Fingerprints

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HAND THERAPY NEW ZEALAND
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Editors' Note

Kia ora Colleagues,

This is the first edition for 2026. Thanks to Victoria King for kindly sharing their Hand and Upper Limb Treatment (HAULT) assignment with us. We really appreciate your contributions and dedication to the profession!

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Nico

How does splinting position affect range of motion and function in proximal interphalangeal joint volar plate injuries?

Introduction

Volar plate injuries arise when an external axial force pushes the fingertip backwards, producing hyperextension at the proximal interphalangeal joint (PIPJ) (McDevitt et al., 2021). These injuries are common in both children and adults, particularly when playing sports (Choi et al., 2024; Miller & Friedrich, 2020). Severity can range from low grade sprains to complex fracture-dislocations (Gianakos et al., 2020).

The PIPJ is a synovial hinge joint, stabilised by an anatomical “box” consisting of a volar plate, collateral ligaments, articular capsule and extensor apparatus (Liodaki et al., 2015). The PIPJ has a range of motion (ROM) from 0 to 110 degrees (McDevitt et al., 2021), contributing to 85% of digital movement during grasping, making it crucial for everyday function (Leibovic & Bowers, 1994). The thick fibrocartilaginous volar plate and check rein ligaments support the PIPJ capsule, primarily resisting hyperextension and contributes to lateral and torsional joint stability (Williams et al., 1998). The integration of the volar plate with the accessory collateral ligaments and A3 pulley provides a supportive surface that facilitates smooth flexor tendon gliding (Watanabe et al., 1994). Given the intricate anatomy and biomechanics, the PIPJ is susceptible to stiffness, pain, and dysfunction following a volar plate injury, leading to long-term complications of fixed flexion deformities (FFDs), premature arthritis and persisting joint instability if poorly managed (Eaton & Malerich, 1980).

Early recognition and a comprehensive clinical assessment are essential for accurate diagnosis to help guide treatment decisions for volar plate injuries (Bindra & Woodside, 2015). Conservative treatment for stable injuries using splinting, combined with early ROM exercises is the widely accepted treatment to achieve PIPJ stability and to minimise effects of immobilisation (Bindra & Foster, 2009). Historically, this involved splinting the finger in slight flexion to ensure joint stability while protecting the healing tissues, however, multiple studies have also reported positive outcomes with neutral positioning of the PIPJ (Walsh et al., 2023).

Despite positive outcomes supporting conservative treatment using splinting across multiple studies, guidelines for optimal splinting position for volar plate injuries remain inconclusive (Chalmer et al., 2013). The aim of this literature review is to systematically evaluate the current research to determine how splinting position affects range of motion and function in PIPJ volar plate injuries.

Methods

A search was performed on the 28th of July 2025 through the following electronic databases: EBSCO Health Databases (which included MEDLINE, CINAHL Complete and SPORTDiscus), Google Scholar, Scopus and PubMed. These databases were selected for their relevance and frequent use within hand therapy literature (Rose et al., 2011; Takata et al., 2019), and jointly provide comprehensive coverage by combining principal and supplementary search systems with support for Boolean operators to refine the search (Gusenbauer & Haddaway, 2020). Keywords with Boolean and truncation techniques describing the condition, intervention, intervention position and outcome measures related to the research question, alongside the inclusion and exclusion criteria are outlined in Table 1.

The search strategy was completed independently by one author and is summarised in Figure 1. Duplicate records were removed using EndNote's automation tool, then manually by the author. Inclusion and exclusion criteria were used to screen the titles and abstracts, and those requiring further full-text evaluation were identified. Reference lists of studies identified in the search and related systematic reviews were also screened for further eligible studies. The remaining full-text articles were retrieved and individually assessed for eligibility. Notably, no restrictions were placed on age or injury to provide broad coverage of participant characteristics. Included studies also needed to compare two splinting positions to address the primary research question, while focussing on conservative management and acute presentations only, to enhance the clinical applicability of the findings.

Randomised controlled trials (RCTs) are considered the gold standard to determine comparative effectiveness of clinical interventions, however, RCTs are scarce in hand therapy literature compared to observational studies (MacDermid, 2004). Alternatively, cohort studies are prevalent within healthcare literature and can provide greater generalisability to real-world outcomes (Bröckelmann et al., 2022). Studies have shown small effect size differences between cohort studies and RCTs, thereby supporting the inclusion of both designs for this review to provide complementary coverage (Toews et al., 2024).

