



Management of an unusual intra- and extra-capsular subcapital femoral neck fracture

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Femoral neck fractures are common in the elderly after low-energy falls. They are broadly grouped into either intracapsular or extracapsular fractures. We report an unusual subcapital femoral neck intra-extracapsular fracture and discuss the management of such a case with its inherent problems.

Key words: femoral neck ; fracture ; intracapsular ; extracapsular.

INTRODUCTION

Proximal femoral fractures are managed either by internal fixation or by prosthetic replacement depending on whether they are extracapsular or intracapsular. Many studies have recommended prosthetic replacement in elderly patients for a displaced intracapsular fracture of the neck of the femur (5, 10). Undisplaced intracapsular femoral neck fractures can occasionally be treated conservatively, but are usually internally fixed with a view to produce compression at the fracture site to aid healing and accelerate rehabilitation. We are reporting an unusual vertical fracture of the neck of the femur which starts within the capsule in the subcapital region superiorly and laterally and ends extracapsularly inferiorly and medially. The problem in the management of such a case and the way to overcome it is discussed below.

CASE REPORT

A 91-year-old lady from a nursing home, who mobilised with a walking frame, was admitted after a fall from her bed with pain in her right hip. On examination she had a tender right hip with a shortened and externally rotated right lower limb. Radiographs of the pelvis and right hip showed a very unusual intracapsular fracture line extending from the superior-lateral aspect of the subcapital region, running down vertically and medially to and beyond the extracapsular lesser trochanter (fig 1).

She underwent a hemiarthroplasty through a lateral approach to the hip joint. The remaining part of the neck was cut at the level of the flange, marked by placing the femoral component with its

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Fig. 1. — Intracapsular subcapital fracture extending extra-capsularly inferiorly.



Fig. 2. — Radiograph taken at six months shows no sinking of the prosthesis.

centre of rotation at the bisection of the line projected medially from the tip of the intact greater trochanter (7). After the neck cut was made, the flange of the prosthesis was left without cortical support on the medial aspect, as the fracture extended beyond the lesser trochanter. This problem was overcome by placing the index finger on the medial aspect below the flange of the prosthesis and allowing the cement to set. This created a rim of cement resting on the hard cortical bone of the shaft of the femur which helped to maintain the height of the prosthesis, thereby supporting and minimising the chances of the prosthesis sinking. Postoperatively the patient was mobilised routinely and she started fully weight bearing in three days time. Six months follow-up check radiographs were satisfactory without any sign of prosthesis sink (fig 2).

DISCUSSION

Although fractures of the neck of the femur can be broadly classified as intracapsular and extracapsular types, a fracture like this is difficult to put into any group. Moreover, this fracture type will also pose a management problem, whether to treat it with osteosynthesis like an extracapsular fracture or with arthroplasty like an intracapsular fracture.

The main blood supply to the adult femoral head comes from the ascending cervical branches of the extracapsular arterial ring formed by the branches of the lateral circumflex femoral artery anteriorly and by a large branch of the medial circumflex artery posteriorly (8). These ascending cervical branches are further grouped into anterior, medial, posterior and lateral. In the literature there is

enough evidence to show that the lateral group of the ascending cervical arteries provides most of the blood supply to the head of the femur (1, 4, 8). Also, the lateral epiphyseal arteries are largely responsible for the blood supply to the head postero-superiorly which is the weight bearing surface of the head (11). Chung demonstrated a subsynovial intraarticular arterial ring at the margin of the articular cartilage from which the epiphyseal arterial branches arise and enter the head of the femur (2). In an intracapsular subcapital femoral neck fracture, starting at the point of entry of the lateral epiphyseal vessels disruption of these vessels occurs, resulting in definite avascular necrosis (2). In our case, the fracture line started at the point of entry of the lateral epiphyseal vessels and hence the chance of the head surviving was very less, if the fracture was stabilised with internal fixation. Further, evidence shows that anastomosis between the artery of the ligamentum teres and other arteries of the head and neck are variable, and are in practice frequently insufficient to maintain viability of the head (6, 11). Hence, in our case even though the medial retinacular arteries on the inferior surface of the head may logically have been preserved, as the fracture exited beyond the femoral neck into the subtrochanteric region, we feel that the chance of avascular necrosis was high as the fracture started at the subcapital region where the lateral retinacular arteries are close to the bone.

Further, Pauwels showed that in more vertical fractures there is increased shearing force between the fracture fragments that may lead to an increased incidence of non-union (9). However, Garden argued that the femoral neck fracture line was found to be constantly at 50° from the horizontal and that the direction of the fracture line changed with the obliquity of the x-ray beam (9). In our case, the initial radiograph demonstrated a vertical fracture line running down to the medial cortex, and this could not be explained as obliquity of the x-ray beam, as the cortical discontinuity is clearly below the level of the superior border of the lesser trochanter (fig 1). Furthermore, the femoral head removed during surgery clearly demonstrated that the fracture line was vertical (fig 3) and that it reached down to the subtrochanteric region in the



Fig. 3. — Extracted head showing fracture starting intracapsularly superiorly and extending vertically down, involving the calcar.

medial aspect involving the calcar (7). Such fractures can easily be missed, especially if the quality of the radiographs is poor, or if the lesser trochanter is not properly visualised. Hence, we emphasise the need for good quality radiographs with adequate visualisation of the lesser trochanter in all femoral neck fractures and in suspected femoral neck fractures.

Obtaining an anatomical reduction of this fracture in view of a stable internal fixation might prove to be very difficult. Moreover, internal fixation of a fracture as shown in our case cannot produce fracture compression because of the verticality of the fracture line, rather may produce excess shearing force leading to non-union and implant failure (9). Prosthetic replacement is also associated with problems in such a fracture as it extends beyond the lesser trochanter and leaves a gap on the medial aspect, after a routine neck cut is made.

If the neck cut is made at the lower level of the fracture line, it will remove part of the lesser trochanter, resulting in gross shortening, decreased offset and hence, increased chances of dislocation

of the prosthetic hip. In such cases a routine neck cut should be made and fixation of the femoral prosthesis with cement becomes necessary. Digital pressurisation of the cement can be performed by keeping the index finger over the medial gap and the thumb superiorly. It is essential to hold the cement medially until it sets with the femoral prosthesis *in situ*. The cement mantle in the medial gap also rests on the medial cortex of the shaft and in theory, should restrict sinking of the prosthesis with time.

In conclusion, to the best of the authors' knowledge, this is the first case to be reported of a femoral neck fracture that starts as an intracapsular subcapital fracture superiorly and laterally and becomes extracapsular and extends beyond the lesser trochanter, in a low-velocity injury. To avoid missing this type of fracture, radiographs should always provide good quality visualisation of the lesser trochanter area. We believe that this fracture needs replacement with an adequately cemented prosthesis.

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