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Conservative treatment of mallet finger: A systematic review

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ABSTRACT

Purpose: To determine if there is a superior orthosis and wearing regimen for the conservative treatment of mallet finger injuries. The secondary purpose is to examine the current evidence to evaluate if a night orthosis is necessary following the initial immobilization phase.
Methods: A comprehensive literature search was conducted using the search terms mallet finger, splint, orthosis, and conservative treatment.
Results: Four randomized controlled trials (RCTs) were included in the systematic review. In all 4 RCTs mallet fingers were immobilized continuously for 6 weeks in acute injuries and 8 weeks for chronic injuries.
Conclusions: Two of the three studies found a large effect size for orthotic intervention ranging from 2.17 to 12.12. Increased edema and age and decreased patient adherence seem to negatively influence DIP extension gains. Recommended immobilization duration is between 6 to 8 weeks and with additional weeks of immobilization in cases of persistent lags.
Level of evidence: 1a

Introduction

Disruption of the terminal extensor tendon at its insertion on the distal phalanx is commonly referred to as mallet finger. A closed injury with or without a small bony avulsion fragment (<20%) of the articular surface is classified as a Doyle I injury.[1] The mechanism of injury is varied and can occur with high velocity and contact sports,[2,3] household activities,[4] and work related injuries to the hand.[5] This injury has long been discussed in the literature; beginning with Mason[6] in 1930 advocating immediate surgical intervention, followed by Pratt and Bunnell[7] describing both improved surgical and orthotic options, and later by Stack[8] with the introduction of the Stack orthosis which redefined conservative treatment. Despite the long history of investigating mallet finger injuries, the best treatment option remains unclear. Although somewhat controversial, there is some consensus in the literature that in the absence of a large articular surface disruption or subluxation, non-operative treatment is favorable.[9–11] However, there are fundamental differences in conservative management, more specifically, orthotic preferences, duration of full-time wear, and the need for supplemental night orthotic wear.

In a Cochrane Review,[12] three of the four included studies examined orthotic treatment for mallet fingers. The authors found insufficient evidence to determine superior effectiveness for different orthoses (custom or off-the-shelf) in the treatment of mallet fingers. This review was performed over 10 years ago and additional randomized controlled trials (RCTs) have been published since, therefore, another systematic review is deemed appropriate to assist in guiding current practice.

In a recent RCT with subjects who did not have a mallet injury, Chotigavanichaval et al[13] compared the "fit" of a custom-made aluminum orthosis to a conventional aluminum orthosis by examining the slippage and deviation of the 2 different orthoses. The study had findings favorable to the custom aluminum orthosis. This is interesting information, but the findings are limited in their relevance and clinical application because the interventions were performed on healthy subjects.

Smit et al[14] performed a recent review of the literature that examined various treatment options including both surgical and conservative management for mallet finger injuries. The authors concluded that uncomplicated mallet injuries are best treated with

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orthotic management. The Smit et al[14] review differed from our current review in that Smit et al[14] examined surgical indications and interventions and also included studies that were not RCTs.

The number of prospective randomized studies that compare orthotic management for mallet fingers and that have been previously analyzed in reviews is meager.[15–17] The findings of these studies are similar in that the authors found equivocal results for extensor lag between groups regardless of orthosis type.[15–17] One review of the literature found that orthotic preference is undetermined and wear schedule has significant disparity.[18] The variability in continuance of wear spans from five[19,20] to twelve weeks[21] with the most common duration being a minimum of six weeks.[15–17,22] The evidence on supplemental night orthotic wear following full time orthotic wear remains vague and inconclusive. There are many studies which propose night orthotic wear.[15–17,22] while one does not.[23] Evidence and information on an orthotic wearing regimen for the immobilization phase of conservative treatment of mallet fingers and the necessity of additional night wear are important to both physicians and hand therapists in order to identify best practice patterns and offer the optimal treatment plans to their patients.

