**Rehabilitation after proximal interphalangeal joint replacement: a structured review of literature**

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**Abstract**

Proximal interphalangeal (PIP) joint arthroplasty remains an unsolved biomechanical challenge despite material advancements and new implant designs. This leads to a high rate of complications. Moreover, there is heterogeneity in postoperative management in the literature. The present structured review examined the therapeutic strategies utilized by physiotherapists to recover a functional finger chain and prevent postoperative complications following PIP joint replacement. Participants undergoing primary total PIP joint arthroplasty of index, ring, middle and little fingers were included. Research published from 2008 onwards, in French and English and reporting on PIP joint replacement and postoperative management were included. Therapeutic strategies were organized according to the surgical approaches. Details of splint strategies, mobilization and muscular strengthening, and management of postoperative complications were recorded. In total, 48 studies including 3 articles providing description of surgical techniques were included. In relation to hand function, most authors advocated joint mobilizations (n=45) and some recommended strengthening (n=4). Static (n=43) and dynamic splints (n=14) as well as buddy taping (n=12) were frequently recommended to prevent and manage postoperative complications. Few studies (n=13) reported on wound assessment and postoperative swelling control. Precise recommendations concerning therapeutic strategies following PIP joint arthroplasty cannot be made based on available evidence. Specific protocols for rehabilitation following PIP joint replacement need to be clarified in future research.

# 1. Introduction

The hand is a complex structure with a number of joints that are linked to enable highly versatile and dexterous movements [1]. Hand function is an important aspect of everyday function [1]. A number of activities including writing, manipulating objects, gripping, opening and closing jars and turning a key require optimum stability and mobility at the different joints [1]. Hand function can be affected by conditions such as osteoarthritis (OA) and rheumatoid arthritis (RA). The second most common location for OA is the finger [2]. OA of the proximal interphalangeal (PIP) joint is relatively common with a prevalence rate of 18% identified through radiographic assessment [3]. OA affects mainly women between 60 and 79 years but both men and women are equally affected between the age of 80 and 89 [4]. Based on radiography (R) and photographs (P), prevalence of PIP joint OA (R:18% ; P:6%) is lower compared to distal interphalangeal (DIP) (R:35% ; P:24%) and carpometacarpal (CMC) joints (R:21% ; P:8%) OA [3,4]. OA is often associated with symptoms such as pain, stiffness, swelling, deformities, instability resulting in loss of function. The prevalence of RA corresponds to approximately 0.5% of the population of Northern Europe and represents the most common form of inflammatory arthritis. It can be symptomatic at any age, but mainly occurs between 40 and 50 years of age with a sex ratio of 3 female to 1 male [5,6]. The symptoms can be managed conservatively using splints, pain medication, and mobilizations [7]. Surgical management might be considered when there is persistent pain, stiffness, deformity, instability and loss of hand function [8].

PIP joint arthroplasty is often preferred to arthrodesis, because the decrease in PIP joint range of motion (ROM) significantly limits hand function [8]. The objectives of this surgery are to reduce pain, improve ROM, restore joint alignment and improve function [8]. However, in RA surgery, PIP joint arthroplasty is rarely performed and mainly indicated for correction of boutonniere or swan neck deformities. This could be due to the difficulty of simultaneously replacing both the metacarpophalangeal (MCP) and PIP joints of the same finger [9].

Complications of PIP joint replacement include infection, loosening, migration, pseudarthrosis, flexor tendon adhesion, extension lag, implant fracture and synovitis [5,8]. Pseudarthrosis is not a frequent complication, bone fracture mainly during prosthesis implantation is much more frequent [10]. Stiffness and swan neck deformity are frequent complications [10].

Currently, two types of implants are used : spacers and surface replacement implant [11]. Spacers are generally constrained and surface replacement implants are either semi-constrained or non-constrained [11]. There are three different surgical approaches for PIP joint arthroplasty: dorsal, palmar, and lateral. The choice of surgical approach is determined by the surgeon and their experience. Dorsal approach involves the extensor digitorum communis and the two collateral ligaments. Lateral approach impacts the volar plate and one of the two collateral ligaments depending on the side chosen by the surgeon whilst palmar approach affects volar plate and the two collateral ligaments [12].

Rehabilitation is indicated after PIP joint arthroplasty and should aim to promote healing, reduce oedema, increase joint ROM, educate patients and improve activities of daily living [8]. Rehabilitation depends on the surgeon's postoperative instructions, the type of procedure performed, the type of prosthesis, joint stability, bone and soft tissue quality, and any additional surgical procedures such as ligament repair, tendon repositioning or reconstruction, tenolysis, and the palmar plate release [8]. In addition, joint stability and the progression of the mobilization phase during rehabilitation must be at the forefront of communication between the surgeon, therapist and patient [8].

The above parameters are important and need to be considered because complications can occur after PIP joint arthroplasty. In 2012, a meta-analysis showed that there was a 28% rate of postoperative complications with at least one complication within 12 months of PIP joint replacement and this involved both silicone implants and resurfacing implants [13]. Duration of postoperative immobilization, splinting, and active and resistive exercise protocols varied considerably between studies and between types of replacement [13]. They reported that there was a lack of detail on rehabilitation protocols and postoperative follow up. In 2013, a systematic review showed that there was no clear superiority of pyrocarbon implants over silicone implants based on the low level of evidence available [14]. Few years later, another systematic review found that silicone implant arthroplasty involving volar approach showed the maximum improvement in ROM, had less extension lag, and there were fewer complications following surgery when compared to other designs and surgical approaches [15]. In 2018, a systematic review and meta-analysis reported that silicone implant was a suitable option for the treatment of stable proximal interphalangeal joints. Surface replacing implants might be better suited to correct unstable or deformed PIP joints, although they were linked to a higher risk of reoperations [10]. The occurrence of complications was not solely dependent on the type of implant, but included factors such as patient sociodemographic status, underlying pathology, type of surgical approach, rehabilitation protocol and the finger that was affected [10]. All these data support the fact that despite the evolution of materials and implant design, there is currently no ideal implant and that prosthetic arthroplasty of the PIP joint still remains an unsolved biomechanical challenge. Furthermore, the current rehabilitation protocols are heterogeneous, and that postoperative rehabilitation protocol is one of the factors influencing the occurrence of postoperative complications in PIP joint arthroplasty. This also supports the fact that physiotherapy has a place in the postoperative management of these patients undergoing such surgery.

Therefore, the present structured review aimed to examine the therapeutic strategies that could be used by the physiotherapist in order to help the patient recover a functional finger chain and prevent postoperative complications following PIP joint replacement.

# 2. Material and methods

A structured literature review was conducted.

2.1. Eligibility criteria

Any study design involving PIP joint replacement with a description of postoperative management was included. Prospective, retrospective, randomized controlled, cohort studies and descriptive articles were included. Studies including people undergoing primary total PIP joint replacement involving the four fingers with specific joint pathologies were included.

The focused intervention was PIP joint arthroplasty. Studies written in English and French published from 1st January 2008 to 29 April 2019 were included. The search strategy was developed in consultation with a health sciences librarian and involved PubMed, PEDro and Web of Sciences.

A detailed search strategy can be found in Fig. 1. All titles of articles identified through the search were screened by two researchers (E.L., D.S.). The selection process (screening and eligibility) was completed by one researcher (E.L.). To ensure consistency, a random sample of 10% of abstracts was independently screened by a second author (D.S). During the selection process if there were doubts regarding inclusion of an article, then second opinion was obtained from another researcher (D.S.).

