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TROCHANTERIC FRACTURES OF THE FEMUR

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The problems of hip fractures in the trochanteric region differ from those of intracapsular ones. Thus the incidences of pseudarthrosis and of necrosis of the femoral head are low in trochanteric fractures. On the other hand, the age of patients with trochanteric fractures is higher than that of patients with medial fractures of the femoral neck (Niemann & Mankin 1968, Riskä 1970 a), and primary mortality grows with age (Alffram 1964, Riskä 1970 a, Öhman et al. 1968). The older the patient, the greater is the importance of effective postoperative mobilization in avoiding complications such as thrombo-embolic diseases (Harris et al. 1967, Riskä 1970 b). However, an early postoperative mobilization requires rigid osteosynthesis to permit full weight bearing on the injured limb (Holt 1963, Küntscher 1969, Massie 1964). Fractures in the trochanteric region have become increasingly common with the growth in the number of traffic accidents, as hip fractures originating in them are often trochanteric.

That the problem is extremely topical was proved by the congress arranged in October, 1969, at Salzburg by Die Oesterreichische Gesellschaft für Unfallschirurgie, which was devoted exclusively to trochanteric fractures. At this conference, special attention was paid to primary mortality, and the importance of early mobilization in the prevention of complications was emphasized. To judge by the reports, new methods of fixation have been developed during the past years (Ender 1969, Giebel 1969, Holt 1963, Küntscher 1969, Massie 1964, Sarmiento 1963), but there were also advocates of conservative treatment (Kuderna 1969). Published reports show that results obtained under different conditions are at least to some extent contradictory. This motivates further investigation, as reports complement each other by elucidating different sectors and aspects of the problem.

Table 1. Patients with trochanteric fractures treated at Koskela hospital in Helsinki between 1961 and 1968.

	Number of patients	Average age (years)	Total
<i>Sex</i>			
Male	21	72.5	210
Female	189	79.8	
<i>Method of treatment</i>			
Conservatively treated	64	81.5	210
Operatively treated	146	78.0	
<i>Type of fracture</i>			
Intertrochanteric	45	76.3	210
Pertrochanteric	125	79.9	
Pertrochanteric comminuted	34	79.3	
Subtrochanteric	6	76.3	

CLINICAL MATERIAL

The material consists of 210 patients with hip fractures in the trochanteric region treated at the Surgical Department of Koskela Hospital in 1961–1968, of whom 21 were men and 189 women. The average age of the former was 72.5 and that of the latter 79.8 years. Conservative treatment was given to 64 and surgical treatment to 146. The average age of the former group was 81.5 and that of the latter 78 years (Table 1).

Type of Fracture

The number of intertrochanteric fractures was 45 and that of pertrochanteric ones 125. Most of the stable fractures of the trochanteric region were found in these two groups in which the reconstruction of the calcar femorale was possible. Pertrochanteric fractures of the comminuted type were found in 34 patients, and these fractures were unstable with split calcar femorale (cf. Dimon & Hughston 1967, Massie 1964). Fourteen of these patients had a severe comminuted fracture type with fracture line extending below the trochanteric region. Six patients had subtrochanteric fractures (Table 1).

Associated Diseases

Of these 210 patients, 116 had universal arteriosclerosis in need of treatment, 54 had senile dementia, 81 heart conditions that required digitalization and other treatment, 26 diabetes, 21 needed treatment for high blood pressure, 11 had a previous history of cerebrovascular accidents, and 21 suffered from chronic renal conditions.

Thirteen patients were permanently bedridden before the accident. Of these nine were treated conservatively. Because of associated diseases, rheumatoid arthritis, osteoarthritis and other conditions, the walking ability was poor in 40 patients before the accident. They had to use one or two sticks when walking. Twelve of them were treated conservatively. 157 patients walked almost without limp before the accident; 43 of them were treated conservatively.

T R E A T M E N T

Conservative Treatment

Because of a poor general condition, 64 patients were treated conservatively with traction and bed rest: in 15 cases because of the patient's general condition, in 16 cases chest infections prevented operative treatment. Twelve patients had a severe heart condition, and in 4 patients a fresh cardiac infarction was discovered. In 15 patients other associated diseases were contraindications for operative treatment of the fracture. Other diseases permitting, patients were mobilized when the fracture had united. This often failed, and the primary mortality was high in the group of conservatively treated patients.

