

# No difference between daily and weekly pin site care

## A randomized study of 50 patients with external fixation

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Submitted 02-05-28. Accepted 03-04-14

**Introduction** We investigated whether there were any differences in the frequency and severity of pin site infections by performing pin site care daily or once a week. We studied patients operated on for gonarthrosis by the hemicallotasis technique, using hydroxyapatite-coated pins in the metaphyseal bone and standard pins in the diaphyseal bone.

**Patients and methods** 50 patients were prospectively randomized to daily (n = 27) or weekly (n = 23) pin site care. We evaluated pin sites, the occurrence of pain (VAS), the use of antibiotics and analgesics and complications every week. Bacterial cultures were taken from each pin site at 1, 6 and 10 weeks and from the pins on removal.

**Results** We found no differences between daily or weekly pin site care as regards the frequency and severity of pin site infections, pain, or the use of antibiotics and analgesics. Grade I infections (Checketts-Otterburns classification) occurred around 11% of the pins and grade II infections around 4%. 70% of the bacterial cultures were negative. The most frequent bacteria were coagulase negative staphylococcus and corynebacterium. Antibiotics were given an average of 47 days. More problems occurred around the proximal pins. 5/200 (all proximal) pins were clinically loose on removal.

**Interpretation** Pin site care once a week seems appropriate.

Pin site infection is the commonest complication using external fixators. Such an infection is painful, delays mobilization and can cause severe com-

plications. A major problem when using external fixation is to prevent pin site infection.

Daily pin site care by the patient or a district nurse is usually recommended (Meléndez and Colón 1989, Olson 1996, Sims and Saleh 1996, McKenzie 1999). In a pilot-study (unpublished data), we found no differences between daily and weekly pin site care.

Therefore, we studied whether there was any difference as regards complications between both types of pin site care in patients operated on for gonarthrosis by the hemicallotasis technique.

### Patients and methods

We randomized 50 consecutive patients (19 women), mean age 54 (35–72) years, operated on for gonarthrosis by the hemicallotasis technique to daily or weekly pin site care. A table of random numbers was used to assign patients to one of the two groups. 23 patients were randomized to weekly pin site care (group 1) and 27 to daily pin site care (group 2) (Table 1).

The patient was given both written and verbal information. A brochure describing the pin site care was given to each patient and the district nurse. The latter also received instructions about pin site care by telephone before the patient was discharged from the hospital. Several district nurses took part in the care of each patient and most of them treated one or more of such patients.

The study was approved by the Ethics Committee of Lund University.

Table 1. Patient characteristics of the study group

	All n = 50	Group 1 Weekly n = 23	Group 2 Daily n = 27
Gender			
Men	31	15	16
Women	19	8	11
Age			
Mean	54	55	54
SD	8	8	7
Medial gonarthrosis	46	23	23
Lateral gonarthrosis	4	0	4
Pre-HKA angle			
Medial g, mean	171	171	171
Medial g, SD	5	5	6
Lateral g, mean	189	–	189
Lateral g, SD	7	–	7
Correction time (d)			
Mean	2	23	20
SD	8	7	8
Frame time (d)			
Mean	99	103	95
SD	24	29	18
Pre-HKA Preoperative Hip-Knee-Ankle angle			

### Hemicallotaxis osteotomy

The procedure was used in younger and active patients suffering from medial or lateral gonarthrosis. 4 pins were inserted, 2 hydroxyapatite (HA)-coated in the metaphyseal bone and 2 standard conical pins (Orthofix) in the diaphyseal bone. The Orthofix T-garche was used for external fixation (Figure 1). Patients were allowed to move freely after the operation.

The correction started 7–10 days postoperatively. The patient did the correction by adjusting 1/4th of a turn 4 times each day. The correction was checked

by radiographic Hip-Knee-Ankle angle (HKA) measurements. When the desired correction was achieved, the instrument was locked (Table 1). 8 weeks after surgery, it was dynamized to stimulate bone healing. About 12 weeks after surgery, the first evaluation of healing on radiographs and an ultrasound examination were done. If healing of the bone was satisfactory, the patient did a weight-bearing test (—i.e., walking for a couple of hours up to 2 days) without the instrument, but with the pins still in situ. If everything seemed satisfactory, the pins were removed in the outpatient clinic; if not, the patient continued with the external fixator for 2 more weeks (Table 1).