Search terms were: "proximal interphalangeal joint\* arthroplast\*" OR "proximal interphalangeal joint\* replacement\*". When the anatomical section and/or the surgery type were clearly mentioned in the title and these did not correspond to PIP joint and/or arthroplasty, the article was excluded. When the title was not clear concerning the above parameters, these were included.

The title and abstract of identified articles were assessed initially. Articles were included if they complied with the following criteria: date of publication between 2008 and 2019, written in English or French, the title and/or the abstract relate to primary total PIP joint replacement. Those that did not meet the above selection criteria were excluded.

If there was uncertainty around inclusion of a publication based on the abstract, the full text was assessed. If details of postoperative protocols were unavailable, the article was excluded.

Risk of bias was minimized by involving two researchers in screening the titles and then 10% of abstracts were reviewed independently by a second researcher.

Data from 48 articles were recorded. A data extraction form was used to collect the following data: study design; etiology; sample size; ratio male/female; number arthroplasty; mean age at surgery; duration of follow-up; hand dominance; side of surgery; type of finger; year of publication; type of implant; surgical approach; postoperative complications; postoperative protocols.

# 3. Results

The search was conducted in October 2018 and repeated in April 2019. A total of 48 articles were identified.

3.1.Study characteristics

Of the 48 articles reviewed, 45 were research studies and 3 were descriptive articles of surgical technique (Table 1). The results are presented based on surgical approach (dorsal, palmar, lateral, lateral and dorsal combined). For each surgical approach, the use of splint, mobilizations, muscular strengthening, scar management, oedema and complications was addressed. Further information on splinting, mobilization, postoperative complications, oedema, and scar management is presented in the supplementary data. Different types of postoperative splints were used after PIP joint replacement such as static splint, dynamic splint, and/or buddy tape. Various designs such as dorsal, palmar, and circular were used (Appendix 1-5). Only data available from studies are presented.

## 3.2. Approach

*3.2.1. Dorsal approach*

Thirty-five articles used the dorsal approach [16,17,19–24,26,27,29,31–39,41–50,52,53,58,60,63] (Table 2). In the study by Riggs et al. [19], there were two groups : static and dynamic splint. It was the only study that looked at rehabilitation and particularly type of splint.

The first mobilizations began between day 1 and week 4. Ten articles [16,23,26,32,39,42–44,46,49] reported commencing mobilizations between day 1 and day 3, eight [19,21,27,35,36,47,48,60] between day 4 and day 7, seven [17,22,29,31,50,58,63] at week 2, seven [24,33,37,38,41,45,53] at week 3, two [20,52] at week 4. The criteria for allowing free use of the operated finger was time post-surgery which ranged from week 4 to week 13. Out of 35 articles, one [16] allowed free use of the operated finger at week 4, one [23] at week 6, nine [17,21,26,27,31,32,36,39,42] at week 7, three [19,33,45] at week 9, one [22] at week 10, one [58] at week 11, one [49] at week 12, two [44,50] at week 13 (Appendix 12 - 16).

Of the 35 articles, different strategies were used to both prevent and limit (6 articles [19,21,23,33,35,45]) or only limit (5 articles [29,32,36,46,50]) joint deficiencies (Appendix 6 -11).

PIP joint extension deficit was managed by reducing flexion [29,33,45], using a dynamic extension splint [36], a dynamic extension splint followed by static extension splint [35], modification of the dorsal splint [23], night-time circular finger splint with the PIP joint nearly in full extension [21], and a static splint [46,50]. PIP joint flexion deficit was managed by increasing exercise frequency [33,45], and manipulation of the joint under general anesthesia [32]. PIP joint hyperextension was managed using dorsal blocking of the PIP joint in flexion (3 articles [19,21,35]), modification of the dorsal splint (1 article [23]) and using a splint with extension blocking (1 article [29]).

*3.2.2. Palmar approach*

Nineteen articles used a palmar approach [17,18,25,26,28,30,33,34,36,38,40,41,45,48,53–56,62] (Table 3).

The first mobilizations began between day 1 and week 3. Six articles reported commencing mobilizations between day 1 and day 3 [18,25,26,30,55,56], four between day 4 and day 7 [28,40,48,62], two at week 2 [17,54], three at week 3 [38,41,53]. The criteria for allowing free use of the operated finger was time post-surgery which ranged from week 7 to month 4. Out of 19 articles, six allowed free use of the operated finger at week 7 [17,18,25,26,40,62], one at week 9 [28], one at month 4 [30] (Appendix 12-16).

Of the 19 articles, different strategies were used to both prevent and limit (3 articles [28,40,62]) or only prevent (2 articles [25,30]) joint deficiencies (Appendix 6 -11). PIP joint extension deficit was managed through mobilization [25], use of static or dynamic splint [30,40,62], removal of dorsal splint [28]. PIP joint flexion deficit was managed using a dynamic splint [28], a static splint and a dynamic splint [40], a static splint or a dynamic splint [62]. PIP joint hyperextension was managed by dorsal blocking of the PIP joint in flexion [28,40,62].

## *3.2.3. Lateral approach*

Three articles used lateral approach [36,51,61] (Table 4). The first mobilization began between day 4 and day 7 [61] and week 5 [51]. The criteria for allowing free use of the operated finger by the authors was not reported in the 3 articles [36,51,61] (Appendix 12-16). Of the 3 articles, the strategy was to limit joint deficiencies in 1 article [61] (Appendix 6 -11). The methods used to manage PIP joint extension deficit, PIP joint flexion deficit and PIP joint hyperextension were not reported in 3 articles [36,51,61].

## *3.2.4. Lateral and dorsal combined approaches*

Two studies used lateral and dorsal combined approach [33,45]. No details about splinting, mobilization, muscular strengthening, and management of complications were available from both articles.

## *3.2.5. Unknown surgical approach*

Two studies did not report the surgical approach [57,59]. One study [57] reported that “after surgery, the immobilization period and hand therapy regimen varied on a surgeon and patient-to-patient basis” and no additional detail was available. The other study [59] reported several stages of splinting during the first 6 weeks postoperatively. Mobilization was prescribed but information about supervision and use of splint during mobilization were not available. The first mobilization began between day 4 and day 7 (Appendix 12-16). The criteria for allowing free use of the operated finger by the authors was not reported. No details about muscular strengthening, management of scar, oedema and joint deficiencies were available (Appendix 6 -11).

# 4. Discussion

This review examined the therapeutic strategies utilized by the physiotherapist to help the patient recover a functional finger chain and prevent postoperative complications. To our knowledge, this was the first structured review of literature that compared postoperative protocol after PIP joint replacement. For each surgical approach, description of splints and mobilizations were generally incomplete and showed that the PIP joint was often considered as a single entity.

Anatomically and biomechanically, the PIP joint is part of a chain of joints. The wrist can have an effect on PIP joint via the central slip of the extensor apparatus and on the DIP joint via the lateral bands [1]. This is particularly important for dorsal approach because the extensor apparatus of the fingers and the collateral ligaments are excised [12]. In the case of palmar approach, the flexor tendons are not excised but reflected. The pulleys A2 to A4 and the collateral ligaments of the PIP joint can be sectioned and the palmar plate detached [12]. These structures are then repaired. Consequently, it is less inconvenient not to include the wrist since the flexor tendons are not severed during surgery. Nevertheless, since ligaments are sectioned and repaired, the stability of the PIP joint must be guaranteed by the splint. It is therefore essential to know the position of the wrist, MCP, PIP and DIP joints and not just the PIP joint, as this will guide the healing of tissues and possible presence of articular, ligament or muscular deficits at the end of the immobilization period.

