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Floating hip and associated injuries

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KEYWORDS

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ABSTRACT

Aim: To describe our experience in treating patients diagnosed with floating hip injury and to communicate the outcomes achieved and the rate of complications. A secondary aim is to compare the results of this group in terms of quality of life with those of patients presenting with a fracture either of the pelvis or of the acetabulum, but in which the femoral segment is not involved.
Patients and methods: This is a descriptive study of the patients diagnosed with floating hip injury (25 patients) who were treated at our hospital between 2004 and 2007, with a minimum follow-up of seven years. The results are compared with those of a control group of 56 patients diagnosed with an isolated pelvic or acetabular injury. We describe the injuries and the associated lesion. The patients' quality of life was assessed using the EUROQOL tool.
Results: Among the floating hip group of patients, three suffered an additional arterial lesion and were later treated with a supracondylar amputation. Seven patients presented heterotopic ossification. No significant difference was observed between the study and control groups, according to the EUROQOL tool, although the scores for every dimension were lower among the floating hip patients. Among the patients in the control group, the quality of life scores were also affected in every dimension of the EUROQOL scale.
Discussion and conclusions: The addition of a femoral fracture to a pelvic or acetabular injury, the so-called floating hip, is a devastating injury which has an important impact on patients' quality of life, going beyond that experienced by patients with isolated injuries. Nevertheless, our results did not reflect statistically significant differences in the quality of life among the three groups analyzed: isolated fractures, floating hip and floating hip resulting in amputation.

Introduction

The term floating hip has been widely used in medicine to refer to many different entities, from congenital abnormalities to surgical procedures, and a classification has been proposed [1]. More precisely, it refers to a fairly uncommon situation in which two ipsilateral fractures proximal and distal to the hip joint are present.

A floating hip comprises a fracture in the femur associated with a second one in the pelvis, requiring specific, sequential treatment. The combination of an acetabular and a femoral fracture is also considered to produce a floating hip, although not all authors agree that this injury should be considered a specific one [2]. Liebergall *et al.* proposed a three-type classification for this entity; type A refers to a fracture involving the acetabular joint; type B, the one properly described as floating hip, includes a fracture through the pelvis; and type C is the situation in which both an acetabular and a pelvic fracture are present, and are accompanied by an ipsilateral femoral fracture.

High-energy trauma is required to generate any of these entities, and further complications accompanying the trauma and the surgery are to be expected. In particular, the association of a pelvic and an acetabular fracture has been reported as a source of suboptimal results [3]. Consequently, when a fracture involving the femur is present in this context, a substandard final outcome may be expected.

In type A injuries, and according to the classification proposed by Tile [4], lateral impact and dashboard injuries (in traffic accidents) can produce a central or a posterior acetabular fracture, respectively. In an attempt to associate these two entities, Liebergall *et al.* [5] proposed an injury pathomechanism. Taking the latter into account, two further pathomechanisms have been proposed, configuring a particular profile for the acetabular fracture and for the location of the femoral fracture. For the first type, a lateral impact on the trochanteric area might

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produce a central injury of the acetabulum, and subsequently, or at the same time, a proximal third fracture of the femur. For the second type, the dashboard may impact first on the knee and then the force would be transmitted to the hip joint, provoking a posterior acetabular fracture. In addition, a fracture in the diaphyseal femur might occur. In this latter situation, injuries in the knee joint may appear, possibly accompanied by ligament rupture or patellar fracture.

Surprisingly, supracondylar fractures are relatively uncommon in this context [4,6]. These fractures, too, are caused by a high-energy trauma, and two explanations for the difference may be proposed. First, a given amount of energy is necessary to produce a supracondylar fracture, and the remaining energy may not be sufficient to produce, in addition, an axial blow and a secondary acetabular fracture. Alternatively, according to the sequence of events proposed in the pathomechanism for posterior injuries, the acetabular fracture occurs first, followed by the fracture of the diaphyseal region, and so insufficient force may remain to produce a fracture (to do so, up to 6230–17,130 N m may be needed [7]).

Since these entities appear in the setting of a polytrauma event, bones and joints are just part of the anatomical structures that can be involved. Soft tissue, namely muscles and neurovascular structures, should also be closely evaluated [8] and the clinician must be aware of possible compartment syndrome development [9].

The aim of this study is to describe our experience in treating patients diagnosed with a floating hip injury and to communicate the outcomes achieved together with the rate of complications. A secondary aim is to compare the results of this group in terms of quality of life with those for patients who have suffered a fracture of the pelvis or the acetabulum but in which the femoral segment is not involved.

