

Silicone arthroplasty for hallux rigidus

Implant wear and osteolysis

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Between 1980 and 1985, silicone hemiprotheses were implanted because of hallux rigidus in 58 feet of 43 patients who were followed up after an average of 5 years. The majority were satisfied and had good function without pain. However, the toes had shortened because of implant wear, and there was considerable associated osteolysis.

A silicone prosthesis designed by Albert Swanson is claimed to meet the disadvantages of resection arthroplasty and arthrodesis for hallux rigidus.

We report the clinical and radiographic results in patients treated with a silicone hemiprosthesis.

size was determined (females mostly sizes 1-3, males mostly 2-4). Osteophytes were removed. After insertion of the implant the capsule was carefully closed. A pressure dressing was applied. Weight bearing was started after the wound had healed, usually about 10 days postoperatively. The average hospital stay was 14 days.

Patients and methods

At our department between January 1980 and December 1985, 58 silicone hemiprotheses were implanted in 43 patients (28 females and 15 males) with persistent pain in the first metatarsophalangeal joint caused by arthrosis. Fourteen patients received silicone implants in both feet, in 12 cases in one session. The mean age at operation was 48 (17-60) years. There was no case of proven deep infection, but 3 patients had delayed wound healing. One patient had persistent pain after the operation, necessitating removal of the prosthesis after 1 year; she was excluded from the rest of the study. Thus, the results of 57 operations are described in this report.

Operation technique

The operation was performed as suggested by Swanson (1972). The patients were operated on under general or spinal anesthesia using a pneumatic tourniquet. A dorsomedial, slightly curved, longitudinal incision was used. The proximal third of the proximal phalanx was resected with a power saw, and the medullary cavity was reamed. With a trial prosthesis the appropriate

Follow-up

At the follow-up, on an average of 5 (2-7) years after the operation, all the patients were interviewed and examined by the authors. Symptoms and activity of the patients were recorded. An apparatus was designed to measure the range of motion and power of the flexor hallucis. The patient placed the foot on a wooden platform; the toes did not rest on the platform. With one leg of the goniometer on the platform, the degrees of plantar and dorsal flexion were measured. The strength of the flexor hallucis longus was measured in the same position. A sling was placed around the hallux and the weight that could be lifted was recorded by a pulley system. With this device, 5.5 kg or more was estimated as a good strength of the flexor. Standard anteroposterior and lateral radiographs of the feet with the patient standing before and after the operation and at the follow-up were used to A) determine the length of the hallux, proximal phalanx, and first metatarsal; B) Measure the metatarsophalangeal angle, the intermetatarsal angle, and the interphalangeal angle; C) record the appearance of osteolysis and cysts; and D) examine the form of the implant. (The length of the proximal phalanx was measured as the distance between the interphalangeal joint and the first metatarsal head. After the operation the length measured in this way consequently included the implant).

Results

Pain

In 45 feet, there was no pain or practically no pain after the operation. One patient had pain almost continuously, but he refused revision surgery. Subjectively, 49 feet were much improved by the operation (Table 1). Seven feet were improved, but the patients had expected a better result. Thirty-three patients could walk without any pain-related limitation. Thirty-seven patients could walk as long as they liked, but a few of them experienced some pain after a while. There was no correlation between the pain and age, sex, or length of the follow-up.

Shoes and cosmetics. Thirty-seven patients had little or no difficulty in obtaining comfortable footwear. Thirty-four said that the operation had improved them on that point (Table 1). The opinion about the cosmetic result was less favorable. Eight patients were really dissatisfied with the appearance of the feet at the time of the follow-up. The reasons were short hallux, malrotation, varus deformity, or excessive dorsiflexion of the hallux.

Objective results

Position. A varus deformity of the hallux developed in two feet. Except for cosmetic appearance, this deformity caused no problems. Malrotation developed in three feet: two in external and one in internal rotation. Forty feet had a normal $< 10^\circ$ valgus position of the hallux and 17 feet $10-20^\circ$.

Range of motion. In 29 feet, plantar flexion of the hallux was more than 20° passively, and 18 feet had more than 20° actively (Table 2). The dorsal flexion was more than 20° passively in 44 feet and actively in 38 feet. The average range of motion was 41° actively and 48° passively.

Power of the flexor hallucis longus. The maximum weight lifted by plantar flexion was on an average 5.4 (1.5-7) kg. There was no correlation between the strength of the flexor and pain or loss of length of the hallux.

Radiographic results

Length. The mean loss in length of the proximal phalanx in the first postoperative radiograph was 0.6 mm. At the follow-up, this shortening had increased to an

Table 1. Subjective evaluation of the results of implant arthroplasty of the hallux as regards pain, footwear, and cosmetic appearance

	Pain	Footwear	Cosmetic appearance
Much improved	49	34	29
Improved	7	9	10
Unchanged	1	13	7
Worse	0	1	11

Table 2. Range of motion in the first metatarsal joint after arthroplasty recorded at the follow-up

Degrees	Active range	Passive range
0-19	5	1
20-39	25	18
40-59	13	23
60-79	12	8
80-99	2	7

