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Conservative management of mallet injuries:

A national survey of current practice in the UK

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SUMMARY

Introduction: Mallet injuries are common, and usually treated conservatively. Various systematic reviews have found a lack of evidence regarding best management and it is unclear whether this uncertainty is reflected in current UK practice. **Methods**: An online survey was developed to determine current practice for the conservative treatment of mallet injury amongst specialist hand clinicians in the UK, including physiotherapists, occupational therapists and surgeons. Clinician's views of study outcome selection were also explored to improve future trials. **Results**: 336 professionals completed the survey. Inconsistency in overall practice was observed in splint type choice, time to discharge to GP, and the assessment of adherence. Greater consistency was observed for recommended duration of continuous immobilisation. Bony injuries were most commonly splinted for six weeks (n=228, 78%) and soft tissue injuries for either eight weeks (n=172, 56%) or six weeks (n=119, 39%). Post-immobilisation splinting was frequently recommended, but duration varied between two and 10 weeks. The outcome rated as most important by all clinicians was patient satisfaction. **Discussion**: There is overall variation in the current UK conservative management of mallet injuries, and the development of a standardised, evidence based protocol is required. Clinicians' opinions may be used to develop a core set of outcome measures, which will improve standardisation and comparability of future trials.

Keywords: Mallet finger, mallet thumb, mallet injury, splint, clinician survey

INTRODUCTION

Mallet finger, or thumb, is a common traumatic injury to the hand [1]. Mallet injuries result from disruption of the extensor tendon mechanism at the distal interphalangeal joint (interphalangeal joint of the thumb), either due to tendon rupture (a soft tissue mallet) or avulsion (a bony mallet) leading to the inability to extend the distal interphalangeal joint [2]. If untreated, a mallet injury may become chronic leading to a swan neck deformity of the finger. As approximately two-thirds of mallet injuries affect the dominant hand [3], effective treatment is important to avoid compromising long-term hand function **In the UK, most patients are first seen in the accident and emergency department. A proportion may require surgical intervention and therefore the majority are subsequently referred to regional hand units or orthopaedic fracture clinics, depending on local protocol. If patients do not require surgery and can be treated in a splint they are usually referred to the hand therapists for further management. There is great variation in the UK depending on local resources. Where specialist hand physiotherapy or occupational therapy involvement occurs it is usually after surgical decision of conservative management. However, some units may have a pathway whereby patients without fractures are directed straight to a therapist.**

Immobilisation with a splint is the most common conservative treatment for undisplaced, closed bony and closed soft tissue mallet injuries but there is a lack of consensus regarding the duration of immobilisation [4] and the type of splint used [3-6]. There is also a lack of agreement regarding appropriate outcome measurements [7]. Randomised trials are considered best evidence for determining the effectiveness of an intervention, but several systematic reviews have demonstrated a lack of well-designed and reported trials in mallet finger [3, 4, 6]. A well-designed large-scale RCT is therefore required to determine the optimum conservative management of mallet injury.

Designing such a trial requires feasibility work to understand current practice and to determine the most appropriate outcome measures. A survey of clinicians in the UK was performed to determine current practices and whether they reflect the lack of consensus apparent in the literature. Clinicians' views of outcome measures were sought to facilitate the development of a core outcome set to improve robustness of future trials.

METHODS

An online survey was developed by the study team, including a senior hand therapist, consultant hand surgeons and experienced health services methodologists (Appendix 1). Using specialist knowledge and a review of the literature the study team defined the concepts to be measured, which included use of treatment protocols, durations of continuous protective (or intermittent) immobilisation, types of splint used, time to discharge to GP, assessment of adherence to treatment, and outcomes of importance. Concept definition also took into account the feasibility of measuring them in the target population. Content matter experts in the team translated the concepts into survey questions for the measurement of strengths, occurrences or frequencies and for the definition of cut offs. For example, scores between 7 and 9 (on a scale of 1-9) were deemed 'very important'. The survey was piloted by researchers with a small group of hand therapists and surgeons to ensure ease of use and to test face and content validity before initiating the study.

