Pin-tract complications in external fixation of fractures of the distal radius

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We analyzed retrospectively the rate and outcome of pin-tract complications in 314 unstable fractures of the distal radius, treated with the Hoffmann small-frame external fixator. The overall rate of complications was 27%. The commonest complication (21%) was pin-tract infection, which was treated with oral antibiotics. There were no cases of osteitis. Complications led to premature removal of the fixator in 17 of the cases. Women over the age of 75 years had a significantly higher rate of pin loosening (17%), but not a higher rate of premature removal of the fixator due to complications. 4% of the cases had a pin-site fracture, all women. The rate of pin-tract complications was high, but severe complications were rare, even in old women.

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Complications due to external fixation of fractures of the distal radius are common, with reported rates from 12% to 53% (Howard et al. 1989, Solgaard 1989). We have analyzed retrospectively the rate and outcome of pin-tract complications in 314 unstable fractures of the distal radius, treated consecutively with the Hoffmann small-frame external fixator.

Patients and methods

During 1992–1996, 316 unstable fractures of the distal radius at Malmö University Hospital were treated with a Hoffmann small-frame external fixator. The surgical procedure was similar in all cases. Two pairs of 3.0 mm self-drilling, half pins were inserted through two 1 cm skin incisions in the diaphysis of the second metacarpal bone and through 1 or 2 skin incisions in the diaphysis of the radius retracting the soft tissues, to avoid the superficial radial nerve. The fracture was then reduced and the fixator locked. The pin sites were inspected and cleaned at least once a week by a nurse. The mean fixation time was 39 (7–122) days. The patient with a fixation time of 7 days had a pin-site fracture and the patient with 122 days had an open fracture. A radiographic and clinical examination was carried out 7–14 days postoperatively. In most cases radiographs were also taken on the day the fixator was extracted.

Our analysis was based on a file study in which 310 files were found and examined in order to study pin-tract complications. There were 244 women, 4 with bilateral fixators, and 66 men. The mean age was 68 (16–91) years. Their mean follow-up time was 36 (6–66) months. All complications with external fixation were recorded. Those with pin-site fractures were further studied by evaluating the radiographs.

Statistical calculations were done with chi-2 analysis.

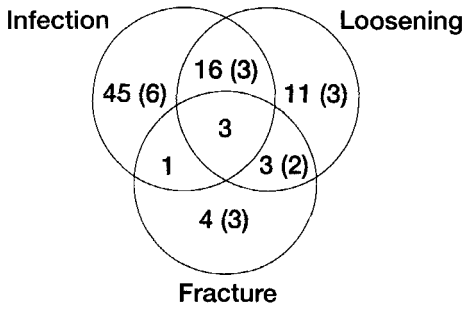
Results

The overall complication rate was 27% (86/314) (Table 1). Pin-tract infections treated with oral antibiotics were seen in 65 (21%) cases (Table 1). 9 of them required premature removal of the external fixator, with a mean fixation time of 28 (15–38) days ($p = 0.0007$). No patient developed osteitis.

Manually unstable pins were considered loose and one or more loose pins were observed in 33 (11%) cases (Table 1). 3 of the cases with pin loosening not

Table 1. Rate of pin-tract complications (n 314)

	Number	%
Use of antibiotics	65	21
Pin loosening	33	11
Pin-site fracture	11	4
Surgery due to deformed scars	4	1
Injury to sensory branch of radius nerve	2	1
Osteitis	0	0
Neuroma	0	0
Number of patients with complications	86	27



Relations between infection, loosening and fracture. Premature removals in brackets.

Table 3. Complications in relation to age of women (n 248)

	< 50		50–75		>75		All	
	n	%	n	%	n	%	n	%
Women	13	5	132	53	103	42	248	100
Use of antibiotics	2	15	21	16	23	22	46	19
Pin loosening	1	8	8	6	17	17	26	11
Pin-site fracture	1	8	5	4	5	5	11	4
Premature removal of the fixator	0	0	5	4	8	8	13	5

The rate of pin loosening is significantly higher in women >75 years (p = 0.009)

related to infection or pin-site fracture required premature removal of the external fixator, after a mean fixation time of 33 (31–36) days. 19 cases with pin loosening were infected ($p < 0.0001$) (Figure).

There were 11 (4%) injuries with pin-site fractures, all in women (Table 2). 6 of the fractures were located at the diaphysis of the second metacarpal bone and 5 at the diaphysis of the radius. 4 of these were treated with antibiotics due to superficial pin-tract infection and 5 required a premature removal of the fixator due to the pin-site fracture. 2 of the fractures were related to trauma. 1 fracture occurred during surgery, 7 during the fixation period and 3 after the removal of the fixator. 8 pin-site fractures healed without displacement, 2 with > 10° angulation and 1 with > 5mm shortening. Women with pin-site fracture did not have a significantly higher rate of superficial pin-tract infection than women without such fracture.

