Variations in Postoperative Immobilization Following Common Hand Surgery Procedures

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Abstract

Background: The aim was to investigate variations in the duration of postoperative immobilization for common hand surgery procedures and to determine whether there is any correlation between surgeon experience and duration of postoperative immobilization. **Methods:** An anonymous cross-sectional survey was sent to the American Society for Surgery of the Hand asking the following questions: (1) number of years in practice and (2) duration of immobilization for 16 common hand surgery procedures. A Pearson's correlation coefficient was used to determine correlations between surgeon experience and duration of immobilization. Box plots were created to display the distribution and variability in postoperative immobilization per procedure among surgeons. **Results:** A total of 1126 respondents completed the survey, yielding a response rate of 40%. Procedures with a greater average duration of immobilization demonstrated the greatest variability. The largest variability overall was observed in intercarpal ligament repair with the majority of responses distributed between 4 and 10 weeks of immobilization. The smallest variability was observed following De Quervain's release and Dupuytren's fasciectomy. Only small correlations between surgeon experience and duration of immobilization were observed. Specifically, all Pearson correlation coefficients were less than .20. **Conclusions:** This study supports the hypothesis that large variations exist in the duration of immobilization following common hand surgery procedures. Only small correlations were found between surgeon experience and average duration of immobilization. The study suggests that there is a lack of evidence to guide postoperative immobilization for common hand surgery procedures and that prolonged immobilization may not be necessary for certain hand procedures.

Keywords: immobilization, hand surgery

Introduction

Wide variations in duration of immobilization have been observed following treatment of common hand conditions. For example, a review of the literature reveals an accepted range of immobilization from 2 to 8 weeks following ulnar shortening osteotomy for the treatment of ulnar impaction syndrome.^{1,2,3,5} To investigate these differences, we designed a survey to gain insight into variations that exist in postoperative immobilization of the hand and wrist. The purpose of this study was to (1) report variations in the duration of immobilization for common hand surgery procedures and (2) to determine whether there is any correlation between surgeon's years of experience and duration of postoperative immobilization as has been observed at our institution. We hypothesized that there would be wide variations in the duration of immobilization for common hand surgery procedures and that with increased years of surgeon experience, duration of postoperative immobilization may decrease for common hand procedures.

Materials and Methods

An anonymous cross-sectional survey was administered electronically via an e-mail invitation to American Society for Surgery of the Hand (ASSH) after obtaining permission from the ASSH. At the time the survey was administered, the ASSH membership consisted of 2893 combined candidate members and members. Our data collection instrument consisted of a questionnaire composed of the following questions: (1) number of years in practice, and (2) what is the duration of time (weeks) you TYPICALLY immobilize a patient COMPLETELY (nonremovable splint/cast) after

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Table 1. Response Rate by Surgeon Experience.

No. of years in practice	Response percent	Response count
0-4	21.8	246
5-8	12.8	144
9-12	9.9	111
Greater than 12	55.5	625

each of the following procedures: ulnar shortening osteotomy, proximal row carpectomy, partial wrist arthrodesis, total wrist arthrodesis, hand/finger arthrodesis, open reduction internal fixation (ORIF) of scaphoid fractures, cast treatment for distal radius fractures, volar plating of distal radius fractures, closed reduction and pinning of hand/finger fractures, ORIF hand/finger fractures, De Quervain's release, intercarpal ligament repair, thumb ulnar collateral ligament repair, Dupuytren's fasciectomy, tendon transfer, and nerve repair. A reminder e-mail was sent 1 week after the initial invitation. Following data collection, a Pearson's correlation coefficient was used to determine the correlation between number of years in practice and weeks of immobilization for each type of surgical procedure. Box plots were created to evaluate the distribution of responses to quantify the variability in postoperative immobilization for the various hand surgical procedures.

