

Instability of trochanteric hip fractures following internal fixation

A radiographic comparison of the Richards sliding screw-plate and the McLaughlin nail-plate

A comparison was made of the McLaughlin nail plate and the Richards sliding screw-plate techniques for fixation of trochanteric hip fractures. The series included 96 patients in each group. The fractures were followed radiographically for 3 months.

Technical failures were encountered in 31 per cent of the McLaughlin fractures and in 8 per cent of the Richards fractures; reoperation was performed in 9 per cent in McLaughlin vs none in the Richards fractures. The main failure was varus displacement in both groups, always combined with lateral cutting of the screw in the Richards fractures, and often combined with failure of the nail-plate junction in McLaughlin fractures. Our study has shown that the sliding screw-plate is superior to the nail plate in both stable and unstable fractures.

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Among the devices available for internal fixation of trochanteric fractures, the McLaughlin nail-plate is one of the most frequently used, although technical failures are often encountered, (Foster 1958, Jensen & Michaelsen 1975, Kolind-Sørensen 1975).

A more recent method, the sliding screw-plate, has gained considerable acceptance in the treatment of stable as well as unstable fractures, and has been reported to reduce the number of technical failures compared to other devices (Ecker et al. 1975, Jensen et al. 1978, Daum et al. 1979, Heyse-Moore et al. 1983).

The purpose of this paper was to compare the results of internal fixation of trochanteric hip fractures treated with the Richards sliding screw-plate and the McLaughlin nail-plate system with respect to technical failures during the initial postoperative period.

Patients and methods

During the period January 1st 1981 through January 31st 1983, 122 patients (122 hips) with trochanteric fractures were treated with the Richards sliding screw-plate. Twenty-six patients died or moved to other counties during the first 3 months. The remaining 96 patients were compared with a preceding, consecutive series of 96 patients with

trochanteric hip fractures treated with the McLaughlin device, and followed radiographically for 3 months.

The fractures were divided into stable and unstable, according to Jensen (1980).

All operations were carried out after initial reduction on a traction table using an image intensifier. The nail/screw and the plates were inserted during traction. After insertion, the traction was suspended, and the fracture was impacted (McLaughlin) or compressed (Richards).

Postoperatively, early weight-bearing was emphasized unless the fracture was severely comminuted.

The reduction of the fractures was evaluated from the first postoperative radiograph, usually taken within 3 days after the operation. Radiographs of autopsies in which a Richards sliding screw-plate or a McLaughlin nail-plate had been inserted, were taken in different known degrees of rotation in both planes. These models were used for correction of the angles, as the radiographs of the patients were taken with the femur in different rotational positions.

Acceptable reduction was defined as an angle between the shaft of the femur and the neck ranging from 130 to 150 degrees in the AP projection and less than 20 degrees in the lateral view.

The position of the screw or nail was defined as acceptable if it was placed inferiorly or centrally in the AP projection, posteriorly or centrally in the lateral view, and within 1.5 cm from the head confinement. Telescoping of the screw was recorded.

Both groups were followed radiographically for 3 months. All radiographs were evaluated by the authors.

Technical failure was defined as varus displacement of more than 10 degrees caused by loosening of the implant, bending or breakage of the nail/screw. Penetration of the femoral head by the implant was regarded as technical failure. Telescoping of the Richards screw within the barrel and axial migration of the screw without penetration were not regarded as a failure.

The median age of the patients (60 women and 36 men) treated with the Richards screw-plate was 74 (30–96) years and 72 (30–92) years in the McLaughlin group (55 women and 41 men).

For statistical analysis, the Chi-Square test was used.

Results

Although the two series were consecutive, the distribution of fracture types and the quality of reduction were equal in both groups (Table 1).

The position of 63 of the screws and 39 of the nails was considered acceptable. Telescoping of the sliding screws occurred in 75 cases, not causing any displacement. The screws in a poor position telescoped more than the screws in an acceptable position ($p < 0.05$), and a higher number of telescoping screws was observed in fractures with poor quality of reduction ($p < 0.01$).

Technical failures were encountered in eight of the sliding screws and 30 of the McLaughlin nail-plates (Table 2); this difference was significant for both stable and unstable fractures ($p < 0.001$). Varus displacement was most frequent in both groups, but in the sliding screw osteosyntheses the varus displacement was always combined with cutting of the screw

Table 1. Quality of the reduction of trochanteric hip fractures according to the first postoperative radiograph.