Concerning the supervision of mobilization, there was no consensus except for dorsal approach where there was a trend towards mobilization by patients themselves. Supervision was often neglected. Self-mobilization requires patient education and regular follow-up [19]. From the patient's perspective, it is necessary to make sure firstly that they can understand the instructions and precautions, secondly that they are capable of carrying them out, and thirdly that they know and are able to apply the correct behavior in the event of a problem. Self-mobilization has several advantages: it allows more frequent mobilization of the joints outside treatment sessions ; it ensures continuity of care and makes them aware that they have a role to play in their functional recovery of the operated finger [19]. If supervised mobilization is chosen, it is important to be aware that depending on the frequency of rehabilitation sessions, the functional result will probably not be the same. Mobilization can be done with or without splinting. In practice, mobilization with a splint is not essential but can be interesting for several reasons. Depending on the way it is designed, the splint can stabilize the joint, protect the affected structures from excessive tension and avoid mobilization towards ROM not indicated during the healing phase. This review demonstrated a trend in terms of first mobilization during the first postoperative week for dorsal, palmar, and lateral approaches. The advantage of early mobilization is that it helps reduce postoperative oedema, pain, stiffness, adhesions of the glide planes [65]. However, it is important to be aware that the initiation of mobilization during the first week requires few precautions depending on the damaged to structures during surgery. For dorsal and palmar approaches, a trend was noticed regarding free use of the operated finger at week 7. This could be due to the period of scarring and fragility of the tendon structures repaired during surgery being 45 days [66]. Caution must be exercised in relation to free use of the operated finger at week 7. There was consensus concerning the commencement of muscular strengthening at week 9.

Concerning the management of complications, it is interesting to note that some methods were very simple to apply, such as removing the dorsal splint or reducing the amount and frequency of flexion of the PIP joint. In practice, the application of these could be considered prior to the fitting of a specific splint. For future research it might be interesting to manage complications such as joint deficiencies by describing precise criteria to begin their management including degrees of ROM, time after surgery, surgical approach used, tissue healing phase. The terminology used to describe management of complications must be clearly defined in order to improve repeatability.

There were limited data regarding the management of oedema and scar tissue. In practice, the implementation of methods to manage oedema requires the presence of a professional to check the cutaneous trophic state and to regulate the pressure applied to the skin and cutaneous tissues. Education would be needed if patients are required to apply this on their own. The hygiene of the operated finger and the hand, and any learning of actions to take if any problems arise following the application of compression must be considered. Buonocore et al. [67] recommended removal of self-adherent wrap before initiating a therapy because their data demonstrated that both the presence of edema and self-adherent wrap increased the work of Flexion (WoF) in cadaveric model. The effects of these variables were additive and produced WoF values that were nearly 4 times baseline values for non-edematous digits. Massage was the only strategy reported in the literature regarding management of scar tissue. In practice, it requires education [19] on how to perform the authorized massage maneuvers, as well as joints positions below and beside the PIP joint during the massage. Moreover, massage can also help reduce oedema.

A particular strength of this review is its wide scope incorporating all types of prothesis, etiologies and surgical approaches. We chose to classify based on surgical approach because different approaches are seen in practice. This is consistent with other reviews involving PIP joint replacement that compared their results based on surgical approach [15] as type of approach used is one of the important factors [10]. If data were classified by different types of prosthesis and etiologies, possible trends in these parameters may become evident.

The broad scope of the review inevitably led to some limitations. Articles published since 2008 were included to ensure contemporary rehabilitation strategies were incorporated in the review. This may have led to strategies published in older publications being missed. However, this review included a significant number of recent publications and provides a broad overview of current practice. The number of parameters considered were substantial (surgical approach, etiologies, prosthesis, type and design of splint, joint positions, time of splinting, time of mobilizations, passive and active motions, intensity, and frequency of mobilizations, etc.) and it might be beneficial to focus on a particular surgical approach in future research. Although, the study design of included articles was quite diverse, information related to postoperative protocols was not overlooked. Similar issues with regards to diverse study design were reported in previous systematic reviews [10,13–15]. The heterogeneity of the designs of the initial research articles and, for each, their level of evidence, was not reported due to limited time and resources. Majority of articles did not focus particularly on the postoperative therapeutic strategies and information of specific strategies was limited. The methodology part of these studies was the main source of information given the paucity of literature on rehabilitation after PIP joint replacement. They were a gentle lack of rigor and it is not always possible to reproduce the postoperative protocols mentioned in some studies. The comparison of degrees of ROM allowed at different postoperative stages could not presented because of a lack of data.

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# Figure legends

**Fig. 1.** Identification, selection, and inclusion of articles

**Table titles**

**Table 1.** Summary of study characteristics

**Table 2.** Summary data concerning splinting, mobilizations and strengthening for dorsal approach

**Table 3.** Summary data concerning splinting, mobilizations and strengthening for palmar approach

**Table 4.** Summary data concerning splinting, mobilizations and strengthening for lateral approach

**Fig. 1.** Identification, selection, and inclusion of articles

Titles identified from search of electronic databases (n= 354)

Titles meeting identification criteria (n=247)

Excluded: did not meet identification criteria (n=107)

Excluded: did not meet selection criteria (n=190)

* Date published prior to 2008 (n=104)
* Foreign language except English and French (n=10)
* Reviews (n=30)
  + Systematic reviews and meta-analysis (n=8)
  + Other types of review (n=22)
* Single case studies (n=6)
* Comment (n=2)
* Revision (n=6)
* Graft (n=7)
* Articles comparing arthrodesis versus arthroplasty (n=2)
* Articles dealing with other types of arthroplasty other than total PIP joint arthroplasty (n= 14)
* Other limitations (n=9)

Articles meeting selection criteria (n=57)

Excluded: lack of a postoperative protocol (n=9)

Included: presence of a postoperative protocol (n=48)

IDENTIFICATION

Assessment of the title and the abstract

SELECTION

INCLUSION

Full text assessment

Title assessment

**Table 1.** Summary of study characteristics

|  |  |  |
| --- | --- | --- |
|  | Number of articles (n)/[references] | Range |
| Study type | **48** |  |
| Prospective, randomized multicenter trial | 1 [16] |  |
| Single center retrospective cohort study | 1 [17] |  |
| Single-center prospective case series study | 1 [18] |  |
| Non-randomized mixed current and historical cohort follow-up study | 1 [19] |  |
| Prospective case series | 2 [20,21] |  |
| Prospective cohort study | 1 [22] |  |
| Prospective consecutive study | 1 [23] |  |
| Prospective studies | 5 [24–28] |  |
| Retrospective case series | 3 [29–31] |  |
| Retrospective cohort studies | 5 [32–36] |  |
| Retrospective studies | 24 [37–60] |  |
| Descriptive articles of surgical technique | 3 [61–63] |  |
| Number of etiology |  |  |
| More than one etiology | 31[17,18,21,22,24–27,29–36,39–43,45–50,55,57,59,60] |  |
| One etiology | 13[16,19,20,23,28,37,38,44,51,52,54,56,58] |  |
| Not available | 4 [53,61–63] |  |
| Sample size |  | **3 ; 205** |
| Age of participants (years) |  | **16 ; 90** |
| Number of PIP joints operated reported in the studies including drop-outs |  | **5 ; 307** |
| Surgical approach |  |  |
| Dorsal | 26[16,19–24,27,29,31,32,35,37,39,42–44,46,47,49,50,52,58,60,63] |  |
| Palmar | 9 [18,25,28,30,40,54–56,62] |  |
| Lateral | 2 [51,61] |  |
| More than one surgical approach | 10 [17,26,33,34,36,38,41,45,48,53] |  |

