients has therefore evolved. They are now identified as osteoporotic medially or anteriorly impacted fractures, occurring in patients with higher functional demands and greater expectations, and therefore more likely to be candidates for operative treatment.

Primary total hip arthroplasty (THA) has been advocated by several authors as an option for the surgical treatment of geriatric acetabular fractures [8-12]. We believe, as others do [13-16], that fractures involving posterior displacement such as T-type or posterior wall are good indications for primary THA in geriatric patients, whereas the more frequent geriatric fracture types, medially or anteriorly displaced, remain accessible to indirect reduction and internal fixation through anterior approaches

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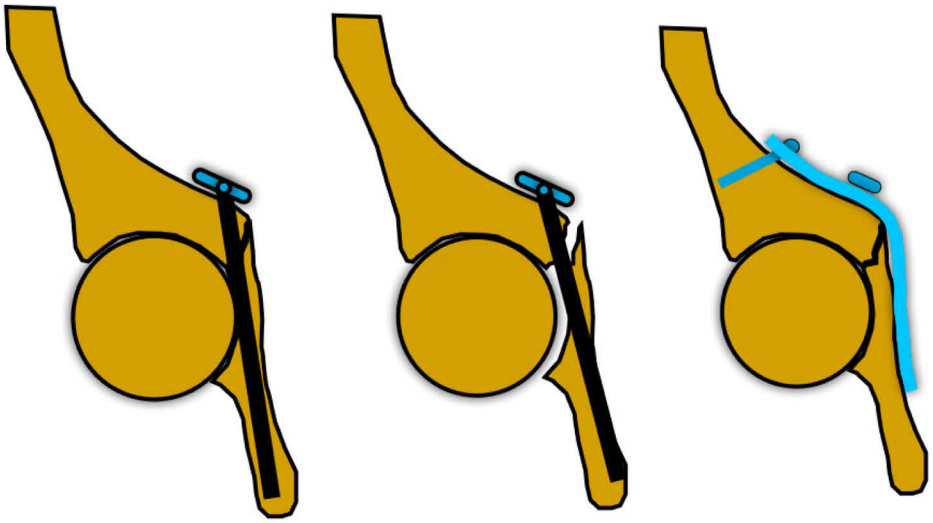

Fig. 1. Screws inserted from the pelvic brim towards the ischium are useful for fixation of posterior column fractures. These screws provide less stability in osteoporotic bone and do not efficiently prevent medial displacement of the quadrilateral plate, a common problem in geriatric acetabular fractures. The buttress plate construct is a good solution in osteoporotic bone as it provides efficient medial support.

involving endo-pelvic implants. In this respect the medial Stoppa approach [17] which permits placement of medial screws and plates offers improved biomechanical conditions and is gaining in popularity [18-22].

The classic fixation technique through the ilio-inguinal approach, involving a reconstruction plate placed on the pelvic brim with screws extending distally into the posterior column, provides adequate stability when used in non-osteoporotic bone. However, this construct fails to control medial displacement of comminuted fragments involving the quadrilateral plate (Figure 1). A solution for this problem is to use a so-called "buttress-plate" to prevent medial displacement of the medial wall of the acetabulum, as suggested by Mast [23].

In this study we present our experience with the "buttress-plate technique" in older or osteoporotic patients, for ORIF of medially or anteriorly displaced acetabulum fractures through the ilio-inguinal approach.

Patients and methods

Our study group consists of 13 patients who were treated using a quadrilateral surface "buttress plate". These 13 patients were part of a cohort of 102 patients treated at our Level 1 trauma centre by ORIF for acetabular fractures between November 2003 and January 2013. Surgery was performed within 3 weeks after fracture in all patients. Patient data was prospectively collected in a dedicated acetabular fracture database. Radiographic analysis included preoperative as well as postoperative pelvic standard radiographs (Anterior-Posterior and Judet views) and computed tomography (CT) in all patients. The average patient age in our cohort of 102 patients was 49 years with a range from 18 to 87 years. The classification system described by Judet & Letournel [24] was used to classify all fractures. Patients were initially treated with bed-rest or eventually skeletal traction if the hip was judged unstable. Indications for ORIF were based upon the fracture type, the degree of displacement or instability and the general and local condition, in accordance with the guidelines defined by Matta [25] and other authors [1,26,27].

Patients were scheduled for surgery as soon as their general condition allowed. Incisions used in our 102 patients were the Kocher-Langenbeck in 49 patients (with trochanter flip in 17), ilio-inguinal in 41 patients, modified Stoppa in 4 patients, Smith-Petersen in 1, associated anterior (Il-Ing) and posterior (KL) in 6, percutaneous in 1. Extended ilio-femoral approaches were not used during this period. Among our 102 patients, a primary hip arthroplasty was implanted during the same procedure in 11 patients, following plate fixation of the posterior column and wall through the KL exposure. The average age in these 11 primary THR's was 66 years (52-82 years).

All patients were mobilized out of bed within 1 to 3 days postoperatively and instructed to ambulate with toe-touch weight bearing for up to 3 months. Physical therapists were available during the hospital stay. Patients medical records, as well as radiologic images were available for consultation into our centralized PACS system. All patients were followed until fracture consolidation and were seen, if possible, at regular intervals up to one year or more with a final clinical and radiologic examination. The Merle d'Aubigné-Postel score was used to rate the final results [28].

Among our cohort of 102 patients, the "buttress plate", as described by Mast [23] was used in 13 patients to supplement the fixation of the medial acetabular wall while performing the open reduction through an ilio-inguinal approach. The ilio-inguinal approach was the single exposure used in every one of these 13 patients. These 13 patients constitute our study group.

Surgical technique

Surgery is performed with the patient in the supine position on a radiolucent table. A traction table is not used and the ipsilateral lower extremity is draped free which allows for flexion and external rotation of the hip. A complete ilioinguinal approach, as described by Letournel [29], is performed, respecting the three bundles formed by the psoas muscle, femoral and femoro-cutaneous nerve laterally, the femoral vessels centrally, and the spermatic cord medially. The quadrilateral surface is exposed using a curved periosteal elevator. Reduction of the fracture is obtained using manual traction on the leg as well as with clamps. A 7 to 10 hole straight 3.5 mm reconstruction plate is then slightly over-contoured with a sharp angle of approximately 80° at its proximal one-third in order to sit perpendicularly across the pelvic brim. The plate is inserted through the lateral and middle windows of the approach. When the plate is properly seated it is fixed using a screw at its uppermost hole,