Breathing exercises and prevention of stiffness of other joints with rehabilitation, active and passive movements, were emphasized in addition to the treatment given by the physician during the patients' confinement to bed. Special attention was paid to the muscular strength of the upper extremities to make walking with crutches possible later.

The patients were not routinely treated with prophylactic anticoagulation. The treatment was started when thrombophlebitis appeared. In several cases Macrodex (Dextran 70) was given intravenously during the first days.

Operative Treatment

The patient with a trochanteric fracture was put in traction at hospitalization to minimize pain and to reduce the fracture. When

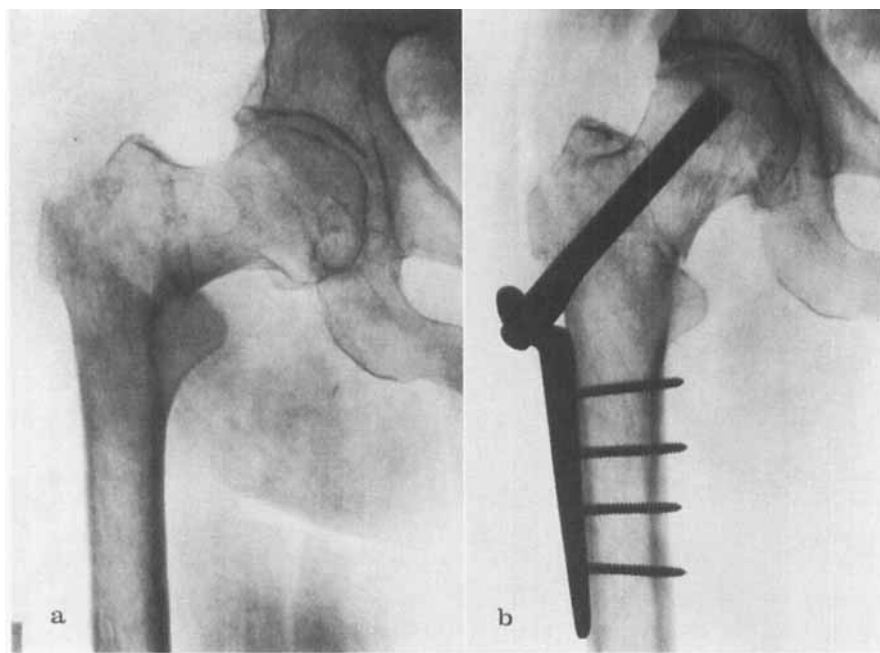


Figure 1 a. An intertrochanteric fracture in a woman 81 years old. This fracture can also be classified as pertrochanteric. Note the typical varus displacement.

Figure 1 b. The same patient ten days after reduction and fixation of the fracture with a McLaughlin nail.

preoperative treatment had made the patient ready for surgery, the fracture was reduced on the operating table, avoiding inward rotation, under inhalation or spinal anesthesia. Neuroleptic anesthesia was the most frequent form of anesthesia used. Osteosynthesis with Nyström nails was performed in one patient because of an intertrochanteric fracture. In two instances, the Smith-Petersen nail was used to fix intertrochanteric fractures as well. The McLaughlin nail (1947) was used in 128 cases (Figures 1 a and b), the Jewett nail (1941 and 1952) in 16 cases (Figures 2 a and b). In connection with the nailing, osteotomy was done on one patient, and three were re-operated. Thus a total of 149 operations were performed on 146 patients. Special attention was paid to the reconstruction of the anatomy in unstable comminuted pertrochanteric fractures. A good operative technique proved to be essential in the treatment of these fractures. Separated screw fixations together with the use of the McLaughlin nail was the method