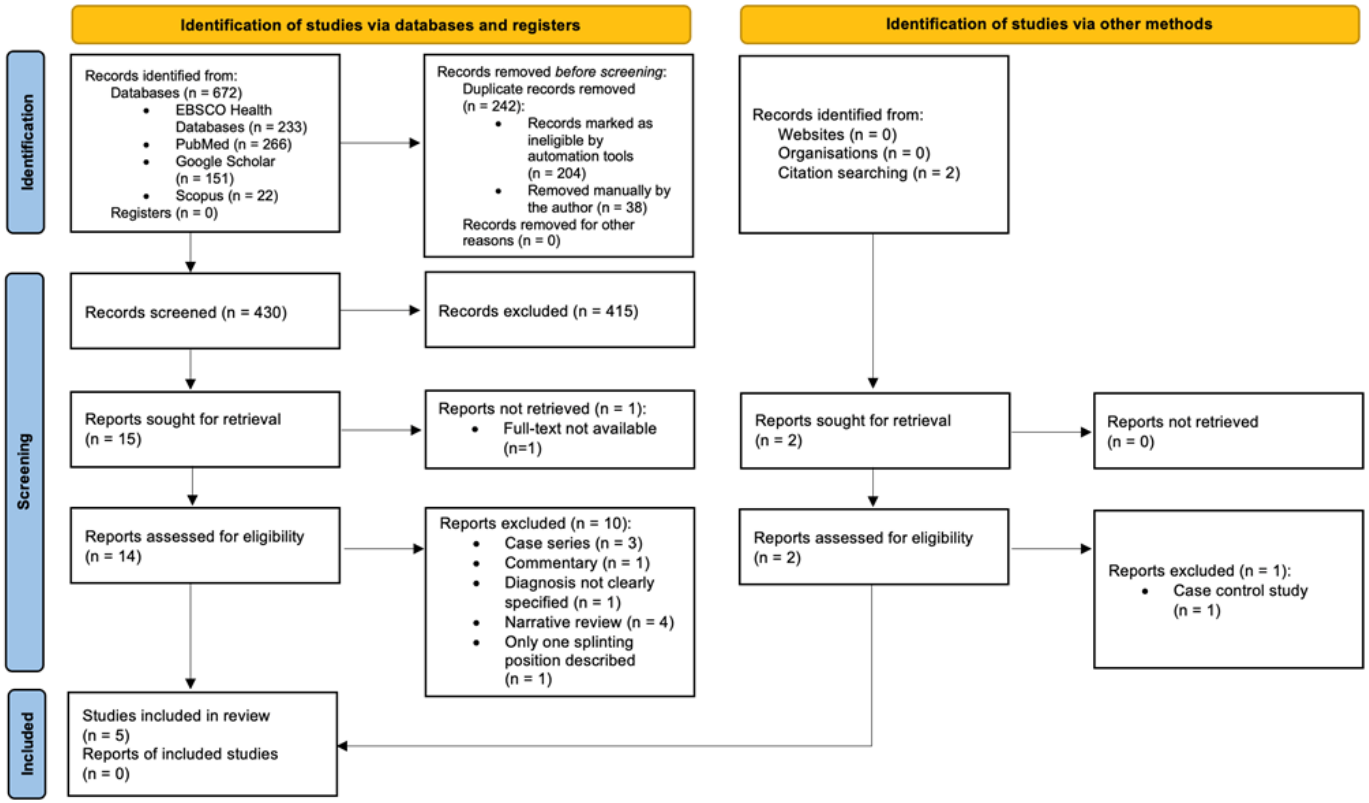
To determine study quality, the author critically appraised cohort studies by applying the Newcastle-Ottawa Scale (NOS) and the Physiotherapy Evidence Database (PEDro) scale for RCTs. Assessing the reliability and validity of evidence is important, as low-quality studies may be biased and unreliable, limiting their applicability to clinical settings and reducing precision of outcomes (Maher et al., 2003). The NOS is a popular and efficient assessment tool for evaluating the quality of cohort studies (Ma et al., 2020). The system uses a star-rated 9-point scale divided into three domains: selection, comparability and outcome/exposure (Hartling et al., 2013). To provide quantitative comparison to the studies in this review, the scores of the NOS were translated to the Agency for Health and Research Quality (AHRQ) standards of “good”, “fair” and “poor” quality (European Review for Medical and Pharmacological Sciences, n.d.).

RCTs were appraised using the PEDro scale, which has demonstrated “good” reliability with physiotherapy RCTs in systematic reviews (Maher et al., 2003). This 11-item scale, with a 10-point maximal score, was derived from a Delphi list and created by a panel of experts to rate the quality of RCTs (Cashin & McAuley, 2020; Maher et al., 2003). Authors suggest rating scores of 0-3 as “poor”, 4-5 as “fair”, 6-8 as “good” and 9-10 as “excellent” (Cashin & McAuley, 2020). This rating system was applied to this review. The Oxford Centre for Evidence-Based Medicine (OCEBM) Levels of Evidence was also applied to determine the hierarchy of evidence (Howick et al., 2011). A comparison of the outcomes for the quality assessment and evidence appraisal tools, and NOS thresholds for this review are outlined in Table 2.

It is acknowledged that these scores and outcomes are not a complete measure of study validity or quality, and were used in this review primarily to compare the quality of the two study design types. To supplement these quantitative scales, the Critical Appraisal Skills Programme (CASP) tool (CASP, 2024), widely used to evaluate methodological quality, was also applied to provide a more in-depth critique (Long et al., 2020).