**Table 2.** Summary data concerning splinting, mobilizations and strengthening for dorsal approach

|  |  |
| --- | --- |
|  | n [references] |
| Number of stages of splint use during the first 6 weeks post-operatively |  |
| One stage | 20 [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] |
| Several stages | 15  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] |
| Mobilizations |  |
| Prescribed by surgeons | 34  [16,17,19–24,26,27,29,31–33,35–39,41–50,52,53,58,60,63] |
| With the supervision of a therapist | 2 [38,63] |
| By patients themselves | 14 [16,17,19,21,23,26,27,31,33,35,43,45,46,49] |
| With the supervision of a therapist and by patients themselves | 1 [58] |
| With the use of a splint | 14 [19,21,22,27,33,35–37,39,42,45,49,50,60] |
| With the remove of the splint | 9 [16,17,19,26,29,31,38,44,58] |
| Strengthening |  |
| Recommended from week 9 | 3 [19,29,58] |
| Not recommended | 1 [17] |

**Table 3.** Summary data concerning splinting, mobilizations and strengthening for palmar approach

|  |  |
| --- | --- |
|  | n [references] |
| Number of stages of splint use during the first 6 weeks post-operatively |  |
| One stage | 10 [17,18,25,26,34,36,38,41,48,53], |
| Several stages | 5 [28,30,40,54,62] |
| Mobilizations |  |
| Prescribed by surgeons | 15 [17,18,25,26,28,30,38,40,41,48,53–56,62] |
| With the supervision of a therapist | 4 [18,38,40,54] |
| By patients themselves | 3 [17,26,30] |
| With the use of a splint | 3 [25,40,62] |
| With the remove of the splint | 5 [17,26,30,38,54] |
| Strengthening |  |
| Recommended from week 9 | 1 [28] |
| Not recommended | 2 [17,30] |

**Table 4.** Summary data concerning splinting, mobilizations and strengthening for lateral approach

|  |  |
| --- | --- |
|  | n [references] |
| Number of stages of splint use during the first 6 weeks post-operatively |  |
| One stage | 1 [36] |
| Several stages | 2 [51,61] |
| Mobilizations |  |
| Prescribed by surgeons | 3 [36,51,61] |
| With the supervision of a therapist | - |
| By patients themselves | - |
| With the use of a splint | 2 [36,61] |
| With the remove of the splint | - |
| Strengthening |  |
| Recommended | - |
| Not recommended | - |

**Rehabilitation after proximal interphalangeal joint replacement : a structured review of literature**

APPENDIX

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# Supplementary file

### Appendix 1 - Types and design of splinting

|  |  |  |  |
| --- | --- | --- | --- |
| **Type and design of splinting** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| N/A | 1 [20] |  |  |
| Static splint with a dorsal design | 4 [31,35,47,49] | 3 [35,42,47] |  |
| Static splint with a palmar design | 7 [36,41–43,52,53] | 1 [50] | 1 [19] |
| Static splint with no information about splint design | 19 [16,17,22,24,26,29,32–34,37,38,44–46,48,50,58,60,63] | 5 [27,31,33,45,63] | 1 [22] |
| Dynamic splint with a dorsal design | 3 [19,21,27] | 3 [36,37,58] |  |
| Dynamic splint with no information about the design |  | 2 [22,24] |  |
| Static splint with a dorsal design combined with a buddy tape | 2 [23,39] |  |  |
| A buddy tape or articulated splint of the PIP joint |  | 1 [19] |  |
| A buddy tape |  |  | 1 [31] |

N/A : not available

|  |  |  |  |
| --- | --- | --- | --- |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| **Type and design of splinting** |  |  |  |
| N/A |  |  |  |
| Static splint with a dorsal design | 3 [28,30,53] | 2 [28,30] |  |
| Static splint with a palmar design | 2 [18,41] |  |  |
| Static splint with no information about splint design | 8 [17,26,36,38,40,48,54,62] | 1 [54] |  |
| Dynamic splint with a dorsal design | 1 [25] |  |  |
| Dynamic splint with no information about the design |  |  |  |
| Static splint with a dorsal design combined with a buddy tape |  | 1 [62] |  |
| Static splint with no information about the design combined with a buddy tape |  | 1 [40] |  |
| A buddy tape or articulated splint of the PIP joint |  |  |  |
| A buddy tape | 1 [34] |  | 1 [30] |

N/A : not available

|  |  |  |
| --- | --- | --- |
| **Surgical approach** | **Type of post-operative splint : 1st stage** | **Type of post-operative splint : 2nd stage** |
| **LATERAL APPROACH** | **Number of articles** | |
|  | **3 articles**  [36,51,61] | **2 articles** [51,61] |
| Static splint | 1 [51] | 1 [51] |
| Static splint + buddy tape | 1 [36] |  |
| N/A | 1 [61] |  |
| Buddy tape |  | 1 [61] |
| **Design of the splint** |  |  |
| Palmar |  | 1 [51] |
| N/A | 3 [36,51,61] | 1 [61] |

|  |  |  |
| --- | --- | --- |
| **Surgical approach** | **Type of post-operative splint : 1st stage** | **Type of post-operative splint : 2nd stage** |
| **UNKNOWN SURGICAL APPROACH** | **Number of articles** | |
|  | **2 articles** [57,59] |  |
| **Type of splint** |  |  |
| Static splint | 1 [59] | 1 [59] |
| N/A | 1 [57] | 1 [57] |
| **Design of the splint** |  |  |
| N/A | 2 [57,59] | 2 [57,59] |

N/A : not available

### Appendix 2 a - DIP joint of the operated finger included in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **DIP joint of the operated finger included in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | **35 articles** [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | **15 articles**  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | **3 articles** [19,22,31] |
| Yes | 10 [16,19,21–23,26,27,35,47,50] | 6 [22,24,36,37,50,58] | 1 [19] |
| N/A | 26 [17,19,20,24,29,31–34,36–39,41–46,48,49,52,53,58,60,63] | 9 [19,27,31,33,35,42,45,47,63] | 2 [22,31] |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| Yes | 4 [25,26,54,62] | 1 [54] |  |
| N/A | 11 [17,18,28,30,34,36,38,40,41,48,53] | 4 [28,30,40,62] | 1 [30] |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| N/A | 3 [36,51,61] | 2[51,61] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] | **2 articles** [57,59] |  |
| N/A | 2 [57,59] | 2 [57,59] |  |