The final survey consisted of 31 items covering all aspects of the conservative management of soft tissue and bony mallet injuries. It was made clear that the survey related only to the conservative management of mallet injuries, which the treating clinician had already decided did not require surgery. Therefore, the decision whether to conservatively manage a mallet

injury was made by the individual clinician. Respondents were also asked to rate the importance of various outcome measures for the injury, scoring each item on a scale from 1 (not important) to 9 (extremely important).

Clinicians in the United Kingdom (UK) identified as being actively involved in the conservative management of mallet finger, namely plastic and orthopaedic surgeons, hand physiotherapists and hand occupational therapists, were invited to participate by email via the professional associations: the British Association of Hand Therapists (BAHT), the British Society for Surgery of the Hand (BSSH), the British Association of Plastic Reconstructive and Aesthetic Surgeons (BAPRAS) and the Reconstructive Surgery Trials Network (RSTN). Follow-up e-mails were sent two to four weeks after the initial invitation to maximise response rates and dissemination of the online survey to the professional associations was staggered to account for crossover of memberships.

Study data were collected and managed using REDCap electronic data capture tools hosted at University of Oxford [8], a secure, web-based application designed to support data capture for research studies.

Simple summary statistics were calculated for each survey item to evaluate variations in the management of soft-tissue and bony mallet injuries. Appropriate non-parametric statistics were used to compare responses by group of specialist hand clinician, namely; plastic surgeons; orthopaedic surgeons; physiotherapists; and occupational therapists. To explore which outcomes respondents felt were important to measure in future mallet injury trials, the proportion of respondents scoring each outcome as ‘very important’ (scores of 7, 8 or 9) was calculated and used to compare the relative importance of each candidate outcome. Items ranked as ‘very important’ by each

clinician group were compared. STATA V14 (www.stata.com) was used for all analyses.

RESULTS

A total of 372 survey responses were received. Of these, four were blank; 26 were completed by surgeons below consultant level and seven were completed by professionals who could not be classified into an appropriate respondent group (e.g. cross-speciality hand therapists). These records were excluded. A total of 336 surveys were included in the analysis Due to the anonymisation of the survey and crossover of membership between professional groups, a response rate is not presented.

The 336 survey respondents included 118 (35.1%) orthopaedic surgeons, 109 (32.4%) hand physiotherapists, 58 (17.3%) plastic surgeons, and 51 (15.2%) occupational hand therapists. Responses demonstrated a good balance between therapy specialities (47.6% physiotherapists and occupational therapists) and surgical specialities (52.4% plastic and orthopaedic surgeons). Of all clinicians, 230 (71%) reported that their unit had a formal protocol for the management of mallet injury, and 157 (68%) believed this to be evidence based.

Conservative management of mallet injuries

The respondents reported that the majority of closed mallet injuries seen are conservatively managed: soft tissue n=308 (92%), and bony injury n=294 (88%). Wide variation was observed between specialities for both soft and bony types of mallet injury regarding the types of splint used; duration of protection immobilisation; assessment of adherence to splint usage; and time to discharge to GP (**Tables 1 and 2**). However, it was observed that different splint types were favoured by different speciality groups. For the management of soft tissue injuries, 43 (80%) therapists used a custom made thermoplastic splint on the dorsal surface, compared with only 11

(20%) surgeons. Conversely, only 17 (18%) therapists used a plastic Stack splint compared with 76 (82%) surgeons. The splint preferences observed for the management of bony injuries were comparable to those of soft tissue injuries.

Greater consensus was observed among clinicians for recommended duration of continuous immobilisation, demonstrating preferences for either six or eight weeks, depending on the type of injury. Bony injuries were most commonly splinted for six weeks (n=228, 78%) and soft tissue injuries for either eight weeks (n=172, 56%) or six weeks (n=119, 39%). (**Tables 1 and 2**). Almost all clinicians also recommended a period of subsequent intermittent "protection" splinting, although the duration varied between two and 10 weeks.

Approximately half of all clinicians reported assessing adherence to the prescribed treatment (soft tissue injury n=153, 50%; bony injury n=144, 49%). Clinicians who reported assessing adherence generally asked their patients directly if they had been wearing their splint. Some respondents reported asking patients to demonstrate how they applied and removed the splint and others assessed how dirty the splint had become as an indication of its use. None of the respondents reported using a formal patient-reported outcome measure of adherence.