The rate of pin loosening was higher in women over the age of 75 years ($p = 0.009$, Table 3). There was no difference between the groups in frequency of use of antibiotics, pin-site fracture or premature removal of the external fixator. There was no significant difference in complications related to age in men (Table 4).

Premature removal of the external fixation in 17 cases resulted in redislocation and dissatisfaction of the patients in 4 instances, but no secondary surgery

Table 2. Data in 11 patients with pin-site fractures

	A	B	C	D	E	F	G	H	I	J	K
1	62	1	2	0	25 [a]	–	1	–	2	1	1
2	84	1	1	9	33	+	1	–	3 (7)	1	1
3	33	1	2	0	33	+	2	–	2	1	1
4	54	1	2	0	20 [a]	–	1	–	2	1	1
5	53	1	2	0	21 [a]	–	1	–	1	1	2
6	75	1	1	10	7 [a]	–	1	–	2	4	2
7	79	1	1	12	41	+	2	+	2	2	3
8	74	1	2	0	43	+	2	–	2	3	1
9	78	1	2	0	35 [a]	–	2	–	2	3	1
10	68	1	1	9	34	–	2	+	3 (70)	3	1
11	85	1	2	0	33	–	1	–	3 (17)	1	1

A Age at injury
B Sex
  1 women
C Type of primary fixation
  1 plaster
  2 external fixation
D Days to external fixation
E Days in external fixation
  [a] premature removal of the fixator due to pin-site fracture
F Use of antibiotics
  + signs of infection at pin sites treated with antibiotics during fixation
  – no signs of infection
G Site of fracture
  1 fracture of metacarpal
  2 fracture of shaft of radius
H Fracture related to trauma
  + yes
  – no
I Time of fracture
  1 at the time of pin insertion
  2 during the fixation time
  3 after pin removal (number of days)
J Treatment of pin-site fracture
  1 none
  2 plaster
  3 internal fixation with DCP-plate
  4 internal fixation with cerclage
K End result
  1 healed without displacement
  2 healed with > 10° angulation
  3 healed with > 5 mm shortening

Table 4. Complications in relation to age of men (n 66)

	< 50		50–75		>75		All	
	n	%	n	%	n	%	n	%
Men	26	39	29	44	11	17	66	100
Use of antibiotics	7	27	8	28	4	36	19	29
Pin loosening	2	8	3	10	2	18	7	11
Pin-site fracture	0	0	0	0	0	0	0	0
Premature removal of the fixator	0	0	3	10	0	0	3	5

was performed.

Complications not directly related to the pin tract were also recorded. 9 patients (3%) had secondary displacement requiring re-reduction, 5 had reflex sympathetic dystrophy, 3 nonunions, 2 operations due to carpal tunnel syndrome and 1 rupture of the EPL tendon.

Discussion

The benefit of an external fixator in preserving the reduction of an unstable fracture of the distal radius is well documented (Howard et al. 1989, Solgaard 1989, Abbaszadegan and Jonsson 1990). The use of external fixation in 314 fractures over a 5-year period represents about 10% of the distal forearm fractures in adults (Bengnér and Johnell 1985). This is the same rate as in the study by Vaughan et al. (1985).

In our study, 27% of the complications were specifically related to the pin sites. This is within the range found in other studies (Howard et al. 1989, Solgaard 1989). Pin-tract infections treated with oral antibiotics were seen in 21%. This is the same rate as in the study by McQueen et al. (1996), but more than in the studies by Howard et al. (1989) and Solgaard (1989).

High age of the patients is thought to be a contraindication for the use of external fixation (Grana and Kopta 1979, Howard et al. 1989) due to pin loosening in the osteoporotic bone. In our study, there were 103 women older than 75 years with a significantly higher rate of pin loosening, but only in 2 of them did this require a premature removal of the external fixation. The rate of pin loosening, however, may have been underestimated in this retrospective study. A correlation was found between pin loosening and infection and premature removal of the external fixator may be the best overall measure of pin-tract failure during the fixation period. With this measure, there was no significant difference between the age groups.

In cases of early premature removal of the external fixation one alternative fixation should be used, such as a plaster or, in very unstable cases, an external fixation in, e.g., the third metacarpal bone.

Pin-site fracture is an uncommon complication, with reported rates of 0–2% (Vaughn et al. 1985, Schuind et al. 1989). Vaughn et al. reported a very late pin-site fracture of the radius 1 year after the removal of a Roger Anderson external fixation device. The relatively high rate of pin-tract fractures in our study may be because our patients were older than in other studies, more careless or the surgical technique was inappropriate. Pin-site fractures seem to heal uneventfully, although some of the fractures in our study should have been better reduced.

Symptoms from the superficial radial nerve were rarer in our study than in others (Solgaard 1989)—probably due to our surgical technique, which includes retraction of the soft tissues during pin insertion.

The rate of complications was relatively high in our study, but severe complications, even in elderly women, were rare and we conclude that external fixation can also be used in patients over 75 years of age.

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