DIGITAL IMPLANT ARTHROPLASTY
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Digital implantation has been employed as an alternative to resectional arthroplasty and arthrodesis for the treatment of symptomatic digital contractures. Four implant designs have been used for this purpose. They are: (1) the Silastic finger joint implant H.P. (Swanson design) (Wright Medical Technology Inc.), (2) the Silastic hammertoe implant (Weil design) (Wright Medical Technology Inc.), (3) The Sutter lesser toe proximal interphalangeal joint prosthesis (SHAW) (Sgarlato Design) (Sutter Biomedical, San Diego, CA), and (4) The Sgarlato hammertoe implant prosthesis (SHIP) (Sgarlato Laboratories, Los Gatos, CA).

Arthroplasty, the removal of the head of the proximal phalanx, is the most common surgical procedure used today and has been for the last 50 years. It is easy to do and does not require an expensive surgical arena. The only study on arthroplasty demonstrated good results after 5 years when stability and alignment were used as part of the criterion. The arthroplasty looks good for up to 1 year post-operative, and then every year after the toe becomes more deformed. There is either a loss of bone and the proximal phalanx stump shrinks or the patient tries to grow a new phalanx head in the space left by the excision. It is common when multiple hammertoes have been corrected by arthroplasty to see some toes bending left and some bending right when looking at these toes 10 to 20 years later.

Toc fusion attempts to create stability of the toe. There are no published results of the procedure, and the surgical community estimates that approximately 25% of the toe fusions do not fuse and thus result in nonunion. Figure 1. The small bones in toes are difficult to fuse.

The technique of digital implant arthroplasty seeks to replace the symptom causing proximal phalanx head with a thinner, shorter implant body with double bending ability and, in addition, prevents length loss of the digit. Implant types used include hinged and nonhinged.

General requirements for the implant arthroplasty include good physiologic and psychological condition of the patient, good neurovascular status, adequate skin coverage, possibility of functional musculotendinous system, availability of postoperative therapy, and fully informed cooperative patient.

INDICATIONS

The lesser toe implants can be used for a variety of lesser toe conditions, such as ankylosed interphalangeal joints, flail or loose toes, failed arthroplasties, arthritic interphalangeal joints, shortened toes, digital clavi at the proximal phalangeal head, varus rotated toes, especially fifth toes, interphalangeal adductus or abductus, excessively long toes, whenever space is to be maintained at a digital arthroplasty site, and for a failed digital fusion.

CONTRAINDICATIONS

Contraindications to implantation include a physiologically or psychologically inadequate patient, the presence of infection, compromised vascular status to the toes, an open wound or ulcer, a proximal phalangeal shaft that is too small, inadequate bone density, recent fracture of the digit, history of allergy to the implant material, significant frontal metatarsophalangeal joint and is not addressed.

The Main mechanical disorder in which toe implants cannot succeed is in partially or completely dislocated metatarsal phalangeal joint. This is seen commonly in cavoos-type feet and in older patients where overuse creates the metatarsal phalangeal joint dislocation. The crossover second toe associated with hallux valgus deformity is the most common example. Incomplete and complete dislocations accompany some level of plantar plate rupture. This rupture can be transverse or longitudinal. The loose proximal attachment of the plantar plate is dislodged. The repair of the dislocation is primary if one expects to have a normal toe postoperatively.

The senior author prefers the McGlamry scoop procedure with orthosorb (Johnson & Johnson, Raynham, MA) pin fixation across the joint. Flexor tendon transfer and total joint replacement also can be successful. The Kirschner wire placement across the metatarsal phalangeal joint is commonly used but does not seem to have a successful prediction probability because the patient does not tolerate the pin for the 4 to 6 weeks that is needed. The correction of the metatarsal phalangeal joint dysplasia can be the key to a successful hammertoe correction.

SILASTIC FINGER JOINT IMPLANT H.P. (SWANSON DESIGN)

This hinged prosthesis was the first implant used as a digital prosthesis for the toes. Sgarlato reported on 97 cases with this implant.

