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Femoral head vitality after peroperative impaction of hip fractures

In 94 patients with femoral neck fracture the vitality of the femoral head was determined pre- and postoperatively with ^{99m}Tc-MDP-scintimetry. In half of the fractures a Thornton nail was used, in the other half three Scand hip pins. Irrespective of the displacement, no difference was noted in the two groups. In half of the operations in each group the fracture was impacted by hammer at the end of the operation. In displaced fractures, impaction caused a decrease in femoral head vitality.

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The fracture moment has generally been regarded as the time of occurrence of vascular injury to the femoral head, although potential threats later in the course have been pointed out (Hulth 1956, Lowell 1980, Strömqvist 1983); further injury may occur during the operation, notably in relation to the nailing procedure (Strömqvist et al. 1984).

The aim of the present investigation was to evaluate the postoperative femoral head vitality by ^{99m}Tc-MDP-scintimetry for two different techniques of osteosynthesis: one where a three-flanged nail was hammered in, and a second where three Scand hip pins were screwed in. The study also aimed to evaluate if impaction of femoral neck fractures at operation would influence the postoperative femoral head vitality.

Patients and methods

From January 1983 to April 1984, all patients with intracapsular femoral neck fractures admitted to the Department of Orthopedics, Skövde Hospital, were included in a prospective randomized investigation. The patients were operated on with a Thornton nail (Art. no. A1-6378-5-(075-150); Shiley/Howmedica) or three Scand hip pins (Art. no. 425616–48; Kenscand AB). The patients were also randomly allocated to peroperative impaction of the fracture with a 1 kg mallet after release of the traction.

Patients with displaced fractures had pin traction preoperatively. The operation was generally performed on the day after admission. General or epidural anaesthesia, extension fracture table and biplane fluoroscopy were used. The operations were performed by staff surgeons, irrespective of their experience. After operation, full weight-bearing was allowed.

Preoperatively and 10 ± 1.2 days after operation, ^{99m}Tc-MDP-scintimetry was performed (Strömqvist 1983). Each patient was given an intravenous injection of 370 MBq ^{99m}Technetium-methylene-diphosphonate. Detailed images of the pelvis, including the upper third of both femurs, were recorded 3–4 h after the injection. A gamma camera (General Electric Maxi) with a parallel hole collimator connected to a nuclear data system (Medstore) allowed storage of images for display and analysis. An X-ray unit (Multi-Imager-7) connected to the computer was used to record the scintigraphic images for visual, qualitative evaluation. An uptake ratio of the femoral heads on the fracture/intact sides was obtained.

A total of 103 patients, 78 females and 25 males, mean age 79 ± 11 years, were included in the investigation. Four patients were excluded because of uninterpretable isotope examinations. Postoperative scintimetry was not performed in three patients, because of hip disease on the contralateral side or technical failures. One patient was operated on with a Moore endoprosthesis and one with a Sven Johansson nail. Thus 94 patients remained for comparison, 45 operated on with the nail and 49 with pins.

Preoperatively the fractures were classified as undisplaced (Garden I and II) or displaced (Garden II and IV) (Garden 1961).

The difference between the groups was evaluated using Student's t-test. $P < 0.05$ was considered as significant.

Table 1. Femoral head isotope uptake in 94 patients with femoral neck fractures. Ratios fracture/intact side, mean values ± standard deviation.

		Number	Preoperatively	Postoperatively
Nail	Undisplaced	11	1.30±0.33	1.58±0.63
	Displaced	34	1.12±0.30	1.21±0.42
Pins	Undisplaced	18	1.16±0.29	1.56±0.48
	Displaced	31	1.13±0.28	1.25±0.48
With impaction	Undisplaced	16	1.18±0.31	1.49±0.58
	Displaced	29	1.11±0.30	1.08±0.36
Without impaction	Undisplaced	13	1.25±0.32	1.67±0.48
	Displaced	36	1.14±0.28	1.34±0.48

Results

There was no difference between the two methods of osteosynthesis concerning postoperative femoral head vitality for undisplaced fractures or for displaced fractures (Table 1). As regards impaction-not impaction, there was no difference for undisplaced fractures. Impaction caused decreased femoral head vitality ($p < 0.05$) in displaced fractures.

Discussion

In addition to the vascular injury caused by the fracture, it has been claimed that further injury does occur during the operation, notably related to the nailing procedure (Strömqvist 1983). We had therefore expected that the femoral head vitality would be decreased for the group operated on with the nail which was hammered in, compared to the group operated on with the three pins, which were screwed in. Since we did not find any difference in this respect, it should be pointed out that our investigation is not quite comparable to that of Strömqvist (1983); his fractures were operated on with a four-flanged Rydell nail or two hook pins, and by a small selected number of surgeons, whereas our fractures were operated on by all staff members.

Undisplaced fractures are comparatively stable and one would not expect that careful impaction at operation would further add to the circulatory deprivation which occurred at the fracture trauma. For displaced fractures, however, which are comparatively unstable even after reduction and nailing, our results suggest that the trauma of impaction of the fracture fragments added to the circulatory deprivation of the femoral head.

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