N/A : not available

### Appendix 2 b - PIP joint of the operated finger included in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **PIP joint of the operated finger included in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| Yes | 34 [16,17,19,21–24,26,27,29,31–39,41–50,52,53,58,60,63] | 15 [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 [19,22,31] |
| N/A | 1 [20] |  |  |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| Yes | 15 [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | 5 [28,30,40,54,62] | 1 [30] |
| N/A |  |  |  |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| Yes | 3 [36,51,61] | 2[51,61] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] | **2 articles** [57,59] |  |
| Yes | 1 [59] | 1 [59] |  |
| N/A | 1 [57] | 1 [57] |  |

N/A : not available

### Appendix 2 c - MCP joint of the operated finger included in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **MCP joint of the operated finger included in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| Yes | 15 [16,19,21,23,26,27,33,35,36,39,41,45,47,49,50] | 10 [22,24,31,33,35–37,45,47,58] | 1 [19] |
| No |  | 2 [19,50] | 1 [31] |
| N/A | 20 [17,20,22,24,29,31,32,34,37,38,42–44,46,48,52,53,58,60,63] | 3 [27,42,63] | 1 [22] |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| Yes | 5 [25,26,36,41,54] | 2 [28,30] |  |
| No |  | 1 [54] | 1 [30] |
| N/A | 10 [17,18,28,30,34,38,40,48,53,62] | 2 [40,62] |  |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| Yes | 2 [51,61] | 1 [51] |  |
| N/A | 1 [36] |  |  |
| No |  | 1 [61] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] |  |  |
| N/A | 2 [57,59] | 2 [57,59] |  |

N/A : not available

### Appendix 2 d - Hand included in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **Hand included in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| Yes | 15 [16,19,21,23,26,27,33,35,36,39,41,45,47,49,50] | 10 [22,24,31,33,35–37,45,47,58] | 1 [19] |
| No |  | 2 [19,50] | 1 [31] |
| N/A | 20 [17,20,22,24,29,31,32,34,37,38,42–44,46,48,52,53,58,60,63] | 3 [27,42,63] | 1 [22] |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| Yes | 5 [25,26,36,41,54] | 2 [28,30] |  |
| No |  | 1 [54] | 1 [30] |
| N/A | 10 [17,18,28,30,34,38,40,48,53,62] | 2 [40,62] |  |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| Yes | 2 [51,61] | 1 [51] |  |
| N/A | 1 [36] |  |  |
| No |  | 1 [61] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] | **2 articles** [57,59] |  |
| N/A | 2 [57,59] | 2 [57,59] |  |

N/A : not available

### Appendix 2 e - Wrist joint included in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **Wrist included in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| N/A | 30 [17,19–22,24,26,27,29,31–35,37,38,41–48,50,52,53,58,60,63] | 12 [22,24,27,31,33,36,37,42,45,47,58,63] | 2 [19,22] |
| Yes | 5 [16,23,36,39,49] |  |  |
| No |  | 3 [19,35,50] | 1 [31] |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| N/A | 14 [17,18,25,26,28,30,34,36,38,40,41,48,53,62] | 4 [28,30,40,62] |  |
| Yes | 1 [54] |  |  |
| No |  | 1 [54] | 1 [30] |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| N/A | 3 [36,51,61] |  |  |
| Yes |  | 1 [51] |  |
| No |  | 1 [61] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] | **2 articles** [57,59] |  |
| N/A | 2 [57,59] | 2 [57,59] |  |

N/A : not available

### Appendix 2 f - Forearm included in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **Forearm included in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| N/A | 31 [16,17,19–22,24,26,27,29,31–35,37,38,41–48,50,52,53,58,60,63] | 10 [22,24,27,31,36,37,42,47,58,63] | 1 [22] |
| No | 3 [19,23,39] | 5 [19,33,35,45,50] | 2 [19,31] |
| Yes | 2 [36,49] |  |  |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| N/A | 13 [17,18,25,26,28,30,34,38,40,41,48,53,62] | 2 [40,62] |  |
| No | 2 [36,54] | 3 [28,30,54] | 1 [30] |
| Yes |  |  |  |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| N/A | 2 [51,61] | 1 [51] |  |
| No | 1 [36] | 1 [61] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] | **2 articles** [57,59] |  |
| N/A | 2 [57,59] | 2 [57,59] |  |

N/A : not available

### Appendix 3 a - DIP joint position in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **DIP joint position in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| N/A | 26 [17,19,20,24,29,31–34,36–39,41–45,48–50,52,53,58,60,63] | 10 [22,24,27,31,33,35,42,45,47,63] | 2 [19,22] |
| Free | 1 [46] | 1 [19] | 1 [31] |
| Extension | 9 [16,19,21–23,26,27,35,47] | 4 [36,37,50,58] |  |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| N/A | 11 [17,18,28,30,36,38,40,41,48,53,62]. | 4 [28,30,40,62] |  |
| Free | 1 [34] |  | 1 [30] |
| Extension | 3 [25,26,54] | 1 [54] |  |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| N/A | 3 [36,51,61] | 1 [51] |  |
| Free |  | 1 [61] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] |  |  |
| N/A | 2 [57,59] | 2 [57,59] |  |

N/A : not available

### Appendix 3 b - PIP joint position in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **PIP joint position in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| N/A | 9 [17,20,31,37,42,43,50,53,63] | 4 [22,24,27,63] | 1 [22] |
| Flexion | 5 [19,27,39,49,52] | 3 [35,42,47] | 1 [19] |
| Extension | 20 [16,19,21,22,24,26,29,32–36,38,41,44–48,58] | 6 [31,33,36,37,45,58] |  |
| Extension (day) and flexion (night) | 1 [23] |  |  |
| Flexion (day) and extension (night) | 1 [60] |  |  |
| Flexion and extension |  | 1 [50] |  |
| Free |  | 1 [19] | 1 [31] |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| N/A | 5 [17,18,28,30,53] |  |  |
| Flexion | 4 [36,40,48,62] | 3 [28,40,62] |  |
| Extension | 5 [25,26,38,41,54] | 2 [30,54] |  |
| Free | 1 [34] |  | 1 [30] |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| N/A | 3 [36,51,61] |  |  |
| Free |  | 1 [61] |  |
| Flexion |  | 1 [51] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] | **2 articles** [57,59] |  |
| N/A | 2 [57,59] | 1 [57] |  |
| Extension |  | 1 [59] |  |

N/A : not available

### Appendix 3 c - MCP joint position in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **MCP joint position in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| N/A | 25 [17,19–22,24,27,29,31,32,34,37,38,42–44,46,48–50,52,53,58,60,63] | 8 [22,24,27,36,37,42,58,63] | 2 [19,22] |
| Free |  | 2 [19,50] | 1 [31] |
| Flexion | 9 [16,23,26,33,35,39,41,45,47] | 5 [31,33,35,45,47] |  |
| Extension | 1 [36] |  |  |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| N/A | 11 [17,18,25,28,30,36,38,40,48,53,62] | 3 [30,40,62] |  |
| Free | 1 [34] | 1 [54] | 1 [30] |
| Flexion | 3 [26,41,54] | 1 [28] |  |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| N/A | 3 [36,51,61] |  |  |
| Free |  | 1 [61] |  |
| Flexion |  | 1 [51] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] | **2 articles** [57,59] |  |
| N/A | 2 [57,59] | 2 [57,59] |  |