Figure 1

PRISMA 2020 flowchart of study selection



Note. Adapted from "The PRISMA 2020 statement: An updated guideline for reporting systematic reviews", by Page et al., 2021, *British Medical Journal*. 372 (http://dx.doi.org/10.1136/bmj.n71). CC-BY 4.0.

Table 1

Search Terms and Eligibility Criteria

Keywords with Boolean operators	Inclusion criteria	Exclusion criteria
(“volar plate injur*” OR “finger hyperextension injur*” OR “proximal interphalangeal joint hyperextension” OR “proximal interphalangeal joint injur*” OR “PIPJ hyperextension” OR “PIPJ injur*”) AND (“splint” OR “orthoses” OR “management” OR “dorsal block*” OR “buddy”) AND (“neutral” OR “extension” OR “angle” OR “position”) AND (“active motion” OR “range of motion” OR “movement” OR “function”)	Participants sustaining an acute volar plate injury Compared two splinting positions in the intervention[+] Outcome measures include active range of motion and/or functional outcomes Randomised controlled trials or retrospective/prospective cohort studies	Articles not written in English Unable to access full text Participants undergoing surgical treatment for the same injury Case reports, case series, reviewed, qualitative studies, editorials

Note. * Indicates truncation used to capture multiple word endings, [+] indicates studies with an unclear splinting position were included but analysed separately for eligibility.

Table 2

Summary of NOS, PEDro and OCEBM Levels of Evidence Scale Scores

Author	*Study design*	*Criteria*											*PEDro score (outcome)*	*NOS score (outcome)*	*OCEBM levels of evidence*
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*			
Grange et al. (2024)	*RCT*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*	*7/10 (good)*	*-*	*2*
Paschos et al. (2014)	*RCT*	*Yes*	*Yes*	*No*	*Yes*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*7/10 (good)*	*-*	*2*
Thomsen et al. (1995)	*RCT*	*Yes*	*Yes*	*No*	*No*	*No*	*No*	*No*	*Yes*	*No*	*Yes*	*Yes*	*4/10 (fair)*	*-*	*2*
Papatolicas et al. (2025)	*Retrospective cohort*	*Yes*	*Yes*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*No*	*-*	*-*	*-*	*7/9 (good)*	*3*
Stanley et al. (2019)	*Retrospective cohort*	*Yes*	*Yes*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*No*	*-*	*-*	*-*	*7/9 (good)*	*3*

Note. Yes = criterion met, No = criterion not met, - = not applicable. Each number under criteria (1-11) corresponds to an individual appraisal criteria. For NOS, only 9 criterion were assessed. The final two cells (criterion 10-11) are marked to reflect this. Total score is calculated based on number of criterion met. Criterion 1 is excluded in the final score for the PEDro.

PEDro criteria: 1 = eligibility criteria specified, 2 = random allocation, 3 = concealed allocation, 4 = groups similar at baseline, 5 = subjects blinded, 6 = therapists blinded, 7 = assessors blinded, 8 = dropouts less than 15%, 9 = Intention to treat analysis, 10 = statistical comparisons reported, 11 = point measures of variability recorded.

NOS criteria: 1 = Representativeness of intervention group, 2 = selection of the control group, 3 = ascertainment of exposure, 4 = demonstrations outcome of interest not present at the start of the study, 5 = comparability for a single factor, 6 = comparability for an additional factor, 7 = assessment of outcome, 8 = adequate follow-up time for outcome to develop, 9 = adequate follow-up of cohort. Selection domain (1-4), comparability domain (5-6), outcome/exposure domain (7-9).

Converting NOS outcomes to AHRQ standards: good = 3 or 4 criterion met in selection and 1 or 2 criterion met in comparability and 2 or 3 criterion met in outcome/exposure, fair = 2 criterion met in selection and 1 or 2 criterion met in comparability and 2 or 3 criterion met in outcome/exposure, poor = 0 or 1 criterion met in selection and 0 criterion met in comparability and 0 or 1 met in outcome exposure.

Results

The five included studies consisted of three RCTs (Grange et al., 2024, Paschos et al., 2014; Thomsen et al., 1995) and two retrospective cohort studies (Papatolicas et al., 2025; Stanley et al., 2019). Implementing the OCEBM levels of evidence to the included studies, three RCTs were classified as Level 2 Evidence (Grange et al., 2024; Paschos et al., 2014; Thomsen et al., 1995), and two were classified as Level 3 Evidence due to the cohort study design (Papatolicas et al., 2025; Stanley et al., 2019).