Fracture type	Sliding screw-plate		McLaughlin nail-plate		Total
	Acceptable	Poor	Acceptable	Poor	
Stable	23	5	22	6	56
Unstable	50	18	51	17	136
Total	73	23	73	23	192

Table 2. Technical failures following sliding screw or McLaughlin nail-plate osteosynthesis of trochanteric hip fractures. There were 96 fractures in each group.

Failures	Sliding screw-plate		McLaughlin nail-plate	
	Stable	Unstable	Stable	Unstable
Penetration of the femoral head	–	–	1	7
Penetration into the acetabulum	–	3	–	2
Cutting with varus displacement	–	5	1	2
Deformation of the implant with varus displacement	–	–	5	12
Total	0	8	7	23

through the femoral head, whereas in the McLaughlin group it was more often combined with failure of the nail-plate junction. In three cases the screw failed to telescope, causing a slight penetration of the femoral head. In the McLaughlin group 10 nails penetrated the femoral head or into the acetabulum.

All the failures in the sliding screw and the majority in the McLaughlin group occurred in unstable fractures ($p < 0.05$) (Table 2). The quality of reduction was related to the failure rate in both groups ($p < 0.05$) as well as the position of the nail in the McLaughlin group ($p < 0.05$).

Nine unstable fractures in the McLaughlin group were reoperated, because of varus displacement in eight cases and penetration of the nail in one case, compared to none in the sliding screw group.

Discussion

In both our groups, the 71 per cent incidence of unstable fractures conformed to the pattern of other series (Jensen et al. 1980a). Høgh et al. (1981), however, reported a higher number of stable fractures (57 per cent).

Technical failures following sliding hip screw osteosynthesis of stable trochanteric fractures have been reported to occur in 0–9 per cent, depending on the fracture classification (Daum et al. 1979, Jensen et al. 1980a, Wolfgang et al. 1982). McLaughlin osteosynthesis of stable

fractures seems to give slightly worse results with failure rates of 6–13 per cent (Foster 1958, Laros & Moore 1974, Jensen & Michaelsen 1975), in accordance with our series (Table 2).

In unstable fractures we encountered 8 per cent technical failures with the sliding screw. Failure rates as low as 4–7 per cent have been reported by Mulholland & Gunn (1972), Ecker et al. (1975), Jensen et al. (1980b) and Heyse-Moore et al. (1983). However, Friedenberget al. (1972) and Wolfgang et al. (1982) encountered failures in 18–19 per cent.

In the McLaughlin osteosynthesis for unstable fractures lacking support across the fracture line, impaction during weight-bearing always leads to either cutting, migration of the nail, bending or breakage of the nail or plate, often followed by varus displacement and a high incidence of re-operations (Kolind-Sørensen 1975). Our failure rate of 24 per cent is in the same range as other series (Foster 1958, Jensen & Michaelsen 1975). However, Friedenberget al. (1972) reported 44 per cent and Kolind-Sørensen (1975) 35 per cent.

The telescoping effect of the sliding screw allows the fracture to impact until bony support is established across the fracture line. Due to different classification systems, reports on this subject are difficult to compare, but Jensen et al. (1978) using the same classification, had telescoping of the screw in 49 per cent, compared with 78 per cent in this study. However, in 66 cases the screw telescoped less than 1 cm, and no fracture displacement was observed. The high number of telescoping screws in our series may be explained by the relatively high incidence of screws in poor position and poor reduction of the fractures (Table 1).

The radiographic failure rate is important as a criterion of the reliability of the implant; mild degrees of varus displacement, bending of nails or even penetration of the femoral head are often symptomless. In fact, in fractures with pronounced osteoporosis, a slight varus displacement, as often seen in McLaughlin osteosynthesis, may be regarded as an advantage compared with cutting through the lateral segment of the femoral head as seen in varus

displacement of fractures operated with the sliding hip screw.

A technical failure rate of 31 per cent in the McLaughlin group must be considered high. However, the clinical failure rate at the 3-month follow-up, defined as those patients in whom radiographic failure caused clinical symptoms to such an extent that re-operation was required, was only 9 per cent of the McLaughlin osteosyntheses. This rate of re-operation is in accordance with other series (Jensen & Michaelsen 1975).

We have concluded that the sliding screw-plate system has a lower rate of technical failures in both stable and unstable fractures during the initial 3 months.

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