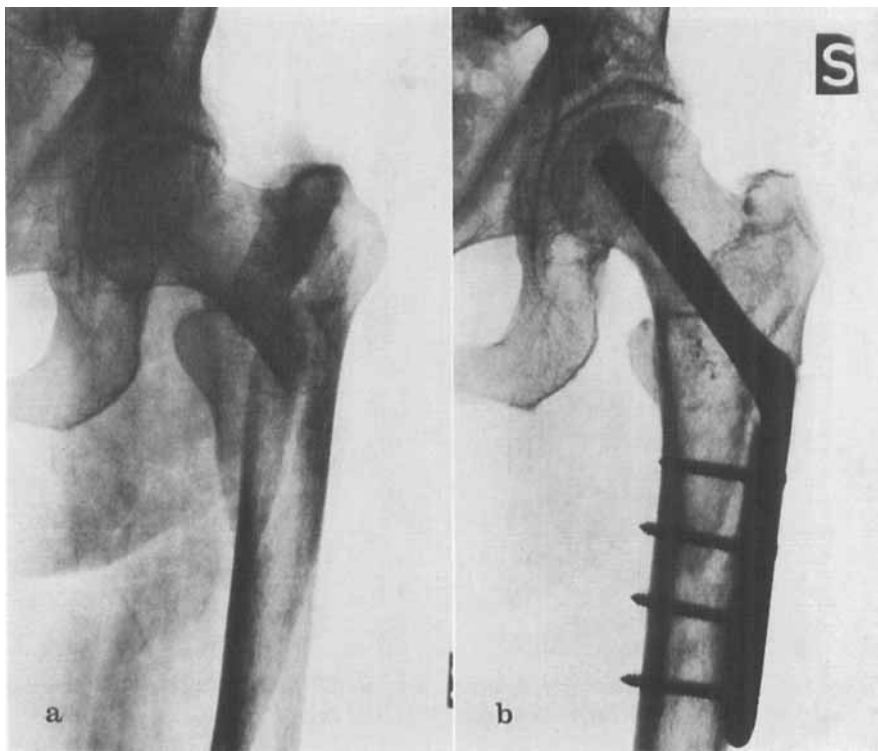


Figure 2 a. A pertrochanteric comminuted fracture of the left hip in a woman 92 years old. The displacement is typical in old patients with comminuted fractures.

Figure 2 b. Anteroposterior roentgenogram made of the same patient two weeks after reduction and fixation with a Jewett nail. The reduction of the fracture and placement of the nail are good.

of choice in most cases. Because of associated diseases, only two out of six patients with a subtrochanteric fracture could be treated operatively.

COMPLICATIONS

The primary mortality (Table 2) was 40.2 per cent among conservatively treated patients (26 out of 64), and 14.4 per cent among operated patients (21 out of 146). According to examinations post mortem, ten deaths were caused by pulmonary thromboembolism, six by cerebral apoplexy, eleven by pneumonia, three by coronary thrombosis, four by other heart diseases, five by universal arteriosclerosis,

three by kidney diseases, two by malignant conditions, one by diabetic coma, one by cirrhosis of the liver, and one of mesenterial thrombosis.

In the 40 patients who died later during hospitalization, examinations post mortem showed that 12 had died of bronchopneumonia, six of coronary thrombosis, six of pulmonary thromboembolism, five of cerebral apoplexy, four of universal arteriosclerosis, three of malignant diseases, two of chronic kidney disease and two of arterial embolism and gangrene.

Thromboembolic diseases were found in only 18 patients (8.6 per cent). The real incidence must have been greater, and some of the venous thrombophlebitis had not been diagnosed. Lethal instances of thromboembolism were verified (Table 2).

Postoperative infections occurred in four operated patients (2.7 per cent). Three were cured by antibiotics, and one died of pyelonephritis after infection eighteen months after the operation (Table 2).

Three conservatively treated patients developed pseudarthrosis, two after pertrochanteric fractures and one after an intertrochanteric fracture (Table 2). Of the operated patients, two developed pseudarthrosis. In one, the screw had become loosened after a pertrochanteric fracture fixed with the McLaughlin nail. In the other, a pertrochanteric fracture of the comminuted type had been nailed with a Jewett nail, but the nail broke two months after the operation because of too early weight bearing on the limb.

POSTOPERATIVE TREATMENT

Efforts were made to mobilize patients on the day after the operation or as soon as possible, but delays in mobilization often occurred. Patients were allowed to weight the operated leg with 10–15 kg, but were not allowed to use the leg for full support until the fracture had united three to six months after surgery.

FOLLOW-UP

Adequate follow-up was achieved in 112 cases with follow-up periods ranging from 9 months to 6 years. In these cases the result of treatment could be clearly estimated. In 103 cases union of the fracture was verified and treatment completed. There were 47 primary deaths within one month, 40 within three months, and 4 within five months either of the injury or of the operation. For 7 patients the follow-up

was inadequate. Of the 103 patients whose fractures had verifiably united, only 11 had been treated conservatively. The hospital mortality of patients treated conservatively was high: within five months 47 out of 64 died because of a poor general condition or associated diseases.