Results

There were 1126 respondents who completed the survey, yielding a response rate of 40%. Seventy-eight percent of respondents had been in practice for 5 years or greater at the time the survey was administered and 55% percent of respondents reported greater than 12 years' experience (Table 1). Results of immobilization times for each procedure are summarized in Table 2. The percentages were derived only from surgeons who perform the procedures listed in Table 2. Those who did not perform specific procedures were excluded from our data analysis. The average duration of postoperative immobilization by surgeon experience is shown in Table 3. All Pearson's correlation coefficients were less than 0.20, indicating weak correlations. Box plots were used to evaluate the variability in postoperative immobilization observed among members of the ASSH. The distributions of all responses for each procedure are plotted in Figure 1. The distributions of responses subcategorized into years in practice are plotted in Figure 2. The red horizontal line within each box represents the median (50th percentile) duration of immobilization. The lower end of each box defines the 25th percentile and the upper end of each box defines the 75th percentile. The whiskers indicate the minimum and maximum values, whereas the asterisk and dot characters represent outliers. The larger range of each quartile indicates greater variability in postoperative

immobilization. In Figures 1 and 2, the data have been sorted such that the variability increases from left to right along the horizontal axis.

Discussion

This study supports the hypothesis that wide variations exist in postoperative immobilization for common hand surgery procedures as illustrated in Table 2 and Figure 1. Procedures with a greater average duration of immobilization demonstrated the greatest variability (see Table 3 and Figure 1). The largest variability overall was observed in the treatment of intercarpal ligament repair with the majority of responses distributed between 4 and 10 weeks of immobilization (see Table 2 and Figure 1). Procedures with a smaller average duration of immobilization demonstrated the least variability in postoperative immobilization (see Figure 1 and Table 3). The smallest variability overall was observed following De Quervain's release and Dupuytren's fasciectomy where the majority of respondents immobilize patients for 2 weeks or less.

Only small correlations were observed between years of experience and duration of immobilization for certain procedures. When subcategorized by number of years in practice, the distribution of responses was similar for all procedures with the exception of total wrist fusion, hand/finger arthrodesis, De Quervain's release, and ulnar collateral ligament repair as demonstrated in Figure 2. Specifically, there was a trend toward a decreased duration of immobilization by a maximum of 1.1 days with increasing experience for total wrist fusion, hand/finger arthrodesis, De Quervain's release, and ulnar collateral ligament repair ($P < .05$). However, these differences, although statistically significant, were small and do not appear to be clinically relevant. The remainder of the procedures did not demonstrate any statistically significant correlations between surgeon experience and duration of immobilization. Overall, all Pearson correlation coefficients were less than .20, indicating that differences in years of experience resulted in only small differences in duration of immobilization. The hypothesis that surgeons may decrease duration of immobilization with increasing surgeon experience was not strongly supported by this study.

Several limitations exist in this study that are inherent in properties of a cross-sectional survey. The results in this study may not accurately represent the practices of all members of the ASSH due to response bias. Despite the fact that there were 1126 responses, our response rate was 40%, which is only a sample of the target population. Another limitation of this study is that the subcategories for question 2 did not include specific details regarding the treatment procedures. For example, this survey did not specify the type of distal radius fracture being treated (ie, intra-articular vs extra-articular, number of fragments, etc).

Table 2. Results of Immobilization Times for Procedures.

