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# THE RICHARDS COMPRESSION AND SLIDING HIP SCREW SYSTEM IN THE TREATMENT OF INTERTROCHANTERIC FRACTURES

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A gradual shift towards an increased number of elderly people in our society leads, among other things, to an increased frequency of intertrochanteric femur fractures. In the choice between a conservative or an operative treatment of these fractures, the latter method has recently been more and more recommended, its great advantage being that it allows early mobilization of the patient more frequently. The importance of this is obvious. In order to be able to mobilize the patient as soon as possible after the operation a method of fixation should be chosen which offers the greatest possible stability. The Richards compression and sliding hip screw system seems to fulfil this demand better than other methods (Clawson 1964, Dahlberg et al. 1970, Bosacco et al. 1972, Friedenberg 1972). For this reason this method of fixation has been employed as a routine treatment of intertrochanteric fractures since March 1971 at the Department of Surgery, Central Hospital in Halmstad.

In this article, experiences and results obtained during the first 12 months in which the method was employed will be described. The results will be compared with those of the preceding 12-month period, when McLaughlin osteosynthesis was the routine method of treatment.

## METHODS

The implant consists of a round lag screw with a worm screw thread at the distal end and a longitudinal groove in the shaft corresponding to a ridge inside the bored-out cylindrical portion of the angled plate. Consequently, after the plate has been slipped on to the screw and affixed to the femoral diaphysis, the screw cannot rotate or change its angle in relation to the plate. The screw can, however,

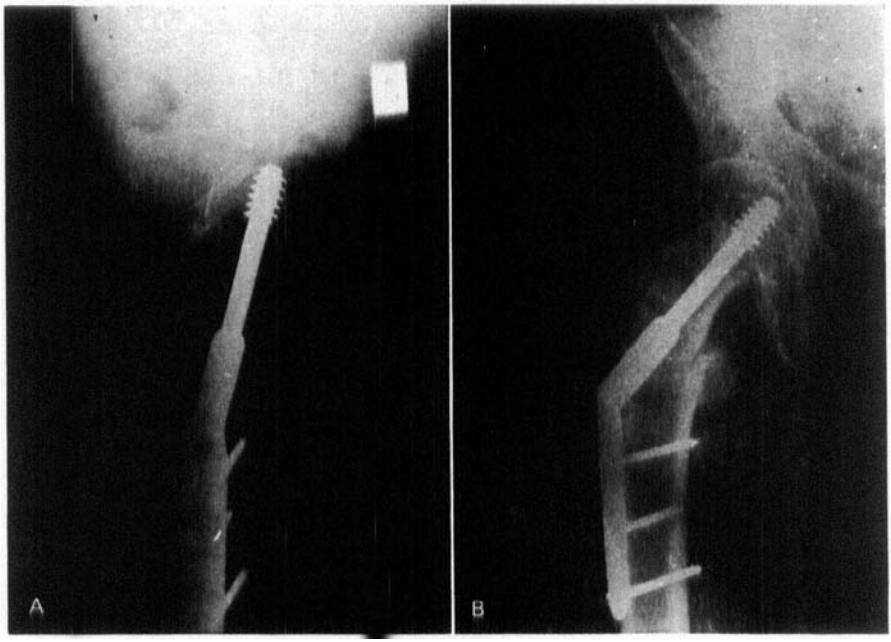


*Figure 1. Routine radiographs after completion of Richards osteosynthesis on a intertrochanteric fracture.*

slide axially in relation to the plate ("telescope") during the process of healing of the fracture. The lag screws are of various lengths from 6.30 to 11.25 cm, and the plates, which are forged at fixed angles from 135 degrees to 155 degrees in 5 degree increments, are also of various lengths, from 2-hole to 5-hole plates for routine use and extra long lengths for special applications. The most useful combination has proved to be, in our experience, the 3-and 4-hole plates with an angle of 135–140 degrees and 8.75 cm lag screws.

The fracture is reduced on the extension table and surgery performed with the aid of TV-image intensifier observation. The required length and position of the lag screw are determined by means of a guide pin. The correct guide pin angle is obtained by means of an adjustable angle guide instrument which is positioned on the lateral shaft of the femur. In this way, stress forces between the screw and the plate are avoided when the two piece device is assembled and the plate is screwed on the femur. A channel through the central part of the femoral head corresponding to the diameter of the lag screw and a cortical hole corresponding to the diameter of the cylindrical portion of the plate are made with special reamers. A special screw insertion wrench is utilized to insert the lag screw, which should be one cm shorter than the depth of the reamed channel in order to allow sufficient compression of the fracture. After the plate has been slipped on to the lag screw and fixed to the femoral shaft with bone screws, the surgical procedure is finished by impacting the fracture with a special compression screw. The radiological appearance after finished osteosynthesis is shown in Figure 1 a and b.

