



## Case report

# Soft tissue interpositional arthroplasty as a treatment of proximal interphalangeal joint arthritis in resource-limited health care facility: A case report

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## ABSTRACT

**Introduction:** Treatment of choice for posttraumatic arthritis in proximal interphalangeal (PIP) joints has remained a controversial subject. There is a lack of consensus regarding the optimal approach and treatment options for PIP joint arthritis. In this study, we report our experience in management of PIP joint arthritis using soft-tissue interpositional arthroplasty.

**Case presentation:** A 12-year-old female, right-handed, complains of stiffness on the left ring finger. There was a flexion deformity accompanied by limitation on both active and passive flexion-extension range of motion (ROM) of the PIP joint. Soft tissue interpositional arthroplasty was then performed using middle phalanx periosteum as interpositional material. Postoperative follow-up showed improvement in both active and passive ROM of PIP joint, improvement in joint function, and a good pain relief. Overall, the patient was satisfied with the outcomes of the procedure.

**Clinical discussion:** Arthrodesis, implant arthroplasty, and interpositional arthroplasty are the treatments of choice for stiff fingers that are caused by bone problems. In this study, we report a case of PIP joint arthritis treated with interpositional arthroplasty. It was able to provide ROM improvement and good functional results. Periosteum is used as an interposition material because of its in-situ nature thereby reducing donor site related morbidity and postoperative complications. In addition, the use of the periosteum makes this procedure relatively inexpensive and makes it a suitable treatment of choice in limited resources areas.

**Conclusion:** Soft tissue interpositional arthroplasty shows promising results as a treatment option for arthritis of PIP joint, especially in limited resource areas.

## 1. Introduction

Treatment of choice for posttraumatic arthritis in PIP joints has remained a controversial subject and a challenge for surgeons. There is a lack of consensus regarding the optimal approach and treatment options for PIP joint arthritis. Traditional surgical treatment includes arthrodesis, implant arthroplasty, and interpositional arthroplasty. Arthrodesis, by fusion of the joint, offers stability at the expense of joint motion. On the other hand, implant arthroplasty preserves joint motion, but it has been plagued by complications including loosening of the prosthesis,

implant failure, and bone absorption, in addition to the high cost of implants [1–3].

Interpositional arthroplasty, a joint resurfacing procedure, has gained popularity in the management of PIP joint arthritis. Interpositional arthroplasty retains some joint movement with high satisfaction that has been noted in several studies, however, it also has been complicated by migration of interposition material and instability [1,3–6]. In this study, we report a case of PIP joint arthritis which was managed with soft-tissue interpositional arthroplasty. This case report was written according to the SCARE 2020 criteria [7].

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## 2. Case report

A 12-year-old female, right-handed, was referred to the orthopedic department of Hasan Sadikin Hospital with chief complaint of stiffness on the left ring finger. Three months prior, she fell while running, with the back of her left hand dragged on the asphalt. The patient complained of pain in the ring finger, accompanied by an open wound. After the incident, she was taken to a local clinic and got her wound treated. From there the patient was taken to a native bonesetter. After 1 month, the wound on her finger has healed but her left finger could not be straightened. She also was not taking any medication and had no relevant personal or family medical history.

Physical examination revealed a flexion deformity accompanied by a scar on the dorsal side of the finger. A visual analogue scale (VAS) of 6 was obtained on examination. Both active and passive flexion-extension ROM of the PIP joint was limited to 90°-100° whereas active and passive flexion-extension ROM of the DIP joint was limited to 30°-90° (Fig. 1). X-ray examination revealed contracture of PIP joint at the left ring finger (Fig. 2). Preoperative evaluation of joint function was also performed using Quick Disabilities of the Arm, Shoulder and Hand Questionnaire (Quick DASH) [8]. This questionnaire consists of 11 questions about patient's symptoms as well as the ability to perform certain activities with the final score ranging from 0 (no disability) to 100 (most severe disability). In our patient, the preoperative Quick DASH score was 50.