On the PEDro scale, RCTs achieved 4/10 (Thomsen et al., 1995) and 7/10 (Grange et al., 2024; Paschos et al., 2014), producing a mean score of 6/10 and corresponding to “good” quality overall. Common limitations included lack of allocation concealment and incomplete blinding, which increases risk of bias and reduces internal validity. Thomsen et al. (1995) had poor baseline comparability and no intention-to-treat analysis, contributing to the ‘fair’ quality rating. Small sample sizes in Grange et al. (2024) and Thomsen et al. (1995) may impact statistical power and generalisability. Both retrospective cohort studies (Papatolicas et al., 2025; Stanley et al., 2019) achieved similar results within each domain on the NOS, scoring a final rating of 7/9 stars corresponding to “good” quality. This included 4/4 stars for the selection domain, 1/2 stars for the comparability domain and 2/3 stars for the outcome domain. Supplementary appraisal implementing CASP checklists identified common limitations, including the inability to control confounding factors and risks of attrition bias (CASP, 2024). Two studies reported a combined 15 participants lost to follow-up (Grange et al., 2024; Paschos et al., 2014), while the remaining studies did not specify (Papatolicas et al., 2025; Stanley et al., 2019; Thomsen et al., 1995).

Data extraction was performed by the one author, with key study characteristics, treatment, results and follow-up periods summarised in Table 3. Sample sizes ranged from 39 (Thomsen et al., 1995) to 125 participants (Stanley et al., 2019). The male-to-female ratio for all participants was approximately 1.3:1. Age ranges varied across every study, with two studies including children (Grange et al., 2024; Paschos et al., 2014). The mean age of all participants in this review was 29 years old. The Eaton classification system to determine volar plate injury severity was used by four studies (Grange et al., 2024; Paschos et al., 2014; Stanley et al., 2019; Thomsen et al., 1995). These all included acute Type I injuries, while the inclusion of other Eaton injury types varied. Stanley et al. (2019) was the only study to include all Eaton classification types. Conversely, Papatolicas et al. (2025) did not specifically use the Eaton classification system as a diagnostic tool. Outcomes related to the use of the Eaton classification system in this review are outlined in Table 4

The overview of splint types, protocols, adjunct therapies and adverse effects are summarised in Table 5. Splint types varied across studies, the most common splint being a thermoplastic dorsal blocking splint, followed by buddy taping. All studies evaluated at least two different splinting positions as their main intervention. The most common initial PIPJ splinting positions were 30 degrees of flexion (Grange et al., 2024; Papatolicas et al., 2025; Stanley et al., 2019) and 15 degrees of flexion (Grange et al., 2024; Paschos et al., 2014; Thomsen et al., 1995). A neutral (0 to 10 degrees) position was applied in two studies using dorsal blocking splints (Papatolicas et al., 2025; Stanley et al., 2019). Two other studies (Paschos et al., 2014; Thomsen et al., 1995) used buddy taping and an elastic double finger bandage (DFB), however, the PIPJ angles were not specifically stated.

Splinting duration was documented differently across studies making comparisons difficult. Grange et al. (2024) and Stanley et al. (2019) prescribed full time splinting in both groups for up to 4 weeks, whereas Thomsen et al. (1995) and Papatolicas et al. (2025) splinted full time between 2-6 weeks depending on patient presentation. Notably, Paschos et al. (2014) did not clearly document a splint weaning process or splint discontinuation.

All studies included active range of motion (AROM) in addition to splinting, however, completing exercises while splinted varied across studies. Three studies (Grange et al., 2024; Papatolicas et al., 2025; Stanley et al., 2019) allowed immediate active motion regardless of splint type or group, whereas Paschos et al. (2014) immobilised both groups for 1 week before starting ROM exercises. Thomsen et al. (1995) also immobilised for 2 weeks but allowed 25 to 30 degrees of PIPJ flexion only in the intervention group using the DFB. Grange et al. (2024) was the only study to describe an exercise protocol, while the remaining studies did not provide a specific programme (Papatolicas et al., 2025; Paschos et al., 2014; Stanley et al., 2019; Thomsen et al., 1995).

All studies observed ROM as an outcome and demonstrated similar improvements in both groups despite variations in ROM assessment measures. From baseline to follow-up, both groups in the study by Grange et al. (2024) found significant improvements with time on PIPJ flexion ($p < 0.001$, $p = 0.01$), but no between-group differences. Paschos et al. (2014) reported that a greater proportion of the intervention group regained full digital motion at week 1 (65% vs. 34%, $p = 0.001$) and week 2 (89% vs. 68%, $p = 0.01$), but no significant between-group differences after 3 weeks. Likewise, Thomsen et al. (1995), Papatolicas et al. (2025), and Stanley et al. (2019) found no significant differences in active finger flexion at discharge between groups ($p = 0.15$, $p = 0.06$, $p = 0.64$ respectively).

Function was reported descriptively in one study (Thomsen et al., 1995) and objectively measured in two studies (Grange et al., 2024; Paschos et al., 2014). Paschos et al. (2014) found that participants wearing buddy taping returned to daily activity and sports significantly earlier than those who were immobilised (2.1 weeks vs. 2.9 weeks, $p < 0.01$) using the Disabilities of the Arm, Shoulder, and Hand score (DASH). Grange et al. (2024) applied the QuickDASH, finding no statistically significant between-group difference, and over time both groups demonstrated significant functional improvements ($p < 0.001$). Thomsen et al. (1995) supports these findings, reporting that all participants returned to work within 2 to 3 weeks. Despite the positive functional results, heterogeneity of the outcome measures makes it difficult for direct comparison.