Postoperative physiotherapy including quadriceps exercises and movement of the hip and knee joint was started the day after the operation. Mobilization to walking with, in principle, full weightbearing on the operated leg was generally allowed for stable as well as comminute fractures on the 7th to the 10th day after the operation. Anticoagulants have as a rule been given as prophylaxis against thrombosis until the patient has been satisfactorily mobilized.

During the preceding year, when McLaughlin osteosynthesis was the routine method, mobilization normally started later and full weightbearing on the operated leg was not permitted until callus was seen roentgenogically.

*Table 1. Distribution of age and sex.*

| Richards-material | | | | McLaughlin-material | | | |
|---|---|---|---|---|---|---|---|
| Age | ♂ | ♀ | Total | Age | ♂ | ♀ | Total |
| <50 | 2 | – | 2 | <50 | – | 1 | 1 |
| 50–54 | 1 | – | 1 | 50–54 | – | – | – |
| 55–59 | 1 | 2 | 3 | 55–59 | – | – | – |
| 60–64 | 2 | – | 2 | 60–64 | – | 1 | 1 |
| 65–69 | 1 | 1 | 2 | 65–69 | – | 3 | 3 |
| 70–74 | – | 8 | 8 | 70–74 | 2 | 4 | 6 |
| 75–79 | 2 | 4 | 6 | 75–79 | 2 | 6 | 8 |
| 80–84 | 1 | 5 | 6 | 80–84 | 1 | 8 | 9 |
| 85–89 | 1 | 4 | 5 | 85–89 | 1 | 2 | 3 |
| 90–94 | 2 | 4 | 6 | 90–94 | – | 3 | 3 |
| Total | 13 | 28 | 41 | Total | 6 | 28 | 34 |

*Table 2. Other serious disease on admission.*

| | |
|---|---|
| Cardiovascular disease | 6 |
| Orthopaedic disease | 12 |
| Neurological disease | 2 |
| Psychiatric disease | 1 |
| Malignant disease | 1 |
| Autoimmune disease | 1 |
| Eye disease | 1 |
| Acute trauma | 2 |

## MATERIAL

A total of 41 patients—13 men and 28 women—were treated with the Richards compression and sliding screw system during a one-year period beginning in March 1971. Stable and comminute intertrochanteric fractures were included in the study. The last-mentioned were in a minority. The average age was 75 years (range 39–94 years). Sixty-three per cent (26/41) of the patients suffered from other serious diseases on admission.

This group was compared to 34 patients—6 men and 28 women—with intertrochanteric fractures treated the preceding year according to the McLaughlin method. Stable and comminute fractures were included in this material too. The number of stable and comminute fractures were proportionally equal in the two materials. The average age in this group was 77 years (range 45–93 years) and 47 per cent suffered from other serious diseases on admission.

## RESULTS

In only one case was the osteosynthesis unsatisfactory. This patient had multiple injuries and was in poor general condition including delirium tremens. Treatment of the intertrochanteric fracture subsequently had to be postponed for 3 weeks. This re ted in unsatisfactory reduction of the fracture, contributing in a decisive way to the unsatisfactory and unstable osteosynthesis. No secondary complications due to the implant were observed, and in no case was it necessary to remove it afterwards. One advantage of this sliding nail technique compared to the McLaughlin technique is that the problem of the nail penetrating the hip joint is theoretically non-existent. However, this trouble was not seen in our McLaughlin material either, not even in those three patients with unstable osteosynthesis, because weightbearing was postponed long enough. The average operation time among 7 surgeons was 85 minutes from the moment when the incision was made to the moment when the wound was closed. Wound infection occurred in 2 cases. Seventy-nine per cent of the patients could lie on the operated side without pressure pain in the operation scar.

*Table 3. Cause of death.*

| | |
|---|---|
| Heart insufficiency | 4 |
| Heart insufficiency + Pneumonia | 1 |
| Pneumonia | 1 |
| Pyelonephritis | 2 |
| Pulmonary embolus | 1 |
| Malignant disease | 1 |

Nine patients died in the hospital, another patient died from malignant disease after discharge. The total mortality rate during an observation time of 6–18 months was thus 24 per cent (10/41).

The average hospital stay of patients who could be discharged from the hospital either to their homes or to a convalescent home was 38 days, 4 of which were used for preoperative preparation.