All patients were given intravenous antibiotic prophylaxis (cloxacillin 2 g × 3), the first dose during surgery and then 2 more doses in the following 24 hours followed by oral prophylaxis (flucloxacillin 1 g × 3) for 14 days (Magyar et al. 1999). If any signs of a pin infection occurred, additional antibiotic treatment was started. As an analgesic, a combination of Paracetamol and dextropropoxyphene or tramadol was used. The hospital stay was mean 2 (1–4) days. Pin site care was performed before the patient was discharged from the hospital.

### Pin site care

Sterile technique (sterile material and sterile gloves) was used in the hospital and clean technique (sterile material and clean gloves) in the outpatient clinic and at home by the district nurses. All bandages were removed. Each pin site was cleaned with a 0.9% NaCl solution. A cotton-pin was used to take away the crusts. A sterile compress (Solvaline, Lohmann) was placed on to each

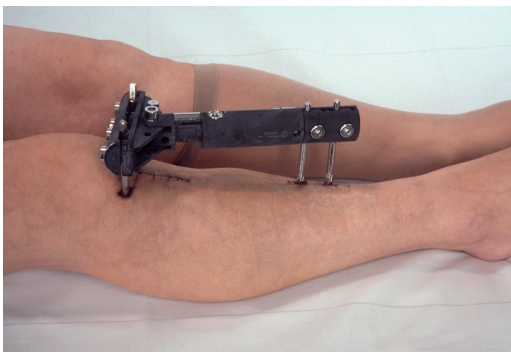


Figure 1. The Orthofix T-garche.

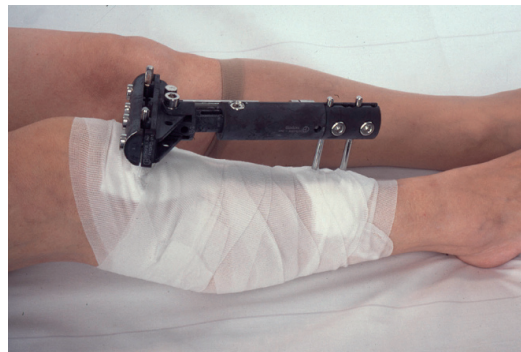


Figure 2. Dressed pin sites.

pin-pair and fixed with a soft dressing (Figure 2). The patient protected the pin sites with a plastic bag when showering.

A nurse involved in the study evaluated all patients for problems with the pin sites once a week in the outpatient clinic. In the case of a pin site infection or drainage, she made more visits, when necessary.

We used the Checketts-Otterburns classification to describe the pin sites (Checketts et al. 1999). Grades I–III were minor infections and grades IV–VI major ones. Bacterial cultures were taken from each pin site after removal of the crusts at 1, 6 and 10 weeks, and from the tips of the pins when they were removed. Pain was estimated on the Visual Analogue Scale (VAS).

Records were kept on the use of antibiotics and analgesics and the occurrence of complications. The pins were assessed as loose or fixed on removal. A loose pin was defined as one, which could be removed by hand without use of a wrench.

### Statistics

The Analysis Of Variance (ANOVA) test, t-test and chi-square test were employed for the statistical analysis, significance level  $p < 0.05$ . The number of pins (200) was used in the analysis of the severity of the pin site infections and their frequency, and the number of patients (50) in the analysis of pain and use of analgesics and antibiotics. For a power of 90%,  $\alpha 0.05$  and an estimated effect size of 0.5, 84 pins were needed in each group.

### Results

We found no differences between daily and weekly pin site care as regards the severity of infections, frequency of infection rate, of positive cultures, except in week 6 (Table 2), pain (Figure 3), and in use of antibiotics or analgesics. The mean infection rate during the study in group 1 was grade I in 14% and grade II in 4% versus grade I in 10% and grade II in 3% in group 2. No grade III–VI infections occurred.

There was no correlation between the clinical assessment of an infection and the results of the pin site cultures. 70% were negative cultures. The positive cultures showed 14% coagulase negative staphylococcus, 4.5% corynebacterium and 3% staphylococcus aureus.

5/200 pins were clinically loose on removal. None of the loose pins was infected with staphylococcus aureus. Antibiotics were prescribed for a mean of 53 days (SD 22) in group 1 and 41 days (SD 30) in group 2.

As regards the number (792) of bacterial cultures taken, more were positive around the proximal pins ( $p < 0.001$ ) in the movable skin, close to the knee joint. The relative risk (RR) of positive cultures at the proximal pin sites was 1.5 (95% CI 1.2–1.9). We found no difference between the groups.