Grange et al. (2024) reported moderate effect sizes for PIPJ flexion (control $d = 0.64$, intervention $d = 0.58$) and the QuickDASH (control $d = 0.79$, intervention $d = 0.77$), suggesting a moderate clinical benefit. As no other studies reported effect sizes, interpretation of clinical significance across studies is limited, which may affect the precision and reliability of reported outcomes. Short-term improvements in ROM and function were reported across studies, with only Grange et al. (2024) reporting a longer follow-up period of 12 months, compared to all other studies which had follow-up of less than 6 months.

Fixed flexion deformities were reported in varying degrees (5, 10, and 15 degrees of flexion) across three studies (Papatolicas et al., 2025; Stanley et al., 2019; Thomsen et al., 1995), equating to 34 cases in total. Additionally, Paschos et al. (2014) reported three poor outcomes (two adults, one child) involving limited motion, oedema and severe pain, however, no specific details were provided. Grange et al. (2024) reported no adverse outcomes.

Table 3

Key Characteristics, Treatment and Results of Included Studies

Study	Design and number of participants (loss to follow-up)	Participant characteristics	Treatment for control and intervention groups	Outcome measures	Results
Grange et al. (2024	RCT n = 42 (5 loss to follow-up)	Age (mean): 27 (range 13-65) Male: Female: 18:24 Acute, seen within 2 weeks of injury	Control (n = 20): Dorsal block splint with PIPJ in 30° flexion, splint adjusted by 10° PIPJ extension each week until neutral achieved Intervention (n = 22): Custom thermoplastic figure-of-eight splint with PIPJ in 15-20° flexion Total splinting time: 4 weeks Adjunct therapy for both groups: AROM/PROM finger exercises with splint on, coban as indicated	AROM (flexion/extension) Oedema (circumferential) Pain (VAS) Function (quick-DASH) Follow-up: Baseline, 4 weeks, 7 weeks, 12 weeks after injury	AROM: Significant improvements with time in both groups from baseline to follow-up (control: intervention): PIPJ flexion ($p < 0.001$, $p = 0.01$), DIPJ flexion ($p < 0.001$, $p < 0.001$). No between-group differences for DIPJ flexion, PIPJ flexion Function (control: intervention): Improvements in Quick DASH in both groups ($p < 0.001$, $p < 0.001$), no between-group differences Effect size: PIPJ flexion (control d = 0.64, intervention d = 0.58), QuickDASH (control d = 0.79, intervention d = 0.77)
Paschos et al. (2014)	RCT n = 121 (10 lost to follow-up)	Age (mean): Overall: 23 (range 2-51); Children: 9 (range 3-16y); Adults: 38 (range 16-51y) Children: Adults: 75:46 Male: Female: 70:41 Acute, seen within 1 week of injury	Control (n = 56): Dorsal aluminium splint with PIPJ in 15° flexion immobilised for 1 week Intervention (n = 55): Buddy taping for 1 week Splinting time: Not specified Adjunct therapy for both groups: Unprotected mobilisation introduced after 1 week	AROM (total) Oedema Grip and pinch strength Pain (VAS) Function/return to daily activity (DASH) Follow-up: Every week for the first month, 3, 6 and 12 months after injury	AROM: Significant increase in full motion in the intervention group compared to control group at week 1 (65% vs. 34%, $p = 0.001$), and week 2 (89% vs. 68%, $p = 0.01$) No significant difference between-groups after 3 weeks Function: No between-group difference in grip and pinch strength after 2 weeks ($p > 0.05$), significantly earlier return to daily and sport activity in intervention group (2.1 weeks vs 2.9 weeks, $P < 0.01$) Poor outcomes: No Type I, 3 Type II ($p = 0.01$) Excellent outcomes: achieved in 89% children, 72% adults ($p<0.05$), no difference in treatment approaches in children.
Thomsen et al. (1995)	RCT	Age (mean): 37 (range 18-79)	Control (n = not specified): Dorsal aluminium splint with PIPJ in 15°flexion	Outcome measures not specified or described	AROM: Improved movement in intervention group but not statistically significant ($p = 0.15$)

