

Appendix

Surgical Technique

This series of SR PIP prostheses were implanted with use of one of three different surgical approaches: dorsal²⁰, lateral, or volar⁴ according to surgeon preference, finger deformity, and the number of digits involved. During the dorsal or volar approaches, the radial and ulnar collateral ligaments were protected with use of small retractors. The proximal phalangeal head was prepared with a perpendicular osteotomy accomplished just proximal to the articular surface. This was done while protecting the proximal origin of the radial and ulnar collateral ligaments. A small distal portion of the proximal phalangeal origin of the collateral ligaments was released as necessary to facilitate the proximal phalangeal osteotomy and subsequent prosthesis insertion. Minamikawa et al.¹⁶ demonstrated, in a cadaver model, that the proximal interphalangeal joint remains stable following removal of 50% of the collateral ligament substance. The “chamfer” back cut of the proximal phalanx is accomplished in a way that allows the proximal phalanx to accept the proximal phalanx component.

An oscillating saw was used to make a perpendicular osteotomy at the base of the middle phalanx. The collateral ligament insertions were protected either with small retractors or by hyperflexion of the digit. This osteotomy was no more than 1 to 2 mm thick. When severe articular erosion or bone loss was encountered, adequate preparation of the bone surface may be accomplished with the use of a small rongeur.

A common technical error is implantation of an undersized prosthesis, which can lead to limited motion due to subsidence and osseous impendence to flexion. Once the bones were satisfactorily broached, the trial components were inserted and sized for “best largest fit.” The digit is tested for osseous impingement between the cortices of the proximal and middle phalanges during a passive range of motion. Permanent prosthetic components are implanted with use of clean surgical gloves and a “no touch technique.” In forty-eight digits, cement was used for fixation of the prosthesis, on the basis of surgeon preference.

A standard rehabilitation protocol is followed, tailored to the surgical approach used. Immediately postoperatively, the patients treated through a dorsal approach wear a volar forearm-based splint that holds the metacarpophalangeal and proximal interphalangeal joints in complete extension. At five to seven days postoperatively, the initial dressing is removed and a dynamic extension splint is applied (Fig. E-2), affording active flexion and passive extension. During the first six weeks postoperatively, the amount of active flexion is gradually increased every two weeks in the following progression: 30°, 60°, and 90°. At the end of six weeks, full digital flexion and extension are permitted. The dynamic outrigger device is worn for an additional six weeks if an extension lag persists.

Rehabilitation for a patient treated with the volar approach includes a resting hand splint used with progressive extension to full extension by six weeks. Patients treated with the lateral approach also use a resting hand splint while progressive flexion and extension are allowed with the affected digit “buddy-taped” to an adjacent digit.



Fig. E-1
Photograph of the PIP-SRA prosthesis.



Fig. E-2
Hand-based extension outrigger splint commonly used for postoperative rehabilitation by our patients (showing passive extension [top] and active flexion [bottom]). The splint allows active flexion against a volar block with passive extension.



Fig. E-3

A sixty-four-year-old woman with a poor outcome four years and one month after treatment of the left index finger with a PIP-SRA. The DASH score was 86, the total active range of motion was 10°, and she had a boutonnière deformity. Note the calcification of the central slip insertion (lateral radiograph, arrow) and the subsidence of the proximal phalanx implant (posteroanterior and oblique radiographs, arrows).

TABLE E-1 Patient Preoperative Characteristics and Surgical Information

Variable	Median (Min., Max.) or No. (%)		
	Patients Who Returned for Postoperative Follow-up	Deceased Patients	Overall Cohort
Patient specific	N = 36	N = 11	N = 47
Age			
At surgery	60 (29, 80)	67 (50, 86)	61 (29, 86)
At time of follow-up	69 (40, 93)	73 (51, 88)	70 (40, 93)
Sex			
Male	11 (31%)	5 (45%)	16 (34%)
Female	25 (69%)	6 (55%)	31 (66%)
Hand dominance			
Right	35 (97%)	10 (91%)	45 (96%)
Left	1 (3%)	1 (9%)	2 (4%)
No. of comorbidities	1 (0, 4)	NA*	1 (0, 4)
Joint specific	N = 51	N = 16	N = 67
Affected hand			
Right	36 (71%)	11 (69%)	47 (70%)
Left	15 (29%)	5 (31%)	20 (30%)
Implant in dominant hand			
Yes	37 (73%)	12 (75%)	49 (73%)
No	14 (27%)	4 (25%)	18 (27%)
Affected joint			
Index	14 (27%)	4 (25%)	18 (27%)
Long	18 (35%)	9 (56%)	27 (40%)
Ring	15 (29%)	1 (6%)	16 (24%)
Small	4 (8%)	2 (13%)	6 (9%)
Preoperative diagnosis			
Osteoarthritis	42 (82%)	8 (50%)	50 (75%)
Rheumatoid arthritis	9 (18%)	8 (50%)	17 (25%)
Cement use			
Yes	35 (69%)	13 (81%)	48 (72%)
No	16 (31%)	3 (19%)	19 (28%)
Surgical approach			
Dorsal	44 (86%)	12 (75%)	56 (84%)
Volar	5 (10%)	1 (6%)	6 (9%)
Lateral	2 (4%)	3 (19%)	5 (7%)
*Information regarding the number of comorbidities was not available for the eleven deceased patients. NA = not available.			