An updated review that examines conservative treatment is needed since the current studies are inconclusive and insufficient for determining effectiveness of different orthoses and an optimal timeframe for orthotic wear. Likewise, the current evidence is ambiguous for establishing subject satisfaction, preference, adherence, and measurement of failure, meaning those subjects that did not respond to orthotic treatment or developed complications due to the orthosis and required a change or modification. The appropriate management of mallet finger injuries can facilitate improved outcomes that would allow for greater functional performance. In a retrospective study on individuals with mallet finger injuries, Groth et al[24] used a 3-point Likert scale to examine patient adherence through self-report of home exercise performance and therapy attendance. The authors concluded that compliant patients have significantly better outcomes than non-compliant patients (61.5% and 9% respectively), which concur with the findings of other studies.[15,25,26]

The primary purpose of this systematic review is to evaluate the current evidence for conservative treatment of mallet finger injuries to contrast and compare DIP extensor lag outcomes from the different studies at final follow-up to determine the optimal orthosis and wearing time frames. The secondary purpose is to determine if night orthotic use is required after the initial immobilization phase is completed. Finally, we wanted to determine if recent structured studies addressed patient adherence and satisfaction in mallet finger management.

Methods

Identification and selection of studies

Inclusion and exclusion criteria for the articles were identified. Inclusion criteria were studies on the conservative treatment of mallet fingers, RCTs, and studies published within the last 10 years. Trials were excluded if the studies were published in a language other than English or if they involved surgical treatment. Cohort studies were also excluded from this systematic review.

Search strategy

A computer search was conducted using the following databases: PubMed, CINAHL, ProQuest Central, Medline, and PEDro (Table 1). Search terms included: mallet finger, splint, orthosis, and conservative treatment. Included studies were limited to those published in English. All authors did separate searches and discussed the findings to jointly determine if each paper identified was eligible for inclusion. Bibliographies of relevant papers were reviewed and additional hand searches were performed to identify potential additional studies. There were no differences in opinion between the authors as to which papers would be included.

Table 1
Example database search strategy

Database	Hits [# after limits]	Obtained	Keywords
CINAHL	6	1	Mallet finger, splint
PubMed	5	1	Mallet finger, orthosis
PubMed	47	4	Mallet finger, splint
Pedro	2	1	Mallet finger, splint
Pedro	1	0	Mallet finger, conservative treatment

#: number.

Subjects

The following data was collected on the subjects in the intervention groups in each study: number of subjects, age, type of mallet finger injury, time from injury to treatment, and type of orthotic intervention. The authors examined the pre-intervention similarity of the subjects in all studies to ensure all were similar. Despite randomization, in the Pike et al[27] study, there were a significantly higher number of smokers in the dorsal padded aluminum orthosis group and in the O'Brien and Bailey[28] study there were significantly more women in the custom thermoplastic orthosis group. These differences in the study groups do not appear to have impacted the treatment or results achieved in these studies. However, smoking produces increased vascular resistance in the fingers and an overall reduction in both volumetric blood flow through arteries and tissue perfusion that may delay healing.[29]

Interventions

All components of the orthotic program, including; the type of orthosis, the length of time the orthosis was worn, and adherence monitoring, were also compiled. A description of the orthotic device and the qualifications of the person administering the intervention were recorded.

Outcomes

The primary outcome measure assessed by all studies was extension at the involved distal interphalangeal (DIP) joint. Secondary outcome measures assessed range of motion,[28,30] edema,[30] strength,[30] and function.[27,31] Validated self-reported outcome measures used by the researchers in these four studies included Michigan Hand Outcomes Questionnaire (MHQ)[27] and the Disability of the Arm, Shoulder, and Hand (DASH).[31] Authors of the studies also reported any complications they observed.[27,28,30] The complications included skin maceration, poor fit, orthosis breakage, and orthosis discomfort.[27,28,30]

Study quality assessment

The quality of the studies was evaluated by two of the investigators (NN, LA) using the Structured Effectiveness for Quality Evaluation of Study (SEQES).[32] The SEQES is a 24-item critical appraisal tool developed by MacDermid and used to evaluate the methodological characteristics of a study.[32] The SEQES score is calculated by totaling the scores of each of the 24 items on the tool. A score of 2 is the highest possible score, a score of 1 indicates a fair rating, and a score of 0 indicates incomplete fulfillment of the criterion (Table 2). Each of the reviewer's SEQES scores was blinded to the