	n = 39 (loss to follow-up not specified)	Male: Female: 19:20 Acute	Intervention (n = not specified): Elastic double finger bandage, PIPJ able to be flexed 25-30° Total splinting time: 2 weeks Adjunct therapy: AROM and normal finger use encouraged after removal of splint, buddy taping for sports for the next 4 weeks	Follow-up: Initial, 2 weeks and 6 months after injury	Function: All participants returned to their normal jobs within 2-3 weeks following injury
Papatolicas et al. (2025)	Retrospective cohort n = 111 (loss to follow-up not specified)	Age: (mean) 26 (no range given) Male: Female: 59:52 Acute, seen within 3 weeks of injury	Control (n= 39): Dorsal blocking splint with PIPJ in 25-30° flexion, seen weekly until neutral achieved Intervention (n=72): Dorsal blocking splint with PIPJ in neutral (0-10°) Total splinting time: >2 weeks Adjunct therapy: Early AROM and PROM flexion exercises, cohesive elastic bandage as needed, verbal and written education, ongoing input until functional ROM achieved	Presence of FFDs (>15° PIPJ flexion) Amount of hand therapy received (total occasions) Total ROM flexion Follow-up: Initial and last appointment before discharge only	AROM: Larger proportion achieving full flexion in intervention compared to control group but not statistically significant (77% vs. 64%, p = 0.06) Function: Not assessed
Stanley et al. (2019)	Retrospective cohort n = 125 (loss to follow-up not specified)	Age (mean): 30 (no range given) Male: Female: 77:48 Acute, seen within 2 weeks of injury	Control group (n= 105): Dorsal blocking splint with PIPJ in 30° flexion Intervention (n= 20): Dorsal blocking splint with PIPJ in neutral position of 0° Total splinting time: 4 weeks Adjunct therapy: AROM exercises in the splint, compression bandage and wound dressings as needed, written and verbal education	AROM with hyperextensibility Number and duration of hand therapy appointments Pain (NPRS) Follow-up: Initial and last appointment before discharge only	AROM: No difference in active flexion between groups (p = 0.64), small significant improvement in active extension (p = 0.02) Control: Flexion: 86.9 (SD +/- 1.79), extension: 5.90 (SD +/- 0.91) Intervention: Flexion: 88.89 (SD +/- 2.51), extension: 1.58 (SD +/- 0.94) Function: Not assessed

Note. AROM = active range of motion, PROM = passive range of motion, PIPJ = proximal interphalangeal joint, DIPJ = distal interphalangeal joint, VAS = Visual Analogue Scale, NPRS = Numeric Pain Rating Scale.

Table 4

Eaton Classification of Volar Plate Injuries Used in the Studies for the Review

Eaton classification	Description	Grange et al. (2024)	Paschos et al. (2014)	Thomsen et al. (1995)	Papatolicas et al. (2025)	Stanley et al. (2019)
Type I	Avulsion of volar plate without a fracture dislocation	Yes	Yes	Yes	Not specified	Yes
Type II	Dorsal dislocation of PIPJ with avulsion of the volar plate, complete tear of the collateral ligament	No	Yes	No	Not specified	Yes
Type IIIa	Fracture dislocation with <40% articular surface with dorsal aspect of the collateral ligament remaining attached to the middle phalanx	Yes	No	No	Not specified	Yes
Type IIIb	Fracture dislocation with >40% articular surface without the collateral ligament remaining attached to the middle phalanx	No	No	No	Not specified	

Note. Yes = included in the study, No = not included in the study, Not specified = not stated in the study.

Adapted from "Management of paediatric volar plate avulsion fractures of the proximal interphalangeal joint: A systematic review" by Choi, H., Moon, S. H., Lee, H., Barnes, S. P., Ma, Y., Jester, A., & Al-Ani, S., 2024, *HAND*, *20*(5), 664-674. Copyright 2024 by The Author(s).

Table 5

Summary of Splinting, Treatment and Adverse Effects of Included Studies

Author	Splinting position and type	Splinting protocol	Total splinting time	Adjunct therapy	Adverse effects
Grange et al. (2024)	Control group: PIPJ 30° flexion Dorsal blocking splint Intervention group: PIPJ 15-20° flexion Figure-of-eight splint	0-4: Splint worn full time 4/5: Splint for high risk only, buddy taped if clinically indicated 7: Discontinue splint, buddy taping for high risk only	4 weeks Splint adjusted by 10° PIPJ extension each week until neutral achieved	Immediate active ROM exercises with splint on: 10x hooks, 10x fists with extension into hood of splint every 2 hours Passive ROM after 2 weeks Coban as indicated	No adverse effects reported
Paschos et al. (2014)	Control group: PIPJ 15° flexion Dorsal aluminium splint Intervention group: Not reported Buddy taping to neighbouring non-injured finger	0-1: Immobilised in splint >1: Unprotected mobilisation introduced	Not clearly reported	Unprotected mobilisation after one week	3 poor outcomes: 2 adults, 1 child. Related to limited motion, persistent oedema and severe pain Group not specified
Thomsen et al. (1995)	Control group: PIPJ 15° extension Dorsal aluminium splint Intervention group: Not reported, 25-30° movement from DFB	0-2: Immobilised in splint >2-6: Splint removed, normal use of finger encouraged. Buddy taping for sports	2 weeks	Active ROM and normal finger use after removal of splint at 2 weeks with buddy taping for sports for the next 4 weeks	6 patients had 5° hyperextension but stable joint 1 patient had 5° lack of extension Group not specified
Papatolicas et al. (2025)	Control group: PIPJ 25-30° flexion Dorsal blocking splint Intervention group: PIPJ in neutral (0-10° flexion) Dorsal blocking splint	0-2: Splint worn full time >2-6: Splint worn based on time and treatment since initial injury, severity, presence of an avulsion fracture, degree of volar plate laxity	> 2 weeks	Immediate active and passive ROM flexion exercises Cohesive bandage as needed Verbal and written education Ongoing input until functional ROM achieved	FFDs 18% (n=7) in control group, 10% (n = 7) in intervention group (p = 0.24)
Stanley et al. (2019)	Control group: PIPJ in 30° flexion Dorsal blocking splint Intervention group: PIPJ in neutral Dorsal blocking splint	0-4: Wearing splint full time	4 weeks	Immediate active ROM exercises within the splint Compression bandage and wound dressings as needed Written and verbal education	FFDs 17% (n = 18) in control group, 5% (n = 1) in intervention group