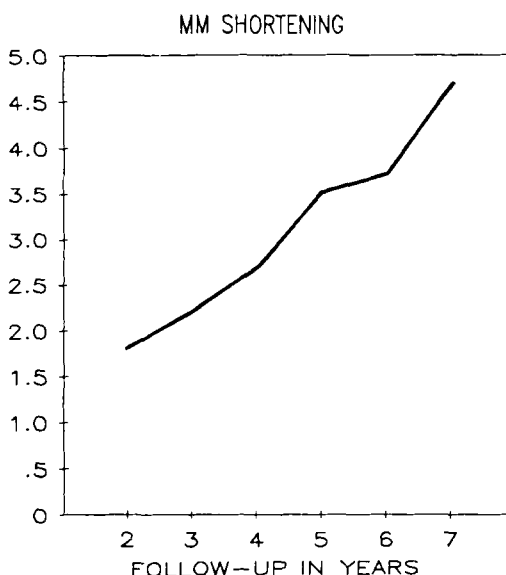


Figure 1. Shortening of the proximal phalanx following silicone arthroplasty for hallux rigidus.

average of 3.4 mm ($P = < 0.001$; Student's *t*-test for paired observations). With the passage of time, the length decreased progressively (Figure 1).

Angles. The average preoperative hallux valgus angle was 13° and that at the review 11° . The intermetatarsal angle was unchanged.

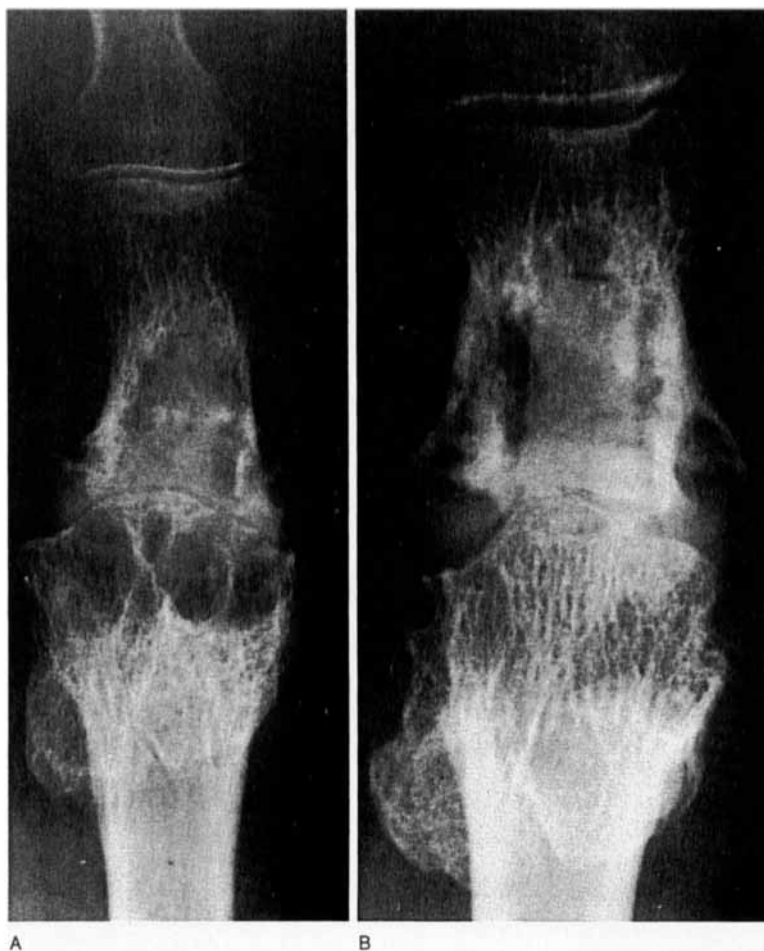


Figure 2. Silicon arthroplasty for hallux rigidus.

A. A 56-year-old woman 4 years after the operation. Cysts have formed in the metatarsal head.
B. A 37-year-old woman 5 years after the operation. Osteolysis around the implant, which is markedly deformed.

Osteolysis. Appearance of cysts around the stem of the implant and in the head of the first metatarsal was frequently seen on the review radiographs. In 40 feet, one or more cysts were seen in the metatarsal head (Figure 2). The cysts were quite large in some feet. Cysts around the stem were seen in 34 feet.

Form. The surface of the implant seemed to be intact in 40 implants. In the remainder, there was a clear deformation of the surface (Figure 2). One of the implants seemed to have broken.

Discussion

Most series describing the use of Swanson's silicone hemiprosthesis have included patients with hallux valgus and rigidus (Wenger and Whalley 1978, Swanson

et al. 1979, Sethu et al. 1980). Better results have been claimed for hallux rigidus (Wenger and Whalley 1978, Sethu et al. 1980). Our series, which contained only patients with hallux rigidus, confirmed the overall patient satisfaction reported by Wenger and Whalley (1978), Mölster et al. (1980), Sethu et al. (1980), Cracchiolo et al. (1981), and Vlatas and Anderson (1987). Although the function of the joint was not normal at the follow-up, most patients had a normal gait pattern with fairly good push-off power of the flexor hallucis. The hemiprosthesis seems to preserve the flexion power better than the silicone hinge prosthesis (Beverly et al. 1985).

However, there are still reasons for caution in the use of the prosthesis. We found the hallux grew progressively shorter because of wear of the prosthesis; and reactive cystic and lytic changes were common as reported following silastic implants in the hand (Gordon and Boullough 1982, Worsing et al. 1982, Pelligrini and Burton 1986, and Schneider et al. 1987).

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