Outcomes measures

All respondents considered patient satisfaction, distal interphalangeal joint (DIPJ) lag and pain to be the three most important outcomes to assess in future trials of mallet finger (**figure 1**). Outcome prioritisation, however, varied by speciality. Orthopaedic surgeons, for example, prioritised swan neck deformity as a top three outcome but did not consider DIPJ lag to be as important as the other respondent groups. Physiotherapists, by contrast, were the only group not to include pain in their top three outcomes instead reporting that range of movement should be assessed as a priority.

None of the respondents considered cosmesis, oedema or dorsal prominence of the DIPJ to be important outcomes (**Figure 1**). In addition to the outcomes evaluated in the survey, several commented that an assessment of general hand function would also be important, as well as a measure of time to return to sport or other leisure activities.

DISCUSSION

There is no consensus regarding the optimal conservative management of mallet finger in the UK and limited high quality evidence to support best practice. This national survey reflects the variation in the literature regarding the conservative management of mallet finger including recommended duration of protection immobilisation, time to discharge to GP, assessment of adherence to treatment, and type of splint. Several systematic reviews including a Cochrane review have highlighted a lack of evidence about optimum splint type [3, 4, 6]. Our findings, however, demonstrate clear preferences within the therapeutic and surgical specialities towards custom made splints and off-the-shelf splints, respectively. **The difference in splint choice between surgical groups is likely to be related to training and surgical dogma within specialities. There is limited data to suggest superiority of any one splint and therefore there has been no drive to change practice across groups. There is some anecdotal evidence to suggest that some splint types can cause more skin damage due to pressure effects and these findings may deter some plastic surgeons from using these.** Consensus among all clinicians was observed for prescribed durations of continuous immobilisation, particularly for bony mallet injuries, and the recommendation of subsequent protection immobilisation. These findings add to the current evidence base by highlighting areas of mallet injury management where, contrary to the literature, there is consistency in UK practice. Despite this, a lack of consensus exists overall and the development of a standardised,

evidence based protocol for the conservative management of mallet injuries is required.

Global surveys are lacking but practices may be observed from the literature. Six international studies covering America, Canada, Australia, South Africa, and Italy, assessed conservative treatment of mallet injury without prior surgery. Four studies were RCTs [5, 9-11] and two of them were single arm clinical studies [12, 13]. The length of continuous immobilisation in the literature is either 6 or 8 weeks in the acute stage which is similar to that in our survey. Following this the duration of non-continuous immobilisation is recommended for 4 weeks in the majority of studies from the literature whereas half of UK survey participants recommend 2 weeks with approximately a third recommending 4 weeks. Our survey participants deemed patient satisfaction, DIPj lag and pain as the most important outcomes and this is reflected in international practices. Only one South African study did not include pain as an outcome or patient satisfaction, although patient compliance was measured [12]. Variability in choice of splint was observed in UK practices and this is reflected in the international literature. Although the range of splint types used were similar, e.g. Stack, thermoplastic and aluminium (Zimmer) splints. Worldwide the Stack splint was less popular than observations from the UK and was used in only one Australian study [5]. Aside from variability in splint type choice there were no geographical variations observed.

Recent randomised controlled trials comparing different splint types found no difference in outcomes and may explain the lack of UK consensus in splint choice. O'Brien and Bailey [5] (n=64) compared Stack, dorsal aluminium, and thermoplastic splints. Pike et al. [10] (n=87) compared volar aluminium, dorsal aluminium, and thermoplastic splints, and Maitra and Dorana [14] (RCT, n=60) compared aluminium and Stack splints. All RCTs observed no difference in the primary outcome, extensor lag. There is no high quality primary evidence comparing different immobilisation durations. However, a critical review by Pratt, AL.

concluded there is a lack of robust evidence to establish whether 8 weeks immobilisation is adequate duration for the treatment of acute closed mallet finger injuries.