Discussion

This review found that conservative management for acute volar plate injuries involving splinting between 0 and 30 degrees of flexion improved function and ROM, however, high-level evidence remains limited, with only five studies meeting inclusion criteria. In the same way, a systematic review by Chalmer et al. (2013) identified a lack of high-quality studies comparing different treatment options for this population, with methodological flaws within the available evidence. Freiberg (2007) suggested that the small number of studies may be attributed to different types of injury classifications, diversity of injury patterns and choices of outcome measures which would require a large number of cases to achieve statistical significance. These factors, as well as varied patient characteristics further complicate interpretation of outcomes.

Participants and injury type

Paschos et al. (2014) reported excellent outcomes in 89% of child regardless of treatment, which was significant compared to adults in the same study. This outcome is comparable to the paediatric systematic review by Choi et al. (2024), reporting positive outcomes in 99.5% of stable PIPJ Type I and II avulsion fractures managed conservatively regardless of splint type and positioning. This suggests that management for children is less likely to be influenced by splint type or positioning compared to adults.

Differences in injury severity across studies further contribute to clinical heterogeneity which complicates comparability of outcomes. Eaton Type I injuries were consistently included across all studies, whereas inclusion of other types varied. Only Paschos et al. (2014) reported findings between types, resulting in excellent outcomes for all Type I injuries, but three Type II injuries had poor outcomes despite receiving the same treatment. Similarly, Lee et al. (2020) explored factors associated with failed conservative management for volar plate injuries, and found a greater prevalence of joint dislocations, and fracture fragment rotation and displacement in the failure group compared to controls. In contrast, Gaine et al. (1998) showed that outcomes for participants with stable injuries were not affected by fracture fragment displacement or size, achieving positive results using early active mobilisation without splinting. These findings suggest that mild acute presentations generally achieve good outcomes with most forms of conservative management, whereas unstable injuries, dislocations, and fractures with displacement or rotation may lead to poorer results. This review emphasises the importance of comprehensive clinical assessment,

supported by appropriate radiograph views, to ensure accurate injury classification and early identification of patients at risk of suboptimal outcomes.

Outcome measures

The purpose of the review was to determine how splinting position affects outcomes relating to movement and function for volar plate injuries. The variety of splint types, designs and protocols made it difficult to comment on whether splinting position alone influenced results. The findings did not confirm an optimal splinting position or protocol, as there were no between group-differences in regaining finger ROM or function, suggesting that splinting at any position between 0 to 30 degrees of PIPJ flexion may be suitable. Splinting protocols varied in duration and rarely reported adherence, with only Grange et al. (2024) documenting full adherence, further limiting comparability. Similar limitations were also identified by Frieberg (2007), Joyce et al. (2014) and Chalmer et al., (2013) who indicated the need for further studies to evaluate individual splinting variables to guide treatment recommendations.

Dorsal blocking splints and buddy taping were the most widely used, with limitations for buddy taping having a lack of specific PIPJ position documentation initially and during the splint weaning process. Freiberg (2007) suggested that buddy taping may be favoured for its simplicity with reduced bulk, allowing for functional use and enables immediate ROM. Walsh et al. (2023) noted that buddy taping may still result in FFDs due to the finger's natural resting position, which often does not maintain neutral alignment. Consequently, Lee and Jung (2014) found the resting PIPJ flexion angle ranges from 0 to 50 degrees depending on wrist and forearm positioning. For this reason, future studies assessing PIPJ positioning should utilise methods that provide reliable and consistent splinting positions, such as dorsal blocking splints. Clinically, both splint types appear to be a suitable option for management, although it is important to monitor for FFDs especially when using buddy taping. Group-specific adverse events were not described in any study, therefore, it is uncertain whether splinting position or delayed ROM with splint immobilisation were the primary cause of unfavourable outcomes.

