

Proximal Interphalangeal Joint Fusion

Indications and Techniques



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KEYWORDS

- Proximal interphalangeal joint arthrodesis • Surgical techniques • Indications • Treatment
- Contraindications

KEY POINTS

- Proximal interphalangeal joint (PIPJ) arthritis leads to significant hand impairment; both nonoperative and operative treatment modalities are available.
- PIPJ arthrodesis is the mainstay of treatment with few contraindications.
- Several surgical techniques are available to perform the arthrodesis: tension band, compression screw, dorsal plate, and 90/90 wiring.
- PIPJ arthrodesis has excellent postoperative outcomes with an extremely high success rate.

INTRODUCTION

The proximal interphalangeal joint (PIPJ) of the finger is a bicondylar joint critical to motion and function. Injury and arthritis to the PIPJ lead to considerable hand impairment because flexibility and stability of the joint are important in maintaining finger motion and hand function. Osteoarthritis of the hand is extremely common and has been shown to be prevalent in 67% of women and 55% of men aged 55 years or older. PIPJ arthritis is the second leading cause of hand pain after thumb carpometacarpal joint arthritis.¹ Degenerative changes of the PIPJ secondary to trauma, osteoarthritis, or inflammatory arthritis can lead to pain, instability, and deformity.² Initial treatment involves anti-inflammatories and activity modification; however, if these measures fail, operative interventions need to be considered and offered to the patient.

Surgical interventions of the PIPJ are taken with immense caution, because the joint is prone to severe and irreversible postoperative stiffness, leading to procedures beyond volar plate arthroplasty to hemi-hamate reconstruction. Moreover, there have been substantial changes in arthrodesis of the PIPJ over the past few decades. Understanding the specific disease process that initiated the joint destruction aids in determining the value of an arthrodesis. Moreover, significant consideration must be taken into account to appreciate the functional limitation with an isolated posttraumatic digit versus arthritis involving all of the fingers. Patients need to be counseled that a single joint arthrodesis may not present a significant alteration in hand function. In contrast, multiple digits with fused PIPJs may provide significant limitations. Positioning of the PIPJ is critical to success in these patients. Many investigators suggest the index finger PIPJ be fused at

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40°, with an increasing cascade radially to ulnarly by an additional 5°.^{3,4} Although arthroplasty options are available, the one-stage solution for achieving pain relief and stability for arthritic PIPJ remains arthrodesis.⁵ There are multiple techniques to perform the arthrodesis. The tension band technique is a fast, reliable, and inexpensive way to fuse the PIPJ.^{6–10} Headless compression screw fixation and intramedullary screw fixation for PIPJ arthrodesis have demonstrated consistent success with relatively low complication rates.^{5,11} Dorsal plating techniques as well as 90/90 wiring have been used for revision arthrodesis.^{5,12}

INDICATIONS AND CONTRAINDICATIONS

Surgical interventions remain the mainstay for treatment of PIPJ arthritis. The classic indications for arthrodesis of the PIPJ are pain that is refractory to conservative measures, deformity, and stiffness. Alternative options that may be considered before arthrodesis are arthroplasty, osteochondral reconstruction, and soft-tissue reconstruction.⁴

Indications

- Painful primary osteoarthritis (Table 1)
- Posttraumatic osteoarthritis refractory to nonoperative and conservative treatment
- Chronic PIPJ dislocations, chronic instability
- Fractures and fracture dislocations
- Chronic septic arthritis
- Significant loss of bone stock
- Fixed joint contractures

Table 1
Indications and contraindications for proximal interphalangeal joint arthrodesis

Indications		Contraindications
Painful primary osteoarthritis	Posttraumatic osteoarthritis refractory to conservative treatment	Recent infection
Chronic PIPJ dislocations and instability	Fractures and fracture dislocations	Soft tissue compromise/loss
Chronic septic arthritis	Significant loss of bone stock	
Fixed joint contracture	Poor soft tissue	
Tendon injuries	PIPJ arthroplasty revision	

- Poor skin coverage (as compared with arthroplasty)
- Irreparable tendon injuries
- Salvage for failed PIPJ arthroplasty¹³

Contraindications

- Recent infection
- Soft tissue compromise/loss

SURGICAL TECHNIQUE/PROCEDURE

Preoperative Planning

- Dedicated posterior anterior and lateral radiographs of the finger (Fig. 1)^{4,11,14}
- Identify appropriate implant for arthrodesis
- Identify presence of bone deficiency
- Assess individual patient function to determine proper fusion angles
- Encourage patients to wear custom fabricated orthoplast splints at different angles to determine most functional angle

Preparation

- Upper arm tourniquet

Surgical Approach

- Dorsal curvilinear incision^{11,14} (Figs. 2 and 3)
- Dorsal serpentine incision can be used if atrophic or compromised skin to create flaps for closure
- Incise extensor mechanism longitudinally
- The central slip should *NOT* be detached from P2 but elevated subperiosteally
- The lateral bands are left undisturbed to allow function of the dorsal interphalangeal joints
- Expose articular surfaces subperiosteally
- Release collateral ligaments both radially and ulnarly to allow free range of motion of PIPJ; in addition, the volar plate can be partially excised as needed
- Flex the PIPJ to expose the entire distal condyle of the proximal phalanx
- Perform osteotomy of head of proximal phalanx and base of middle phalanx to remove articular surfaces using an oscillating saw or rongeur so that the ends of the bone mate
- Bone is resected on proximal phalanx at desired angle of fusion
- Positioning of PIPJ arthrodesis is critical at this juncture, usually 30° to 40° for the index finger, 35° to 45° for the middle finger, 40° to 50° for the ring finger, and 45° to 55° for the small finger

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