### Discussion

The frequency of pin site care recommended in

Table 2. Clinical pin tract infections and cultures during the treatment of HCO (number of external pins)

	Week 1 n = 200 Group		p-value	Week 6 n = 196 Group		p-value	Week 10 n = 196 Group		p-value	Extraction n = 200 Group		p-value
	1	2		1	2		1	2		1	2	
Classification <sup>a</sup>												
0	69	87		71	92		81	98		81	97	
1	17	18	ns	15	10	ns	6	9	ns	11	8	ns
2	6	3		6	6		1	1		0	3	
Cultures <sup>b</sup>												
negative	64	84	ns	56	80	0.02	56	80	ns	58	83	ns
positive	28	24		36	24		32	32		34	25	

Group 1 = weekly pin site care. Group 2 = daily pin site care.

<sup>a</sup> Checketts-Otterburns classification according to Checketts et al. 1999

<sup>b</sup> No cultures from 4 pins

## Pain (VAS 0–10)

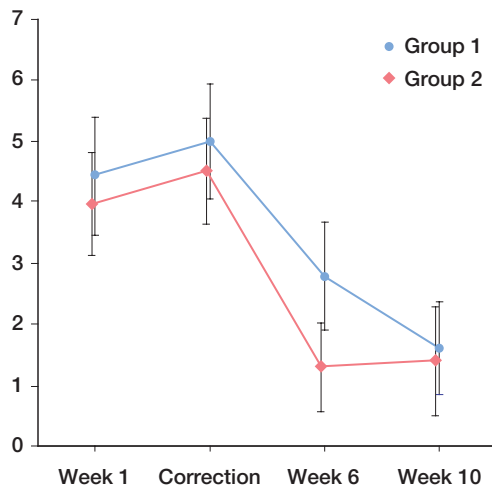


Figure 3. Mean pain according to a 0–10 visual analogue scale and 95% confidence intervals during treatment of HCO with daily (Group 2) and weekly (Group 1) pin site care.

institutions and by clinicians varies from 4 times daily to weekly (McKenzie 1999) and some authors even encourage patients to take daily showers (Sims and Saleh 1996).

We found no differences between weekly or daily pin site care except for fewer positive cultures ( $p = 0.02$ ) in week 6 in the group with daily pin site care. This single statistically significant difference between the groups could be spurious and a result of mass significance.

The reported frequency of pin site infections varies widely—i.e., from 4%–51% (Meléndez and Colón 1989, Checketts et al. 1993, Magyar et al. 1998, 1999, Gordon et al. 2000).

In our series, pin site infections occurred in 15%, were usually grade I and none were severe (grade IV–VI). Grade I is probably more an irritation than an infection but may develop into an infection without proper care. 30% of the bacterial cultures were positive. This means that half of the positive cultures were of no clinical significance and probably skin contaminants.

A weakness of our study is low statistical power concerning the use of analgesics, antibiotics and pain because these variables were counted in persons and not in number of external pins. Callus distraction and pin site infection were associated with

pain. The patients' estimation of pain, and their use of analgesics were high, especially during the correction phase. The removal of crusts was also painful and the pain could persist for several days.

In a comparison of all bacterial cultures taken in this study, the risk of a positive culture was 50% higher with a proximal pin site than with a distal one. We found no difference in the clinical risk of a pin site infection, using the Checketts-Otterburns classification.

The location of the fixator and, if correction is performed, affects the risk of a pin infection (Sims and Saleh 2000). The type and placement of the pin, including its coating, affect its stability (Magyar et al. 1997). The skin movements around the pins also increase the risk of an infection (Paley and Jackson 1985).

5 of 200 pins were loose on removal. All loose pins were proximal and had positive cultures. A loose pin increases the risk of an infection (Mahan et al. 1991). HA-coated pins enhance screw fixation in the metaphyseal bone and lower the risk of a pin site infection (Mahan et al. 1991, Magyar et al. 1997, Moroni et al. 1998, Moroni et al. 2001). Mahan et al. (1991) found a correlation between loose pins and pin tract infection and reported 23% loose pins and 75% of the cultures from pin tips were positive for bacteria.

We conclude that pin site care once a week seems appropriate. The high incidence of pin site infection, the frequent use of antibiotics and frequent pain are disadvantages of external fixators.

No competing interests declared.

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