N/A : not available

### Appendix 3 d - Wrist joint position in the splint

|  |  |  |  |
| --- | --- | --- | --- |
| **Wrist joint position in the splint** | | | |
| **Surgical approach** | **1st stage** | **2nd stage** | **3rd stage** |
| **DORSAL APPROACH** | 35 articles [16,17,20,21,23,26,29,32,34,38,39,41,43,44,46,48,49,52,53,60,64] | 15 articles  [19,22,24,27,31,33,35–37,42,45,47,50,58,63] | 3 articles [19,22,31] |
| N/A | 32 [17,19–22,24,26,27,29,31–38,41–50,52,53,58,60,63]. | 12 [22,24,27,31,33,36,37,42,45,47,58,63]. | 1 [22] |
| Free |  | 3 [19,35,50] | 2 [19,31] |
| Extension | 3 [16,23,39] |  |  |
| **PALMAR APPROACH** | **15 articles** [17,18,25,26,28,30,34,36,38,40,41,48,53,54,62] | **5 articles** [28,30,40,54,62] | **1 article** [30] |
| N/A | 13 [17,18,25,26,28,30,36,38,40,41,48,53,62] | 4 [28,30,40,62] |  |
| Free | 1 [34] | 1 [54] | 1 [30] |
| Extension | 1 [54] |  |  |
| **LATERAL APPROACH** | **3 articles**  [36,51,61] | **2 articles** [51,61] |  |
| N/A | 3 [36,51,61] |  |  |
| Free |  | 1 [61] |  |
| Extension |  | 1 [51] |  |
| **UNKNOWN SURGICAL APPROACH** | **2 articles** [57,59] | **2 articles** [57,59] |  |
| N/A | 2 [57,59] | 2 [57,59] |  |

N/A : not available

### Appendix 4 - Time of splint wearing immediately after surgery and progression of splint use after surgery

|  |  |
| --- | --- |
| **Time of splint wearing immediately after surgery** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Day time use | 2 [27,31] |
| Day and night time use | 29 [16,17,19–24,26,29,32–35,38,39,41–47,50,52,53,58,60,63] |
| Night time use | 1 [48] |
| N/A | 3 [36,37,49] |
| **PALMAR APPROACH** |  |
| Day and night time use | 10 [17,26,30,34,38,40,41,53,54,62] |
| Night time use | 2 [18,48] |
| N/A | 7 [25,28,33,36,45,55,56] |
| **LATERAL APPROACH** |  |
| Day and night time use | 2 [51,61] |
| N/A | 1 [36] |
| **UNKNOWN SURGICAL APPROACH** |  |
| Day and night time use | 1 [59] |
| N/A | 1 [57] |
| **Progression of postoperative splint usage** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Completely stopping splint use | 12 [17,20,26,29,31,32,34,41,42,44,48,53] |
| Night time use | 15 [16,19,21–23,27,35,38,39,47,49,50,58,60,63] |
| N/A | 8 [24,33,36,37,43,45,46,52] |
| **PALMAR APPROACH** |  |
| Completely stopping splint use | 8 [17,18,26,34,40,41,48,53] |
| Night time use | 2 [30,38] |
| Day and night time use | 1 [54] |
| N/A | 8 [25,28,33,36,45,55,56,62] |
| **LATERAL APPROACH** |  |
| Completely stopping splint use | 1 [51] |
| N/A | 2 [36,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| Night time use | 1 [59] |
| N/A | 1 [57] |

N/A : not available

### Appendix 5 - The stop date of postoperative splint outside of any complications

|  |  |
| --- | --- |
| **Removal of postoperative splint when there are no complications** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Day 11 | 1 [17] |
| Day 14 | 2 [41,53] |
| Day 21 | 2 [20,34] |
| Day 28 | 2 [29,37] |
| Day 35 | 1 [23] |
| Day 38 | 1 [63] |
| Day 42 | 9 [26,31,32,36,39,42,44,48,50] |
| Day 56 | 2 [33,45] |
| Day 82 | 1[27] |
| Day 120 | 2 [21,22] |
| Day 132 | 2 [38,60] |
| Day 150 | 1 [19] |
| Day 168 | 1 [58] |
| Day 210 | 1 [49] |
| N/A | 7 [16,24,35,43,46,47,52] |
| **PALMAR APPROACH** |  |
| Day 11 | 2 [17,54] |
| Day 14 | 3 [34,41,53] |
| Day 42 | 8 [18,25,26,28,36,40,48,62] |
| Day 132 | 1[38] |
| N/A | 5 [30,33,45,55,56] |
| **LATERAL APPROACH** |  |
| Day 30 | 1 [51] |
| N/A | 2 [36,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| Day 87 | 1 [59] |
| N/A | 1 [57] |

N/A : not available

### Appendix 6 - Management of oedema

|  |  |
| --- | --- |
| **Management** **of oedema** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Compression band | 1 [29] |
| Elastic band or massage | 1 [16] |
| Pressure sleeve | 1 [35] |
| N/A | 32 [17,19–24,26,27,31–34,36–39,41–50,52,53,58,60,63] |
| **PALMAR APPROACH** |  |
| Cohesive wrap | 1 [54] |
| Cohesive wrap or pressure sleeve | 1 [28] |
| N/A | 17 [17,18,25,26,30,33,34,36,38,40,41,45,48,53,55,56,62] |
| **LATERAL APPROACH** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 7 - Scar assessment

|  |  |
| --- | --- |
| **Scar assessment** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Yes | 3 [23,39,41] |
| N/A | 32 [16,17,19–22,24,26,27,29,31–38,42–50,52,53,58,60,63] |
| **PALMAR APPROACH** |  |
| Yes | 1 [41] |
| N/A | 18 [17,18,25,26,28,30,33,34,36,38,40,45,48,53–56,62] |
| **LATERAL APPROACH** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 8 - Scar management

|  |  |
| --- | --- |
| **Scar management** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Scar massage to remodel the scar | 1[19] |
| N/A | 34 [16,17,20–24,26,27,29,31–39,41–50,52,53,58,60,63] |
| **PALMAR APPROACH** |  |
| N/A | 19 [17,18,25,26,28,30,33,34,36,38,40,41,45,48,53–56,62] |
| **LATERAL APPROACH** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 9 - PIP joint extension deficit

|  |  |
| --- | --- |
| **PIP joint extension deficit** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| ***Criteria for management*** |  |
| A deficit > 10-15 degrees | 1[21] |
| A deficit > 15 degrees | 2 [35] |
| An existing deficit | 5 [29,33,45,46,50] |
| A persistent deficit | 1 [36] |
| Stiffness | 1 [23] |
| ***Date of commencement for the management*** |  |
| Day 15 | 2 [23,35] |
| Day 21 | 2 [33,45] |
| Day 29 | 1 [21] |
| Day 42 | 2 [36,50] |
| N/A | 2 [29,46] |
| ***Duration of the management*** |  |
| Over 2 weeks | 1 [35] |
| 6 weeks | 1 [36] |
| 3 months | 1 [21] |
| N/A | 6 [23,29,33,45,46,50] |
| **PALMAR APPROACH** |  |
| ***Criteria for management*** |  |
| Clinically significant deficit | 1 [62] |
| Developing flexum | 1 [28] |
| Prevention | 1 [25] |
| Significant deficit | 1 [40] |
| N/A | 1 [30] |
| ***Date of commencement for the management*** |  |
| Day 1 | 1 [25] |
| Day 21 | 1 [28] |
| Day 42 | 2 [40,62] |
| Throughout the therapeutic program | 1 [30] |
| ***Duration of the management*** |  |
| N/A | 5 [25,28,30,40,62] |