Limitations of the study include the lack of an accurate response rate. However, the total number of responders was high. Despite over 300 respondents the study is based on survey data and it is possible that individual practice varies from that which is reported. As this was an e-mail based survey, there may also be response bias with the practice of the clinicians participating in the survey differing from those who chose not to participate or who were unable to access the survey electronically. This is partly mitigated by the high response rate. In addition, the views of individual professional groups were analysed separately, and sufficient numbers of clinicians were included in each group for the results to be meaningful. As the link to the survey was anonymous and distributed via several professional associations, it is theoretically possible that some clinicians may have completed the survey more than once. This is very unlikely given the time constraints for NHS clinicians. It is therefore likely that the study (the largest such study undertaken) provides an accurate representation of variation in the current management of mallet finger in the UK.

A further aim of the study was to explore clinicians' views of study and clinical outcome measures to improve future trials. Our findings show that among all clinicians, patient satisfaction, DIPJ lag, and pain were rated the three most important outcomes. These findings will support further work in mallet injury outcomes to reduce inconsistent and heterogeneous outcome reporting demonstrated in previous mallet injury trials [3, 4].

A valid and reliable measure of adherence to recommended treatment will be essential for any future mallet injury trial. Only approximately half of respondents in the survey reported they assessed adherence to treatment, and this was frequently done in an ad

hoc way. Methodological work is currently on going to identify validated measures of adherence as the basis of future work.

CONCLUSION

Our findings demonstrate an overall lack of consensus in the current conservative management of mallet injury in the UK indicating a requirement for the development of a standardised, evidence based treatment protocol. Qualitative approaches, such as interviews or focus groups, to further explore the reasons for differing practices between the therapeutic and surgical specialities would represent a valuable part of this development. Important preliminary work towards the development of a core outcome set has been presented, which will support the improvement of future trials of mallet injury by standardising practice and enabling the comparison of findings of individual studies. A valid and reliable measure of adherence should be developed to further support the improvement of future trials.

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CONFLICTS OF INTEREST

None.

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FIGURE LEGENDS

Figure 1 – Outcome prioritisation by respondent group.

Outcomes rated by clinicians as 'very important' are presented, i.e. outcomes given a score between 7 and 9 on a scale of 1-9.

TABLES

Table 1 – Management of soft tissue mallet injuries by speciality

	All respondents whole splint (n=308) (%)	Plastic surgeons (n=53) (%)	Orthopaedic surgeons (n=111) (%)	Hand physiotherapists (n=46) (%)	Occupational hand therapists (n=98) (%)	P value
Type of splint applied						
Plastic stack splint	102 (33)	17 (32)	63 (57)	10 (22)	12 (12)	<0.01[X]
Custom Zimmer splint on dorsal surface	13 (4)	3 (6)	7 (6)	1 (2)	2 (2)	
Custom Zimmer splint on volar surface	10 (3)	5 (9)	4 (4)	0 (0)	1 (1)	
Custom thermoplastic splint on dorsal surface	64 (21)	4 (8)	12 (11)	14 (30)	34 (35)	
Custom thermoplastic splint on volar surface	97 (31)	23 (43)	24 (22)	17 (37)	33 (34)	
Any other type of splint	22 (7)	1 (2)	1 (1)	4 (9)	16 (16)	
Duration of continuous splinting for injuries presenting within 7 days						
Less than 6 weeks	5 (2)	2 (4)	1 (1)	0 (0)	2 (2)	<0.01[X]

6 weeks	119 (39)	16 (30)	57 (51)	13 (28)	33 (34)	
7 weeks	2 (0)	0 (0)	1 (1)	1 (2)	0 (0)	
8 weeks	172 (56)	28 (53)	52 (47)	32 (70)	60 (61)	
9-10 weeks	2 (1)	1 (2)	0 (0)	0 (0)	2 (2)	
11-12 weeks	8 (3)	6 (11)	0 (0)	0 (0)	1 (1)	
Number recommending non-continuous protection splinting after continuous splinting	277 (90)	40 (75)	97 (87)	46 (100)	94 (96)	<0.01
Duration of protection splinting (n=277)						
2 weeks	126 (45)	25 (63)	28 (29)	21 (46)	52 (55)	
3 weeks	14 (5)	0 (0)	9 (9)	3 (7)	2 (2)	
4 weeks	95 (34)	13 (33)	34 (35)	16 (35)	32 (34)	<0.01
6 weeks	28 (10)	2 (5)	17 (18)	3 (7)	6 (6)	
More than 6 weeks	14 (5)	0 (0)	9 (9)	3 (7)	2 (2)	
Number assessing adherence to splinting	153 (50)	25 (47)	38 (34)	34 (74)	56 (57)	<0.01
Time to discharge to primary care						
Immediately after first review	21 (7)	3 (6)	16 (14)	2 (4)	0 (0)	<0.01
Less than 6 weeks	4 (1)	1 (2)	0 (0)	0 (0)	3 (3)	