ROM exercises were provided as an adjunct therapy in all study treatment protocols. Grange et al. (2024) was the only study to document the exercise programme used, while all others simply encouraged early active or passive ROM. Previous studies support immediate

protected mobilisation of stable volar plate injuries over immobilisation (Gaine et al., 1998; Incavo et al., 1989). Conversely, prolonged immobilisation negatively affects joint hydrodynamics and subsequently leads to stiffness (Chinchalkar & Gan, 2003). A recent cadaver study found that at 30 to 40 degrees of PIPJ mid-flexion, ligaments relax and shorten, and fully open the capsular space (Punsola-Izard et al., 2025). As recommended by Punsola-Izard et al. (2025), if immobilisation is required, the PIPJ should be placed in extension to prevent contracture risk. As supported by the aforementioned literature, positioning the finger in neutral splints that leave the DIPJ and PIPJ free, combined with targeted exercise programmes may facilitate early functional ROM and reduce FFDs.

Although functional outcomes in the review were generally positive, the findings are not comparable due to inconsistent and subjective outcome measures, as well as variations in splinting protocol and timing of ROM exercises, which may explain the mixed functional results. Short-term effects in ROM and function were observed across studies, however, the long-term effects are unknown due to the limited follow-up periods.

Limitations

Methodological quality of the evidence included in this review were “fair” or “good” on the PEDro scale and NOS. The CASP checklist identified specific limitations, including lack of blinding, inadequate allocation concealment, and inability to control confounding factors (CASP, 2024). These issues affect internal validity and may contribute to potential bias. Furthermore, effect sizes were reported only in Grange et al. (2024), limiting the precision of outcomes and ability to determine clinical significance of the interventions. Sample sizes of studies were considered small to moderate, and variations in injury classifications and participant age ranges across the studies further contributed to heterogeneity, which, coupled with limited statistical power of individual studies, may affect generalisability of the results. Lastly, large variations in treatment protocols and inconsistent use of outcome measures limited the ability to perform direct comparisons between studies.

Future research

To improve understanding of how splinting position affects ROM and function, future research should directly compare splinting positions using standardised objective outcome measures, stratify by severity and age, report adherence to splinting and exercise protocols,

include long-term follow-up, and expand on adverse effects. Additionally, incorporating RCTs and larger sample sizes will improve the overall quality and reliability of evidence in this field.

Conclusion

Volar plate injury management requires balancing joint protection with early mobilisation to minimise scarring and restore PIPJ biomechanics. Conservative management involves splinting, education and exercises. Good quality evidence in this review suggests that splinting in any position between 0 to 30 degrees flexion is suitable for managing Type I injuries across age groups, and achieves successful ROM and functional outcomes. Children appear to consistently achieve positive outcomes regardless of splinting position and type, while adults and those with unstable or complex injuries may show greater variability. Early mobilisation may be more impactful than splinting angle and therefore should continue to be prioritised in treatment plans to prevent FFDs. The lack of high-quality studies, heterogeneity of participants and variations in splinting protocols highlight the need for more rigorous, standardised research. Future studies should provide large RCTs that compare splinting positions using standardised outcome measures, stratify by age and injury severity, report adherence and adverse effects, and include long-term follow-up.

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Educational opportunities

Below are a series of resources for educational purposes that the HTNZ Education committee and us have identified in the last period. You can also keep an eye out for updates on the HTNZ blog page.

Online Journals

Hand Therapy New Zealand offers access to several fantastic journals. If you haven't already done so, head over the Journal page and try accessing any of the resources available (e.g. Journal of Hand Therapy). If you do not have a log in, contact admin@handtherapy.org.nz to receive a unique login code. The benefit of having access to these journals is that if you find an article on HandyEvidence that you like or you just want to search for information in the journals, you can often access the full text.

Hand Coach

This series of courses are run by Alison Coyle. They are great to expand your skills or meet the HTNZ registration requirements if you are an associate. Head over to their website to see what they offer - https://handcoach.co.nz

HandyEvidence

Nico's website reviews and assesses three clinically relevant scientific articles on Hand Therapy every week. In addition, it contains a database of over 830 previous synopses searchable by topic and level of evidence. It has been sponsored by HTNZ for 2025 for all New Zealand Hand Therapists.

Consent for clients' information and images

HAND THERAPY NEW ZEALAND
Ringaromi Aotearoa

Consent form – use of clinical case information and images

I, (*patient's name:* _____) consent to the use of information and images including photographs or videos from my hand therapy assessment and treatment to be used for (*mark agreement by clicking on box or print and tick*)

- ☐ Educating clinicians relevant to hand therapy
- ☐ Educating clinical students
- ☐ Service audit
- ☐ Publication in professional or scientific journal

I understand that the information and images will not have my name attached to them and will not obviously identify me in any way.

Patient Details:

Name: _____ Tel: _____

Email: _____

Signed: _____ Date: Click or tap to enter a date.

Clinician Details:

Name: _____ Tel: _____

Email: _____

Organisation: _____

Hand Therapy New Zealand membership ☐Full ☐Associate Membership No. _____

Signed: _____ Date: Click or tap to enter a date.

Consent form case study final 15/02/2021

You can download the original document on HTNZ webpage.