In 1982, Horbert and Benedetti reported their experience with this implant in right and third digit implantation with a maximum of 4 cars follow-up. Complications included persistent edema, restriction of joint motion due to fibrosis of the implant area, fracture of the proximal phalanx, and lack of toe purchase. Mednick et al evaluated 40 of these implants; 22.5% (9/40) demonstrated prolonged edema and limited range of motion. None of the 82 implants reported in the two studies necessitated removal due to complications. This implant, however, was not designed to be placed in the small joints of the foot. Because of the observed complications and the advent of implants designed for the toes, the use of this implant in the foot is not recommended.

SILASTIC H.P. 100 (SWANSON TYPE) WEIL DESIGN

This is a nonhinged, double-stemmed flexible implant with a cylindrical center body. It is symmetrical without a specifically designated proximal or distal stem and is available in seven sizes (Figure 2). It is made of medical-grade, high-performance silicone elastomer. Its purpose is to stabilize the toe without arthrodesis of the joint and maintain toe length and toe purchase through mild flexion.

Sollitto and Werner retrospectively analyzed 47 procedures in 22 patients using this implant with average follow-up of 13 months. Complications included dislocation in 6.4% (4/47), bony regrowth in 10.6% (5/47), prolonged edema in 8.5% (4/47), and poor purchase power in 2.1% (1/47) of toes. Due to these complications in combination with no observed increase in transverse plane stability or flexor purchase power and no active flexion at the implanted interphalangeal joint, they could not recommend the use of this implant.

Lanham discussed the results of 124 procedures that used this implant. Removal was required in 1.6% (2/124) of toes due to infection. Chronic swelling in the planter web area was reported in 4.1% (10/240) of Weil’s personal cases. The prospective evaluation of 22 implants yielded the following postoperative complications: lateral deviation in 14% (3/22) of cases and prolonged edema in 5% (1/22) of cases. Range of motion was limited in 62% (13/22) and
absent in 5% (1/22) of toes. Toe purchase was poor in 29% (6/22) and absent in 5% (1/22) of the cases. Implant removal was required in 9% (2/22) of toes, one due to foreign body reaction and the other in a fifth toe due to dislocation.

Shaw and Alvarez reported on the use of 84 of these implants with 14.3% (12/84) requiring removal for the following reasons: discomfort/swelling 6% (5/84), lesion recurrence in 6% (5/84), infection in 1.2% (1/84), and material failure in 1.2% (1/84). They stated that this implant is not being used as frequently as others due to the large diameter of the central portion that may predispose to a greater likelihood of lesion recurrence and digital swelling.

**SUTTER LESSER TOE PROXIMAL INTERPHALANGEAL JOINT PROSTHESIS (SGARLATO DESIGN)**

This is a polymethylsiloxane silicone rubber, hinged implant with tapered rectangular stems with a Dacron (E.I. Dupont de Nemours, Wilmington, DE) mesh internal fabric (Fig. 3). It was approved for use in 1981. The hinge area of the smallest available device is 0.138 in. This implant may be inserted with flat, angled, or vertical positioning.

Lanham reported on series of 109 Sutter implants. Removal was required in 0.9% (1/109) of toes secondary to post-traumatic malalignment. Sgarlato implanted 920 of these devices. Removal was required in 0.8% (7/920) of toes, three because of infection, one due to irritation, and three because they made fifth toes too long.

Shaw and Alvarez reported on 505 of these implants. Removal was required in only 0.003% (2/585) of cases, one due to discomfort and swelling and one due to infection. The authors state that many prefer the Sutter implant because of its reduced size and high success rate.

The SHIP implant is a silicone elastomer shaped to occupy the space between the proximal phalanx and distal phalanx (Figs. 4 and 5). We recommend a 7 to 8 mm implant in a lesser toe is 18 years. The senior author has called on a number of surgeons who regularly use toe implants and all report similar results.

Digital implant arthroplasty offers the foot surgeon an excellent alternative to resection arthroplasty and arthrodesis for the treatment of symptomatic digital deformities. The long-term results appear favorable as the toe continues to appear normal with every passing year. The longest amount of recorded time for an implant in a lesser toe is 18 years. The senior author has called on a number of surgeons who regularly use toe implants and all report similar results.

**References**


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