6 weeks	33 (11)	3 (6)	19 (17)	3 (7)	8 (8)
8 weeks	59 (19)	9 (17)	25 (23)	6 (13)	19 (19)
10 weeks	57 (19)	12 (23)	13 (12)	11 (24)	21 (21)
12 weeks	109 (36)	19 (36)	27 (25)	20 (43)	43 (44)
6 months	6 (2)	4 (8)	1 (1)	1 (2)	0 (0)
Other	18 (6)	2 (4)	9 (8)	3 (7)	4 (4)

Chi squared test $^{\chi}$

Table 2 – Management of bony mallet injuries by speciality.

	All respondents who splint (n=294) (%)	Plastic surgeons (n=49) (%)	Orthopaedic surgeons (n=108) (%)	Hand physiotherapists (n=43) (%)	Occupational hand therapists (n=94) (%)	P value
Type of splint applied						
Plastic stack splint	93 (32)	15 (31)	61 (56)	7 (16)	10 (11)	<0.01[χ]
Custom Zimmer splint on dorsal surface	13 (4)	5 (10)	5 (5)	1 (2)	2 (2)	
Custom Zimmer splint on volar surface	9 (3)	4 (8)	4 (4)	0 (0)	1 (1)	
Custom thermoplastic splint on dorsal surface	54 (18)	1 (2)	10 (9)	12 (28)	31 (33)	
Custom thermoplastic splint on volar surface	104 (35)	24 (49)	26 (24)	19 (44)	35 (37)	
Any other type of splint	21 (7)	0 (0)	2 (2)	4 (9)	15 (16)	
Duration of continuous splinting for injuries presenting within 7 days						
4 weeks	29 (10)	7 (14)	15 (14)	3 (7)	4 (4)	0.07[χ]
5 weeks	3 (1)	0 (0)	2 (2)	0 (0)	1 (1)	
6 weeks	228 (78)	32 (65)	78 (72)	35 (81)	83 (88)	

7 weeks	1 (0)	0 (0)	0 (0)	0 (0)	1 (1)	
8 weeks	28 (10)	7 (14)	13 (12)	4 (9)	4 (4)	
More than 8 weeks	5 (2)	3 (6)	0 (0)	1 (2)	1 (1)	
Number recommending non-continuous protection splinting after continuous splinting	251 (85)	37 (76)	87 (81)	41 (95)	86 (91)	P<0.01
Duration of protection splinting (n=251)						
2 weeks	133 (53)	24 (65)	36 (41)	20 (49)	53 (62)	P=0.16
3 weeks	5 (2)	0 (0)	4 (5)	1 (2)	0 (0)	
4 weeks	73 (29)	10 (27)	26 (30)	13 (32)	24 (28)	
6 weeks	32 (13)	3 (8)	16 (18)	5 (12)	8 (9)	
More than 6 weeks	6 (2)	0 (0)	3 (3)	2 (5)	1 (1)	
Number assessing adherence to splinting	144 (49)	23 (47)	36 (33)	31 (72)	54 (57)	<0.01
Time to discharge to primary care						
Immediately after first review	11 (4)	2 (4)	8 (7)	1 (2)	0 (0)	<0.01
Less than 6 weeks	17 (6)	1 (2)	11 (10)	2 (4)	3 (3)	
6 weeks	58 (19)	9 (17)	34 (31)	2 (4)	13 (14)	
8 weeks	67 (22)	11 (21)	19 (17)	11 (24)	26 (27)	

10 weeks	64 (21)	14 (27)	11 (10)	11 (24)	28 (29)
12 weeks	62 (21)	10 (19)	18 (17)	12 (27)	22 (23)
More than 12 weeks	6 (2)	3 (6)	1 (1)	1 (2)	1 (1)
Other	14 (5)	1 (2)	6 (6)	4 (9)	3 (3)

Chi squared test ^{X}