N/A : not available

|  |  |
| --- | --- |
| **PIP joint extension deficit** | |
| **Surgical approach** | **Number of articles** |
| **LATERAL APPROACH** |  |
| ***Criteria for management*** |  |
| N/A | 3 [36,51,61] |
| ***Date of commencement for the management*** |  |
| N/A | 3 [36,51,61] |
| ***Duration of the management*** |  |
| N/A | 3 [36,51,61] |
| ***Duration of the management*** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| **PIP joint extension deficit** |  |
| ***Criteria for management*** |  |
| N/A | 2 [57,59] |
| ***Date of commencement for the management*** |  |
| N/A | 2 [57,59] |
| ***Duration of the management*** |  |
| N/A | 2 [57,59] |
| ***Duration of the management*** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 10 - PIP joint flexion deficit

|  |  |
| --- | --- |
| **PIP joint flexion deficit** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| ***Criteria for management*** |  |
| PIP joint flexion < 90 degrees | 1 [32] |
| An unmet flexion goal | 2 [33,45] |
| N/A | 2 [21,23] |
| ***Date of commencement for the management*** |  |
| Day 42 | 1 [32] |
| N/A | 4 [21,23,33,45] |
| ***Duration of the management*** |  |
| N/A | 5 [21,23,32,33,45] |
| **PALMAR APPROACH** |  |
| ***Criteria for management*** |  |
| Clinically significant deficit | 1 [62] |
| Significant deficit | 1 [40] |
| Stiff flexion | 1 [28] |
| ***Date of commencement for the management*** |  |
| Day 28 | 1 [28] |
| Day 42 | 2 [40,62] |
| ***Duration of the management*** |  |
| N/A | 3 [28,40,62] |
| **LATERAL APPROACH** |  |
| ***Criteria for management*** |  |
| N/A | 3 [36,51,61] |
| ***Date of commencement for the management*** |  |
| N/A | 3 [36,51,61] |
| ***Duration of the management*** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| ***Criteria for management*** |  |
| N/A | 2 [57,59] |
| ***Date of commencement for the management*** |  |
| N/A | 2 [57,59] |
| ***Duration of the management*** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 11 - PIP joint hyperextension

|  |  |
| --- | --- |
| **PIP joint hyperextension** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| ***Criteria for management*** |  |
| Existing deformity | 3 [19,23,29] |
| Prevention | 2 [21,35] |
| ***Date of commencement for the management*** |  |
| Day 4 | 3 [19,21,35] |
| Day 15 | 1 [23] |
| N/A | 1 [29] |
| ***Duration of the management*** |  |
| More than 2 weeks | 1 [35] |
| 4 months | 1 [21] |
| N/A | 3 [19,23,29] |
| **PALMAR APPROACH** |  |
| ***Criteria for management*** |  |
| Existing deformity | 1 [28] |
| Prevention | 2 [40,62] |
| ***Date of commencement for the management*** |  |
| Day 4 | 2 [40,62] |
| Day 15 | 1 [28] |
| ***Duration of the management*** |  |
| 6 weeks | 1 [40] |
| N/A | 2 [28,62] |
| **LATERAL APPROACH** |  |
| ***Criteria for management*** |  |
| N/A | 3 [36,51,61] |
| ***Date of commencement for the management*** |  |
| N/A | 3 [36,51,61] |
| ***Duration of the management*** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| ***Criteria for management*** |  |
| N/A | 2 [57,59] |
| ***Date of commencement for the management*** |  |
| N/A | 2 [57,59] |
| ***Duration of the management*** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 12 - Parameters used to describe intensity and frequency of mobilisations

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters used to describe intensity and frequency of mobilisations** | | | |
| **Surgical approach** | **Week 1 after surgery** | **Week 2 after surgery** | **Week 3-6 after surgery** |
| **DORSAL APPROACH** |  |  |  |
| 10 movements, 3 times a day | 2 [33,45] |  |  |
| 4 times, 20 minutes per day | 1 [16] | 1 [16] |  |
| 5 minutes, 4 times a day | 1 [46] | 1 [46] | 1 [46] |
| 5 times a day | 2 [21,27] |  |  |
| Every 2 hours | 1 [35] | 1 [35] | 1 [35] |
| Every hour | 2 [19,31] | 4 [19,21,27,31] | 4 [19,21,27,31] |
| Several times a day | 1 [26] | 1 [26] | 1 [26] |
| Function of the patient's ability to maintain the allowed active arc of movement |  | 2 [33,45] | 2 [33,45] |
| N/A | 25 [17,20,22–24,29,32,34,36–39,41–44,47–50,52,53,58,60,63]. | 25 [17,20,22–24,29,32,34,36–39,41–44,47–50,52,53,58,60,63] | 26 [16,17,20,22–24,29,32,34,36–39,41–44,47–50,52,53,58,60,63] |
| **PALMAR APPROACH** |  |  |  |
| Several times a day | 2 [26,30] | 2 [26,30] | 2 [26,30] |
| N/A | 17 [17,18,25,28,33,34,36,38,40,41,45,48,53–56,62] | 17 [17,18,25,28,33,34,36,38,40,41,45,48,53–56,62] | 17 [17,18,25,28,33,34,36,38,40,41,45,48,53–56,62] |
| **LATERAL APPROACH** |  |  |  |
| N/A | 3 [36,51,61] | 3 [36,51,61] | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |  |  |
| N/A | 2 [57,59] | 2 [57,59] | 2 [57,59] |

N/A : not available

### Appendix 13 a - Mobilisation of the DIP joint of the operated finger

|  |  |
| --- | --- |
| **Mobilisation of the DIP joint of the operated finger** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Yes | 7 [17,19,21,46,49,50,58] |
| N/A | 28 [16,20,22–24,26,27,29,31–39,41–45,47,48,52,53,60,63] |
| **PALMAR APPROACH** |  |
| Yes | 2 [17,25] |
| N/A | 17 [18,26,28,30,33,34,36,38,40,41,45,48,53–56,62] |
| **LATERAL APPROACH** |  |
| Yes | 1 [61] |
| N/A | 2 [36,51] |
| **UNKNOWN SURGICAL APPROACH** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 13 b - Mobilisation of the PIP joint of the operated finger

|  |  |
| --- | --- |
| **Mobilisation of the PIP joint of the operated finger** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Yes | 34 [16,17,19–24,26,27,29,31–39,41–50,52,53,58,60,63] |
| N/A | 1 [34] |
| **PALMAR APPROACH** |  |
| Yes | 13 [17,18,25,26,28,30,38,40,41,48,53,54,62] |
| N/A | 6 [33,34,36,45,55,56] |
| **LATERAL APPROACH** |  |
| Yes | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| Yes | 1 [59] |
| N/A | 1 [57] |