We planned the patient for debridement and soft tissue interpositional arthroplasty. The patient underwent general anesthesia without regional block and surgery was performed at a district general hospital by the first author (JC), an orthopedic surgeon with an additional hand and microsurgery fellowship training. The PIP joint of the left ring finger was exposed via a curved dorsal incision. The PIP joint was released by removing the osteophytes, fibrous tissues, and incising the main collateral ligament as necessary. Rupture of the central extensor tendon, malunion fracture of the middle phalanx, and damaged cartilage on the base of middle phalanx and head of proximal phalanx was also identified intraoperatively (Figs. 3 and 4).

Periosteum of the dorsal middle phalanx was harvested as interposition material, then it was inserted and positioned to cover all the articular surface (Fig. 5). After the graft was correctly inserted, movement test was performed to evaluate joint movement and stability, finally periosteum was sutured to dorsally to the capsule and soft tissue around the joint to prevent displacement of the graft. Malunion fracture of the middle phalanx was fixed internally with K-wires.

Sutures and K wires were removed after 3 weeks. Patients are taught to do ROM exercises 2–4 times a day with 15 repetitions of 10 s for each flexion and extension movement as pain tolerated. Clinical evaluation

including patient's satisfaction, passive and active ROM of metacarpophalangeal (MCP), proximal interphalangeal (PIP), and distal interphalangeal (DIP) joint, total active movement (TAM), VAS score, and Quick DASH questionnaire were performed and recorded at follow up. No obvious gross infection and no postoperative complications were encountered (Fig. 6). The patient was quite satisfied with the outcomes of the procedure which was also reflected from the improvement of the Quick DASH score. Comparison of clinical evaluation between preoperative and postoperative period is presented in Table 1.

## 3. Discussion

Complaints of stiff fingers can be categorized into flexion and extension deformities. In addition, classification of stiff finger deformities can also be determined into four categories according to the involved tissues: 1) Skin and fascia related problems. 2) Muscle and tendon injuries or lesions. 3) Capsule and ligament of joint contractures. 4) Damage of articular bone [9]. In practice, it is often extremely difficult to delineate the exact underlying cause of contractures only through preoperative examination. Nevertheless, there are some signs that can help us identify the probable cause of the contracture. When active ROM is more limited than passive ROM, musculotendinous or adhesion problems are more likely. Conversely, equal limitation of both passive and active ROM suggests joint or bone problems are likely causes [10]. We list stiff fingers classification along with their causes and treatments in Table 2 [9].

Arthrodesis, implant arthroplasty, and interpositional arthroplasty are the treatments of choice for stiff fingers that are caused by bone problems. No procedure is superior to the other [6]. Arthrodesis is a straightforward procedure that could provide excellent pain relief and stability for the treatment of end-stage arthritis of finger joints [6]. However, arthrodesis leads to complete loss of joint motion and compromises the joint function which is less tolerated in young and active patients. Implant arthroplasty is able to provide a good pain relief while preserving ROM, thereby granting excellent functional outcomes with high patient satisfaction [11]. However, finger prostheses still failed to match the success achieved by artificial hip and knee prostheses. This raises the possibility of some implants associated complications such as implant fracture and dislocation, implant loosening, and bone resorption in the long run, making this option less preferable especially in young patients [1–3,6]. In addition, limited resources, relatively high price of implants, widespread poverty, and ineffective health insurance in our area, often makes implant arthroplasty procedures inaccessible to the public.

Interpositional arthroplasty is a type of resurfacing surgery in which



Fig. 1. Preoperative clinical picture showing flexion deformity on the left.