*Table 4. Classification of ability to walk.*

| | |
|---|---|
| Grade 1 | Walk without support. |
| Grade 2 | Walk with one cane. |
| Grade 3 | Walk with two canes, crutches, trestles, walker, or living support. |
| Grade 4 | Confined to bed or wheelchair. |

*Table 5. Ability to walk before and after operation.*

| Grade | Before | After |
|---|---|---|
| 1 | 23 | 9 |
| 2 | 4 | 15 |
| 3 | 2 | 5 |
| 4 | 0 | 0 |

*Table 6. Ability to walk before and after operation.*

| 1 → 1 | 1 → 2 | 1 → 3 | 2 → 2 | 2 → 3 | 3 → 3 |
|---|---|---|---|---|---|
| 9 | 12 | 2 | 3 | 1 | 2 |

Follow-up study was made by means of a questionnaire 6–18 months after the operation. The ability to walk before and after the operation was compared and classified as shown in Table 4 (in 2 cases no information about the ability to walk could be obtained). Prior to the injury 6 patients (21 per cent) had a reduced ability to walk. In 14 cases (48 per cent) the ability to walk remained unchanged, in 13 cases (45 per cent) it deteriorated by one grade and in 2 cases by two grades (Tables 5 and 6). The proportion of patients discharged from the hospital either to their homes or to the convalescent home at the hospital (where the patients get their meals cooked but otherwise have to look after themselves) is probably a representative measurement of the functional as well as the social rehabilitation. This proportion was found to be 69 per cent.

In the McLaughlin series 2 cases of unsatisfactory and unstable osteosynthesis occurred. The average operation time was 10 minutes shorter. Wound infection occurred in 2 cases. The average hospital stay was 57 days and the preoperative preparation time 4 days. The proportion of patients discharged either to their homes or to a convalescent home was 43 per cent.

## DISCUSSION

The Richards compression and sliding hip screw system provides sufficient stability in most cases of intertrochanteric fractures to allow early postoperative mobilization of the patient. The firm fixation of this technique usually converts an unstable fracture to a stable one. Rehabilitation is easier and more effective if the elderly patient is allowed to bear weight on both legs. If there is a restriction to partial weightbearing on the operated leg it is often difficult for many patients in this age group to adjust weightbearing as needed. In view of the circumstances mentioned above and the observations reported by Clawson (1964), our patients with stable as well as comminute or before the operation unstable fractures were instructed to carry full load on the operated leg. Ambulation was deferred until 7–10 days after the operation, mainly because the postoperative pain reaction has normally receded to a satisfactory extent by that time. No serious complication resulted from this way of postoperative treatment. In only one case did unsatisfactory osteosynthesis require a delay of mobilization. Because of advanced age and a poor general condition a few patients were mobilized within the first few days after the operation.

The end results including ability to walk are comparable to those of other series treated with the same method (Clawson 1964, Bosacco et al. 1972). Of the two patients whose ability to walk deteriorated by two grades, one underwent amputation of the lower leg because of gangrene in the foot a short time after the hip surgery. The only case of unsatisfactory osteosynthesis deteriorated by one grade. This patient had multiple injuries including a tibial fracture on the opposite side.

Comparison of the Richards and McLaughlin groups in the present series clearly demonstrates the advantages of the Richards method. More favourable results were obtained in the group operated on with the Richards method because of fewer cases of unsatisfactory and unstable osteosynthesis, and a reduction of average length of hospital stay by 19 days. Furthermore the proportion of patients discharged from the department of surgery straight to their homes was increased by 26 per cent. The 10 minutes longer operation time in the Richards group may be explained by the fact that the method was new to our clinic when the investigation period began, whereas McLaughlin osteosynthesis had been used for many years when the comparison period began.

## CONCLUSION

Results of using the Richards compression and sliding hip screw system in the treatment of intertrochanteric fractures are reported. The method has proved that it can stabilize the fracture to such an extent that it has been possible to mobilize the patient to walking with full weightbearing on the operated leg within a few days. The results have been compared with those obtained previously when McLaughlin osteosynthesis was used as the routine method. Obvious advantages of the Richards osteosynthesis were observed in the form of a better fixation, a shorter length of hospital stay and an increased proportion of patients who could be discharged from the department of surgery straight to their homes. Rehabilitation has thus been facilitated and improved with consequent positive effects for patients and savings of hospital resources.

## REFERENCES

Bosacco, N., Berman, A., Cesare, J. & Conner, H. (1972) Early weight bearing for intertrochanteric fractures. Paper read at an AAOS meeting in Washington D.C. 1972.

Clawson, K. (1964) Trochanteric fractures treated by the sliding screw plate fixation method. *J. Trauma* **4**, 737–752.

Dahlberg, B., Edeland, H. G. & Nistor, L. (1970) Treatment of pertrochanteric femur fractures with Richards hip screw system. Preliminary report. Proceedings, Swedish Medical Society Assembly 1970.

Friedenberg, Z. B., Gentenos, E. & Rutt, C. (1972) Fixation in intertrochanteric fractures of the hip. *Surg. Gynec. Obstet.* **135**, 226–229.

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