RESULTS

Union was verified in 103 patients (Figures 3 a and b, 4 a and b), and 81 were reconditioned and dehospitalized. These patients walked as well as before the accident, and the mobility of the joint was normal and

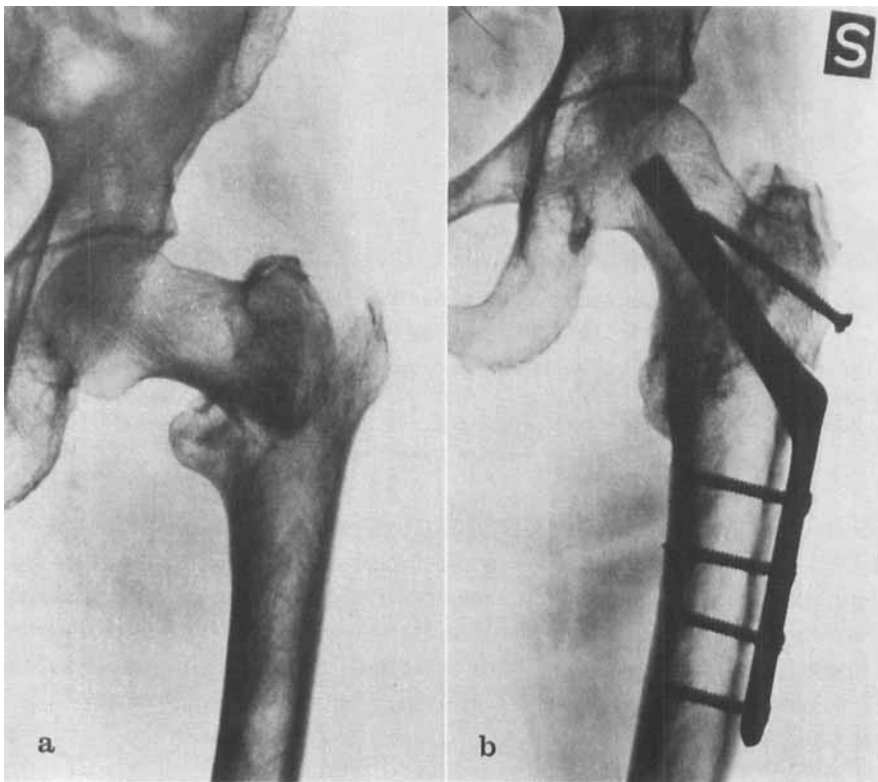


Figure 3 a. A pertrochanteric comminuted fracture in a woman 90 years old. Note the varus displacement and the fracture of greater trochanter.

Figure 3 b. Anteroposterior roentgenogram made eight months after reduction and internal fixation with a Jewett nail. The greater trochanter has been fixed with a screw. The fracture united in a good position.

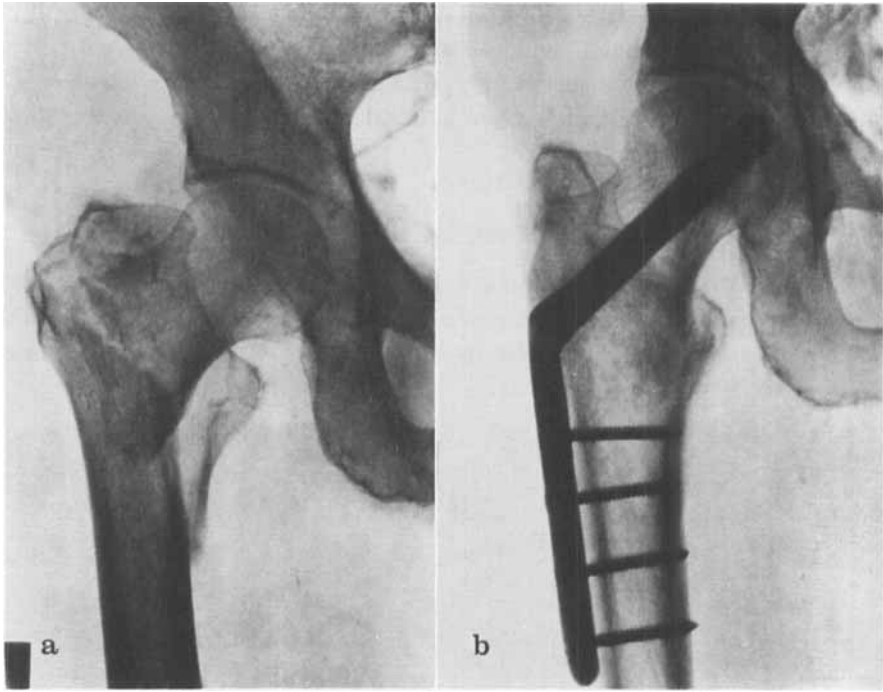


Figure 4 a. A pertrochanteric comminuted fracture in a woman 73 years old. This severe fracture had a typical displacement.