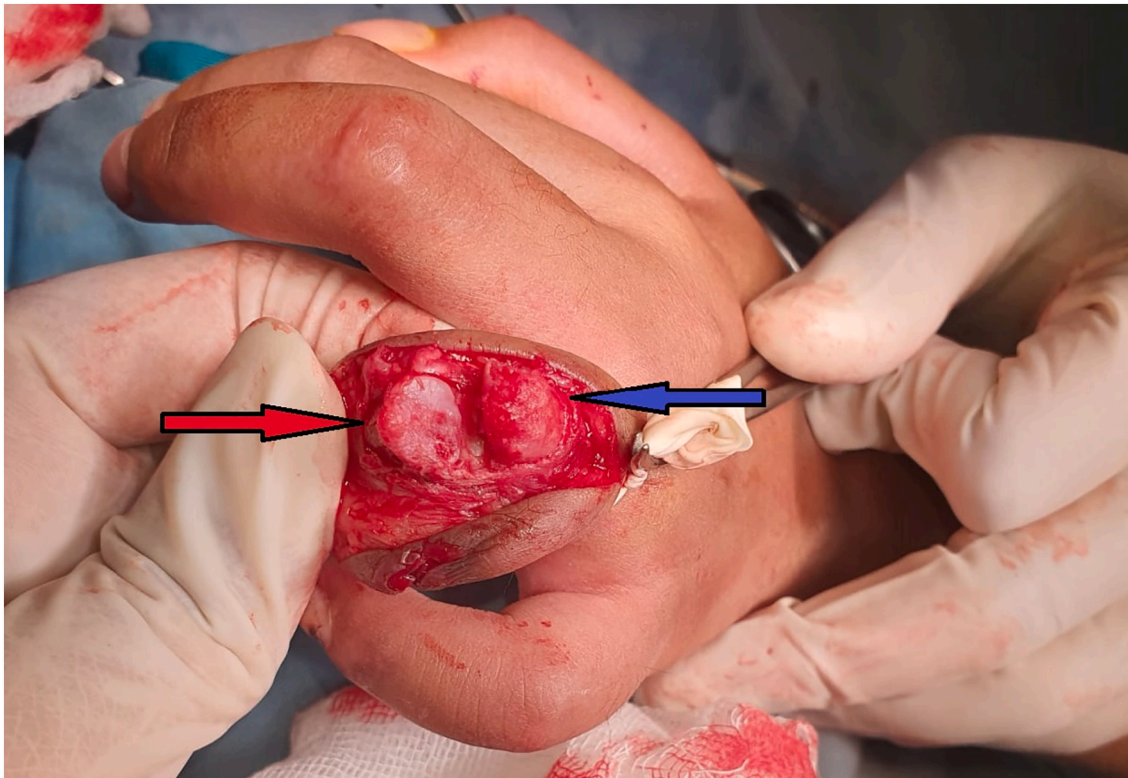


Fig. 2. Preoperative radiograph showing flexion contracture at PIP joint at the left ring finger.

