EXPERIENCE WITH THE ZICKEL DEVICE

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INTRODUCTION

SUBTROCHANTERIC fractures of the femur are difficult to treat successfully. Fractures in this region show typical displacement. The strong gluteal muscles abduct the proximal fragment, whereas the adductors inserted below the fracture site adduct the distal fragment—see Figure 1. Biomechanical analysis of stress in the femur shows a high concentration of stress in the subtrochanteric region. Also, these fractures occur in bone that is predominantly cortical. These two factors, i.e. cortical bone and stress, have been suggested as reasons for the high incidence of complications. The incidence of mechanical complications, i.e. breakage or bending of the fixation devices, has been reported by Seinsheimer to exceed twenty per cent. Skeletal metastasis in the subtrochanteric region are frequent and pose a problem for fixation. The high stresses plus loss of bone substance make pathological fractures more difficult to stabilise than non-pathological ones.

It is generally agreed that the best way to treat subtrochanteric fractures is by open reduction and internal fixation. However conventional blade plate devices are often unsatisfactory especially in pathological fractures because of loss of fixation. Heiple and colleagues report a significant rate of failure of the fixation device using long blade plates.

The Zickel nail was designed specifically to fix securely both proximal and distal fragments of subtrochanteric fractures. Figure 2A and B shows views of Zickel device before and after assembly. Studies of the use of this device for subtrochanteric fractures, both traumatic and pathological, have been encouraging (Mickleson et al 1976: Zickel et al 1976). The purpose of this paper is to describe our results using Zickel nail fixation for the treatment of seventeen patients who had either traumatic or pathological fractures in this region of femur.

MATERIAL

Seventeen patients were treated over a three year period for traumatic or pathological fractures of the subtrochanteric region. Seven of the patients were male and ten were female. The ages of the patients ranged from sixteen to ninety-five years. Of the seventeen fractures, twelve were traumatic and five were pathological. One of the men presented with multiple injuries as a result of trauma. Two of the patients had had a previous attempt at internal fixation using conventional blade plates.

It was decided to categorise the fractures using the classification suggested by Seinsheimer as follows.
This shows the typical deformity that follows a subtrochanteric fracture.

This shows an exploded and an assembled view of the Zickel nail. After inserting the nail into the medullary canal the pin is screwed up into the femoral neck.

Type I — Non-displaced fractures or any fractures with less than two millimetres displacement.

Type II — Two part fractures.

Type III — Three part fractures.

Type IV — Comminuted fractures with four or more fragments.

Type V — Subtrochanteric-intertrochanteric fractures, any subtrochanteric fracture with extension through the greater trochanter.

Using this classification we were able to divide our seventeen patients into the following groups:

| Type | I | II | III | IV | V |
|------|---|----|-----|----|---|
| Number | 0 | 7 | 1 | 3 | 5 |

The remaining fracture involving the femoral neck could not be classified using this scheme.
RESULTS

Fourteen of the patients were operated on within one week of the fracture being recognised. The general condition of one patient who received multiple injuries was such that operation was delayed for three weeks. In the remaining two patients the delay was up to five months, but in the intervening period other attempts at internal fixation had been tried.

The operative technique used was that described by Zickel, except that all the patients were in the lateral position. The only problem encountered at operation was excessive anteversion or retroversion of the intramedullary rod. This had to be adjusted in order to allow correct placement of the neck pin.

POST-OPERATIVE COURSE

All the patients were able to sit out at twenty-four to forty-eight hours following operation. All were walking with aids within two to four days. There were no cases of wound infections. There were no deaths in the immediate post-operative period.

FOLLOW-UP

At the time of this study, three of the patients with pathological fractures had died. The remaining patients were ambulatory at review. Two of the patients had a routine removal of the fixation device one year following operation. Bony union was achieved in fifteen cases. Even the pathological cases showed evidence of union. Malunion developed in one case with a type V fracture. However she remained symptom free and quite mobile. Because of this no further treatment was required.

One Zickel nail required early removal when the pin protruded into the acetabulum causing pain. This occurred in our oldest patient, aged ninety-five, also with a type V fracture. However, following removal, the patient was symptom free and quite mobile with a Zimmer aid.

DISCUSSION

The Zickel nail has the advantage over other devices in that it is strong enough to stabilise weakened bone and, by the nature of its design, prevents rotation at the fracture site. Figure 3 shows a type IV fracture and how it was successfully managed using a Zickel nail.

The aims of treatment in our series were two-fold:-

1. Relief of pain by secure fixation.
2. Early ambulation.

Other means of internal fixation may be equally effective in producing pain relief, but these do not necessarily enable early ambulation. Early mobility is increasingly important with older patients in reducing the incidence of post-operative complications. An early return to normal in patients with pathological fractures secondary to a neoplasm is particularly beneficial. It has been shown by Parrish and Murray that such patients have an average survival time of five months, and early ambulation would therefore increase the quality of their remaining life.

Zickel, in a study of eighty-four cases, had only had one failure of fixation and in another series of thirty-five with pathological fractures, early ambulation was
achieved in nearly every case. In our own series, two of the patients had had previous unsuccessful attempts at fixation using blade plates. It was interesting that both cases, when treated with Zickel nails, proceeded to good bony union without any further problems.4

Failure of fixation with conventional devices is usually seen in the first six months.1 In our series, which was reviewed between three months and three years from operation, only one nail required early removal.

Our group is small and no statistically significant conclusions can be drawn from the results. However, the trends of our findings were very similar to those of Zickel and Mouradian4 and Mickelson and Bonfiglio.3 If we then consider our results alongside theirs and then compare them with those of Seinsheimer1 and those of Heiple and associates,2 they tend to give some support for the use of Zickel nails.

In conclusion, we therefore feel that when treating patients with subtrochanteric fractures, and especially in those where early ambulation is desirable, internal fixation using a Zickel nail is a form of treatment well worth considering.

SUMMARY

Seventeen patients with subtrochanteric fractures of the femur were treated by internal fixation with a Zickel nail. Five of the patients had pathological fractures. Bony union was achieved in sixteen cases. Early mobilisation was achieved in all cases. There were no failure of the fixation device, although one patient developed mal union.
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