Figure 4 b. Anteroposterior roentgenogram made two months after reduction and internal fixation with a Jewett nail. Note the good position of the fracture. Ten months after surgical intervention the fracture was united, the hip was symptomless, and the patient walked without limp.

painless. Eight patients in this group had been treated conservatively. Twelve patients remained in bed because of other diseases. One patient of this group had been conservatively treated. In five patients, fractures had united in poor positions; three of them had been treated conservatively and two had been operated on. During hospitalization, 87 patients died prior to consolidation, and their results could therefore not be assessed.

DISCUSSION

In spite of the high age of the patients (Table 1) and their poor general condition, 81 patients (39 per cent) were reconditioned and sent home without symptoms in the hip joint. Seventy-three had been treated

operatively, which speaks for surgical treatment, as do other reports (Boyd & Griffin 1949, Dimon & Hughston 1967, Evans 1951, Massie 1964). Among those treated conservatively, hospital mortality was high (73 per cent). Perhaps a few of them could have been reconditioned and sent home if they had been operated on. The examinations post mortem showed that 23 patients had died of bronchopneumonia, which suggests that infection remains a major lethal factor and would suggest increased prophylactic treatment with antibiotics. Sixteen patients had died of pulmonary thromboembolism, which indicates routine prophylactic anticoagulation treatment (Riska 1970 a, b).

Early postoperative mobilization is essential, only being possible with rigid fixation of the fracture (Holt Jr. 1963, Massie 1964). This succeeds in stable fractures, in which the calcar femorale can be reconstructed, whereas the achievement of stability by osteosynthesis in fractures of the comminuted type is more difficult. Recently some intertrochanteric and pertrochanteric fractures have been treated with a Küntscher nail inserted into the femoral neck through the medial femoral condyle (Figures 5 a and b). The patients were permitted early weight bearing of the limb and union was achieved with surprising rapidity without any complications. Primary results have been good in a group consisting of more than fifteen patients, which agrees with available reports from Germany (Giebel 1970, Küntscher 1970).

In unstable fractures the choice of method is more difficult. Of the 34 patients in this group, 16 were reconditioned and sent home with united fractures and symptom-free hip joints. However, the seriousness of this fracture type is accompanied by the high mortality rate: within one month, 8 patients died, and 4 more died later in hospital. Four remained bedridden because of other diseases. In unstable trochanteric fractures, osteotomy with medial displacement fixation has been advocated (Boyd & Griffin 1949, Dimon & Hughston 1967, May & Chacha 1968). This was done in only one instance. As a method, the reconstruction of the anatomy of the fractured bone seems more reasonable, as suggested by Müller & Allgöwer. Filling in the defects that have arisen in connection with the fracture with bone transplants has also been advocated (Müller, Allgöwer & Willenegger 1969), but this would hardly reduce the non-weight-bearing period.

A fracture fixed slightly in valgus seemed to unite more quickly than one fixed in anatomical position. In this way it was possible, at least to some extent, to prevent progressive varus deformities from appearing during the convalescent period.