Patients and methods

A retrospective review was conducted of patients who attended at our hospitals between 2004 and 2007, with a minimum follow-up of seven years. Two main groups were evaluated: 25 patients diagnosed with floating hip, and a control group with 56 patients suffering pelvic or acetabular injuries, but without an additional femoral fracture.

Group of patients with floating hip

Proximal component: According to the Liebergall *et al.* [5] classification, 13 of the patients suffered an acetabular fracture and were classified as type A. Following the globally accepted Letournel classification for acetabular fractures [10], five of these patients presented a two-column fracture, three suffered a transverse fracture, two were classified as a T-type fracture, two had a posterior wall fracture and one was diagnosed with an extended tectorial fracture. Floating hip type B, involving a pelvic fracture, was diagnosed in twelve cases, nine of which, according to the Tile *et al.* [4] classification, suffered a vertical and rotational instability, termed a type-C injury; three patients were classified as having a pure type-B pelvic fracture but without vertical instability. One patient suffered a lesion of the bladder, which was pierced by a fragment of the pubic bone.

Ipsilateral femoral fracture: The fracture of the femur was located in the subtrochanteric zone in nine cases (three were type 31 A3, five were 31 A2, and one was 31 A1; AO classification), in eight patients, the fracture was in the diaphyseal area (three cases were 32A1, two were 32A3, and three were 32C3), and in eight patients the fracture was located in the supracondylar region (two were 33 A3; five were 33 C2, and one was 33 C3).

Associated injuries: One patient suffered a concomitant floating knee because of a fracture in the ipsilateral tibia. A fracture in the distal extremity of the radius was diagnosed in two cases. One patient presented a transverse fracture in the contralateral hemipelvis.

Vascular lesions: Three patients presented an associated lesion of the popliteal artery. In two of them, the femoral fracture was located in the supracondylar region. The third case was diagnosed with a diaphyseal fracture. One patient suffered iatrogenic femoral artery damage during the reconstruction of the contralateral acetabular fracture through an ilioinguinal approach.

Neurological lesions: Initial damage to the sciatic nerve was present in a patient with a type T acetabular fracture and a mangled lower limb.

Initial treatment: The patients with acetabular fractures did not receive any initial treatment except for rest in bed. Five of the twelve patients were diagnosed with pelvic fractures, which were rotational and vertically unstable, and treated with an external fixator placed on the iliac wing. Seven of the external fixators were applied in the supracetabular area. In no case was a C-clamp used. Femoral fractures were mainly treated with external fixation. In supracondylar cases, the fixation was performed spanning the knee joint. For the subtrochanteric fractures, transtibial traction was applied until the main procedure was carried out. One patient with a diaphyseal fracture was treated with transtibial traction instead of an external fixator. The mangled limb was initially treated in a conservative manner with wound debridement, external fixation and vascular reconstruction in patients suffering popliteal artery damage. No initial amputations were performed. For open fractures, type C, prophylaxis of the infection was carried out with first-generation cephalosporin and gentamicin for 72 hours. Patients were provided with appropriate antitetanus prophylaxis according to their previous immunisation status. Thromboembolic prophylaxis was performed with low-molecular-weight heparin (LMWH) (Enoxaparin™, Sanofi, Paris) from the start of treatment and continued until the patient was able to move unaided. No physical or pharmacological treatment was given to prevent heterotopic ossification.

Main procedure: A sequential treatment was carried out. The femoral fracture was addressed first, and open reduction and internal fixation were combined with percutaneous fixation of the acetabular or pelvic fracture. For the femoral fracture, an intramedullary nail was implanted after the removal of the external fixator. Quality of life was assessed according to EQ-5D 3L [11], recording the dimensions of mobility, self-care, usual activities, pain/discomfort and anxiety/depression, on a scale from highest score, 1, to worst situation, 3. Additionally, a visual analogic scale (VAS), ranging from 0 to 100 (the higher the score, the better the status), was used to determine the self-rated health status. As the patients were located in Spain, the EQ-index was derived using the VAS scale [12]. In addition, a control group was established, consisting of patients whose results for acetabular and pelvis fracture had been partially published previously, in order to compare their overall outcome with that of the patients diagnosed with floating hip [13].

Control group

The control group was composed of 56 patients who had suffered a pelvic fracture (23 patients) or an acetabular fracture (33 patients), during the study period. None had suffered additional fractures in the lower limb. The treatment protocol applied to these patients was essentially the same. None of them needed emergency surgery and early total care was the protocol applied. Fractures of the pelvis were immobilised in the same way as described above, with external fixation applied to the iliac bone. No C-clamps were used. The main procedure was carried out during the window of opportunity.

Results

Floating hip injuries

The main adverse result affected patients in whom a vascular injury was present at the time of the initial diagnosis. Two of them were classified as mangled lower limb involving a catastrophic foot. In one of