N/A : not available

### Appendix 13 c - Mobilisation of the MCP joint of the operated finger

|  |  |
| --- | --- |
| **Mobilisation of the MCP joint of the operated finger** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Yes | 4 [17,19,50,58] |
| No | 1 [21] |
| N/A | 31 [16,19,20,22–24,26,27,29,31–39,41–49,52,53,60,63] |
| **PALMAR APPROACH** |  |
| Yes | 2 [17,25] |
| N/A | 17 [18,26,28,30,33,34,36,38,40,41,45,48,53–56,62] |
| **LATERAL APPROACH** |  |
| Yes | 1 [61] |
| N/A | 2 [36,51] |
| **UNKNOWN SURGICAL APPROACH** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 13 d - Mobilisation of the wrist joint

|  |  |
| --- | --- |
| **Mobilisation of the wrist joint** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Yes | 3 [17,50,58] |
| N/A | 32 [16,19–24,26,27,29,31–39,41–49,52,53,60,63] |
| **PALMAR APPROACH** |  |
| Yes | 1 [17] |
| N/A | 18 [18,25,26,28,30,33,34,36,38,40,41,45,48,53–56,62] |
| **LATERAL APPROACH** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 14 - Description of joints position above and below the mobilised joint(s)

|  |  |
| --- | --- |
| **Description of joints position above and below the mobilised joint(s)** | |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| Yes | 3 [17,39,50] |
| N/A | 32 [16,19–24,26,27,29,31–38,41–49,52,53,58,60,63] |
| **PALMAR APPROACH** |  |
| Yes | 2 [17,48] |
| N/A | 17 [18,25,26,28,30,33,34,36,38,40,41,45,53–56,62] |
| **LATERAL APPROACH** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 15 - Start date for mobilisation of the PIP joint in flexion

|  |  |
| --- | --- |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| **Mobilisation of the PIP joint allowed in flexion** |  |
| From week 1 | 18 [16,19,21,23,26,27,32,35,36,39,42–44,46–49,60] |
| From week 2 | 6 [17,22,29,31,50,63] |
| From week 3 | 8 [24,33,37,38,41,45,53,58] |
| From week 4 | 2 [20,52] |
| N/A | 1 [34] |
| **Active flexion of the PIP joint allowed** |  |
| From week 1 | 13 [16,19,21,26,27,32,35,36,42,44,46–48] |
| From week 2 | 3 [17,29,50] |
| From week 3 | 9 [23,24,33,37,38,41,45,49,58] |
| From week 4 | 2 [20,52] |
| N/A | 8 [22,31,34,39,43,53,60,63] |
| **Passive flexion of the PIP joint allowed** |  |
| From week 1 | 1 [48] |
| From week 2 | 1 [46] |
| From week 3 | 4 [16,23,32,41] |
| From week 4 | 2 [42,52] |
| From week 5 | 2 [35,47] |
| From week 7 | 2 [19,58] |
| From week 9 | 1 [50] |
| N/A | 22 [17,20–22,24,26,27,29,31,33,34,36–39,43–45,49,53,60,63] |
| **PALMAR APPROACH** |  |
| **Mobilisation of the PIP joint allowed in flexion** |  |
| From week 1 | 9 [18,25,26,28,40,48,55,56,62] |
| From week 2 | 2 [17,54] |
| From week 3 | 3 [38,41,53] |
| N/A | 5 [30,33,34,36,45] |
| **Active flexion of the PIP joint allowed** |  |
| From week 1 | 9 [18,25,26,28,40,48,55,56,62] |
| From week 2 | 2 [17,54] |
| From week 3 | 3 [38,41] |
| N/A | 6 [30,33,34,36,45,53] |
| **Passive flexion of the PIP joint allowed** |  |
| From week 1 | 4 [25,48,55,56] |
| From week 3 | 1 [41] |
| N/A | 14 [17,18,26,28,30,33,34,36,38,40,45,53,54,62] |

N/A : not available

|  |  |
| --- | --- |
| **LATERAL APPROACH** |  |
| **Mobilisation of the PIP joint allowed in flexion** |  |
| From week 1 | 1 [61] |
| From week 5 | 1 [51] |
| N/A | 1 [36] |
| **Active flexion of the PIP joint allowed** |  |
| From week 1 | 1 [61] |
| N/A | 2 [36,51] |
| **Passive flexion of the PIP joint allowed** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| **Mobilisation of the PIP joint allowed in flexion** |  |
| From week 1 | 1 [59] |
| N/A | 1 [57] |
| **Active flexion of the PIP joint allowed** |  |
| N/A | 2 [57,59] |
| **Passive flexion of the PIP joint allowed** |  |
| N/A | 2 [57,59] |

N/A : not available

### Appendix 16 - Start date for mobilisation of the PIP joint in extension

|  |  |
| --- | --- |
| **Surgical approach** | **Number of articles** |
| **DORSAL APPROACH** |  |
| **Mobilisation of the PIP joint allowed in extension** |  |
| From week 1 | 15 [16,17,19,21,23,26,27,36,39,43,46–49,60] |
| From week 2 | 4 [22,31,50,63] |
| From week 3 | 7 [33,37,38,41,45,53,58] |
| From week 4 | 3 [20,42,52] |
| N/A | 6 [24,29,32,34,35,44] |
| **Active extension of the PIP joint allowed** |  |
| From week 1 | 5 [16,17,26,46,48] |
| From week 2 | 1 [50] |
| From week 3 | 5 [23,33,38,41,45] |
| From week 4 | 4 [19,20,42,52] |
| From week 5 | 1 [21] |
| From week 6 | 1 [49] |
| N/A | 18 [22,24,27,29,31,32,34–37,39,43,44,47,53,58,60,63] |
| **Passive extension of the PIP joint allowed** |  |
| From week 1 | 5 [19,21,27,36,48] |
| From week 3 | 5 [16,23,37,41,58] |
| From week 4 | 2 [42,52] |
| From week 9 | 1 [50] |
| N/A | 22 [17,20,22,24,26,29,31–35,38,39,43–47,49,53,60,63] |
| **PALMAR APPROACH** |  |
| **Mobilisation of the PIP joint allowed in extension** |  |
| From week 1 | 9 [17,18,25,26,40,48,55,56,62] |
| From week 2 | 1 [54] |
| From week 3 | 3 [38,41,53] |
| From week 4 |  |
| N/A | 6 [28,30,33,34,36,45] |
| **Active extension of the PIP joint allowed** |  |
| From week 1 | 9 [17,18,25,26,40,48,55,56,62] |
| From week 2 | 1 [54] |
| From week 3 | 2 [38,41] |
| N/A | 7 [28,30,33,34,36,45,53] |
| **Passive extension of the PIP joint allowed** |  |
| From week 1 | 2 [25,48] |
| From week 3 | 1 [41] |
| N/A | 16 [17,18,26,28,30,33,34,36,38,40,45,53–56,62] |

N/A : not available

|  |  |
| --- | --- |
| **LATERAL APPROACH** |  |
| **Mobilisation of the PIP joint allowed in extension** |  |
| From week 1 | 1 [61] |
| From week 5 | 1 [51] |
| N/A | 1 [36] |
| **Active extension of the PIP joint allowed** |  |
| From week 1 | 1 [61] |
| N/A | 2 [36,51] |
| **Passive extension of the PIP joint allowed** |  |
| N/A | 3 [36,51,61] |
| **UNKNOWN SURGICAL APPROACH** |  |
| **Mobilisation of the PIP joint allowed in extension** |  |
| From week 1 | 1 [59] |
| N/A | 1 [57] |
| **Active extension of the PIP joint allowed** |  |
| N/A | 2 [57,59] |
| **Passive extension of the PIP joint allowed** |  |
| N/A | 2 [57,59] |

N/A : not available