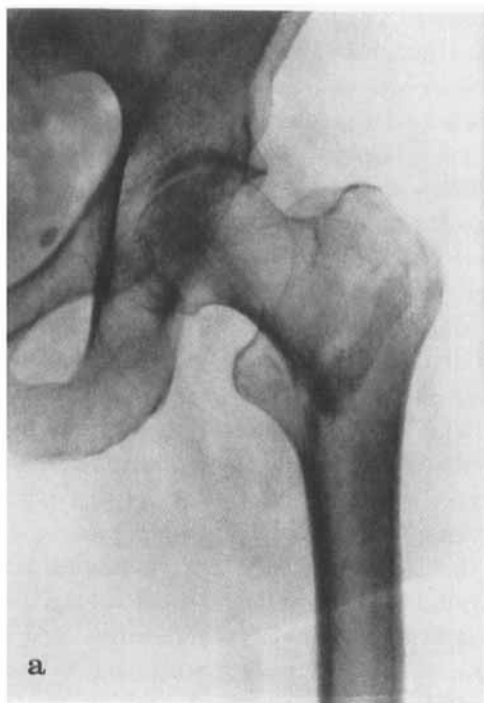
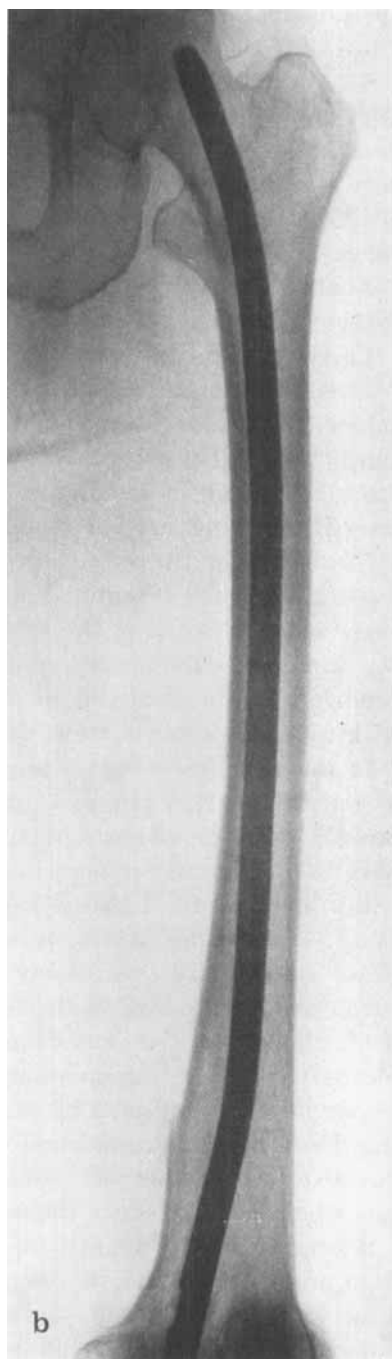


Figure 5 a. A pertrochanteric fracture in a woman 85 years. Note the typical varus displacement.

Figure 5 b. Anteroposterior roentgenogram of the same femur made one month after internal fixation with a Küntscher nail inserted into the femoral condyle after reduction of the fracture on the operating table under anesthesia. A small cortical fracture above the medial condyle appeared in connection with insertion of the nail. The patient walked on the day after the operation with full weight bearing on the injured limb. Two months after the operation the hip was painless and the patient walked without limp and without a stick.



SUMMARY

The results of the treatment of trochanteric fracture of the femur have been reviewed on the basis of 210 patients treated at the Surgical Department of Koskela Hospital, Helsinki, during 1961–1968. Of these patients, 21 were male and 189 female. The average age of the men was 72.5 years and that of the women 79.8 years. Conservative treatment was given to 64 and operative treatment to 146 patients.

There were 45 intertrochanteric fractures, 125 pertrochanteric fractures, 34 unstable fractures of the comminuted type, and 6 subtrochanteric fractures.

In 64 cases, treatment had to be restricted to traction and bed rest, surgery being contraindicated by a poor general condition and associated diseases. Osteosynthesis with the McLaughlin nail was done to 128 patients and with the Jewett nail to 16 patients. Adequate follow-up periods ranging from 9 months to 6 years were achieved for 112 patients; in 103 cases the fractures were found to have united and treatment was concluded.

Of those treated conservatively, 26 out of 64 patients (40.2 per cent) died within one month. The primary mortality of those operated on was 21 out of 146 patients (14.4 per cent). As shown at examination post mortem, the most frequent causes of death were pneumonia, pulmonary thromboembolism, cerebral apoplexy and heart disease.

Thromboembolic disease was found in 8.6 per cent. Postoperative infections occurred in four operated patients (2.7 per cent).

Pseudarthrosis developed in 3 conservatively treated and 2 nailed patients.

The fractures were found to have united in 103 patients, of whom 81 were reconditioned and sent home. In stable fractures, efforts were made to reconstruct anatomical conditions, especial attention being paid to the calcar femorale. In unstable fractures a slight valgus position was found to be favourable for the consolidation. The stability achieved with the McLaughlin nail was as good as that obtained with the Jewett fixed angle nail, as long as the nail was fixed to the plate in a correct manner.

The importance of rigid fixation in the treatment of trochanteric fractures has been emphasized. At least in stable fractures, this can be achieved with the new method by inserting a Küntscher nail into the femoral neck through the medial femoral condyle.

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