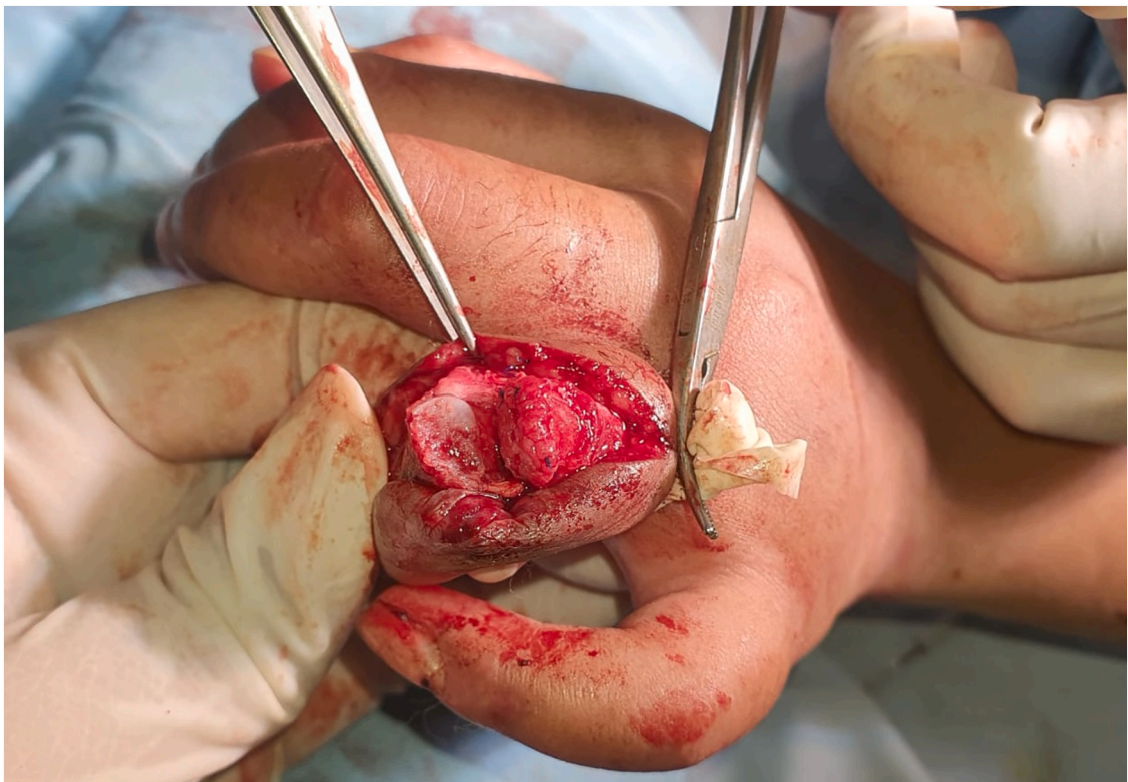


Fig. 3. Exposure of PIP joint showed rupture of the central extensor tendon (red arrow) with fibrous tissue (blue arrow). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)





**Fig. 4.** PIP joint exposure showed cartilage damage on the base of middle phalanx (red arrow) whereas the cartilage in the head of the proximal phalanx was completely destroyed (blue arrow). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)



**Fig. 5.** Exposed PIP joint after periosteum insertion.



Fig. 6. Postoperative improvement in functional movement of the PIP joint of the left ring finger.

**Table 1**  
Comparison of clinical evaluation between preoperative and follow up period.

Clinical parameter	Preoperative	6th week follow up	12th week follow up
Active ROM			
MCP	-10°-70°	-10°-90°	-10°-90°
PIP	90°-100°	30°-80°	20°-90°
DIP	30°-90°	20°-80°	15°-80°
Passive ROM			
MCP	-30°-90°	-30°-90°	-30°-90°
PIP	90°-100°	20°-90°	10°-90°
DIP	30°-90°	20°-80°	10°-80°
Total active movement	140°	210°	235°
VAS score	6	1	1
Quick DASH score	50	22	20

**Table 2**  
Stiff finger classification.

	Flexion deformity	Extension deformity	Operative treatment
Skin and fascia related problems	Skin scar or deficiency Dupuytren contracture	Skin scar or deficiency	Scar release or skin graft Fasciectomy
Muscle and tendon injuries or lesions	Flexor tendon adhesion	Extensor tendon adhesion	Tenolysis
	Retinacular ligament adhesion or tightness	Lateral band adhesion or tightness	Adhesion release
		Intrinsic muscle contracture	Intrinsic release
Capsule and ligament of joint contracture	Capsule contracture	Capsule contracture	Capsulotomy
	Collateral ligament and/or ACL contracture	Collateral ligament contracture	Ligament release
	Palmar plate and/or checkrein ligament contracture		Palmar plate release and/or ligament excision
Damage of articular bone	Bone block	Bone block	Arthrodesis/arthroplasty/joint replacement

(From Yang G, McGlenn EP, Chung KC. Management of the stiff finger: evidence and outcomes. *Clin Plast Surg.* 2014;41(3):501-512.)

interposition material is inserted between the joint surfaces to form a false joint. Several studies have reported that interpositional arthroplasty yielded good results for pain relief similar to that of arthrodesis and preservation of joint ROM similar to that of implant arthroplasty [4,6]. Furthermore, it can also be easily converted to arthrodesis or implant arthroplasty due to preservation of the bone stock, should it be needed in the future [1]. In this sense interpositional arthroplasty seems to be an attractive and appropriate treatment option for our patient. In our case, soft tissue interpositional arthroplasty was able to provide ROM improvement and good functional results in the short term as shown from the data in Table 1.

Various materials have been described as interposition materials, both allograft (e.g., silicone, polyethylene, pyrocarbon) and autograft (e.g., volar plate [6], capsule [5], tendon [4]). In this case, we chose to use the periosteum because of its in-situ nature thereby reducing donor site related morbidity and postoperative complications. In addition, the use of the periosteum makes this procedure relatively inexpensive and makes it a suitable treatment of choice in limited resources areas. Experimental studies also have shown that periosteum may possess chondrogenic capabilities when placed within a chondrotrophic environment [12].

The main drawback of our study is the very short follow-up duration, making it too early to draw any long-term conclusions. The patient is in regular follow-up, so it will be worthwhile to study the long-term results of this procedure. To date there has been no studies focusing on the longevity of the outcomes and long-term complications of soft tissue interpositional arthroplasty, in comparison to the outcomes of arthrodesis or implant arthroplasty as a treatment for arthritis on the PIP joint. Further studies evaluating longevity of the results and long-term complications with larger samples are required.

#### 4. Conclusion

Through this report we would like to highlight the use of soft tissue interpositional arthroplasty as a treatment for PIP joint arthritis, particularly in limited healthcare facilities. Our results shows that it was able to provide ROM improvement and good functional results with a high level of satisfaction in the short term. It is worth to be considered as a treatment option for arthritis of PIP joint, especially in limited resource areas because of no specialized equipment or synthetic implant materials are necessary thus it is relatively inexpensive and can be easily reproduced. Further studies with longer follow up and larger sample period are required.

**Provenance and peer review**

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**Ethical approval**

In our center, case reports are excluded from the need for ethical approval.

**Consent**

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

**Appendix A. Quick disabilities of the arm, shoulder and hand questionnaire**

**Author contribution**

Jecky Chandra: Performed the operation, study concept, wrote the manuscript.

Johannes E.B. Kurnia: analysed the literature research, wrote and edited the manuscript.

Nucki N. Hidajat, Widya Arsa, and Mohammad R. Chaidir supervised the writing of manuscript and performed the scientific validation.

All authors read and approved the final version of the manuscript.

**Research registration**

Not applicable.

**Guarantor**

Jecky Chandra.

Johannes E. B. Kurnia.

**Declaration of competing interest**

The authors have no conflicts of interest to declare.



## QuickDASH

Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. Open a tight or new jar.	1	2	3	4	5
2. Do heavy household chores (e.g., wash walls, floors).	1	2	3	4	5
3. Carry a shopping bag or briefcase.	1	2	3	4	5
4. Wash your back.	1	2	3	4	5
5. Use a knife to cut food.	1	2	3	4	5
6. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	1	2	3	4	5

	NOT AT ALL	SLIGHTLY	MODERATELY	QUITE A BIT	EXTREMELY
7. During the past week, to what extent has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	1	2	3	4	5

	NOT LIMITED AT ALL	SLIGHTLY LIMITED	MODERATELY LIMITED	VERY LIMITED	UNABLE
8. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?	1	2	3	4	5

**Please rate the severity of the following symptoms in the last week. (circle number)**

	NONE	MILD	MODERATE	SEVERE	EXTREME
9. Arm, shoulder or hand pain.	1	2	3	4	5
10. Tingling (pins and needles) in your arm, shoulder or hand.	1	2	3	4	5

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	SO MUCH DIFFICULTY THAT I CAN'T SLEEP
11. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand? (circle number)	1	2	3	4	5

$$\text{QuickDASH DISABILITY/SYMPTOM SCORE} = \left( \frac{\text{sum of n responses}}{n} - 1 \right) \times 25, \text{ where n is equal to the number of completed responses.}$$

A QuickDASH score may not be calculated if there is greater than 1 missing item.

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