Procedure	Percentage of respondents (n = total number of respondents)						
	0-1 weeks	2 weeks	3 weeks	4 weeks	6 weeks	8 weeks	>10 weeks
Intercarpal ligament repair	2 (17)	3 (32)	2 (24)	10 (105)	23 (348)	33 (353)	18 (196)
ORIF of scaphoid fractures	9 (93)	19 (207)	3 (39)	16 (178)	32 (347)	14 (150)	8 (85)
Hand/finger arthrodesis	13 (143)	15 (164)	6 (71)	29 (322)	32 (358)	3 (38)	1 (10)
Ulnar shortening osteotomy	15 (156)	22 (230)	4 (37)	22 (229)	32 (337)	5 (51)	1 (11)
Total wrist arthrodesis	7 (75)	14 (146)	3 (33)	17 (186)	43 (460)	13 (142)	3 (31)
Thumb UCL repair	4 (50)	7 (81)	9 (102)	40 (450)	36 (403)	3 (28)	0.3 (3)
Partial wrist arthrodesis (4CF, CL, STT, SC)	3 (30)	5 (57)	2 (19)	17 (188)	52 (561)	18 (196)	2 (26)
Distal radius fracture: cast treatment	1 (10)	1 (8)	2 (18)	24 (262)	66 (732)	6 (61)	0.2 (2)
Tendon transfer	14 (154)	15 (169)	16 (172)	36 (398)	18 (194)	1 (16)	0.2 (2)
Proximal row carpectomy	9 (101)	27 (284)	14 (146)	35 (375)	14 (150)	1 (9)	0.4 (4)
CRPP of hand and finger fractures (K-wires)	13 (141)	12 (129)	30 (328)	37 (415)	8 (92)	0.3 (3)	0.2 (2)
Nerve repair	26 (284)	32 (360)	26 (293)	13 (147)	2 (25)	0.2 (2)	0 (0)
Distal radius fracture: volar plate fixation	31 (337)	41 (440)	8 (82)	14 (155)	6 (62)	0.1 (1)	0.1 (1)
ORIF of hand and finger fractures (plate and/or screws)	42 (456)	32 (353)	14 (153)	10 (114)	2 (18)	0.1 (1)	0.1 (1)
De Quervain's release	69 (751)	26 (281)	3 (29)	2 (22)	0.2 (2)	0.1 (1)	0 (0)
Dupuytren's fasciectomy	84 (915)	12 (127)	1 (12)	2 (17)	1 (6)	0.5 (5)	0.3 (3)

Note. ORIF, open reduction internal fixation; UCL, ulnar collateral ligament; 4CF, four corner fusion; CL, capitulunate fusion; STT, scaphotrapeziotrapezoidal fusion; SC, scaphocapitate fusion; CRPP, closed reduction percutaneous pinning.

Table 3. Average Duration of Immobilization by Surgeon Experience.

Procedure	Average duration of immobilization per years in practice (weeks)				Average duration of immobilization for all years in practice (weeks)
	0-4 years	5-8 years	9-12 years	>12 years	
Intercarpal ligament repair	6.6	7.2	7.4	6.9	7.0
ORIF of scaphoid fractures	5.2	4.6	5.2	5.0	5.0
Hand/finger arthrodesis	4.1	4.1	3.8	4.0	4.0
Ulnar shortening osteotomy	4.1	4.1	3.8	3.9	4.0
Total wrist arthrodesis	5.6	5.4	5.2	4.7	5.2
Thumb UCL repair	4.8	4.5	4.5	4.3	4.5
Partial wrist arthrodesis (4CF, CL, STT, SC)	5.7	5.7	5.8	5.7	5.7
Distal radius fracture: cast treatment	5.6	5.5	5.4	5.5	5.5
Tendon transfer	3.6	3.5	3.3	3.6	3.5
Proximal row carpectomy	3.5	3.5	3.3	3.3	3.4
CRPP of hand and finger fractures (K-wires)	3.2	3.3	3.2	3.3	3.2
Nerve repair	2.4	2.2	2.2	2.5	2.3
Distal radius fracture: volar plate fixation	2.4	2.3	2.1	2.3	2.3
ORIF of hand and finger fractures (plate and/or screws)	2.0	1.9	2.0	2.0	2.0
De Quervain's release	1.4	1.5	1.4	1.3	1.4
Dupuytren's fasciectomy	1.3	1.3	1.3	1.2	1.3

Note. ORIF, open reduction internal fixation; UCL, ulnar collateral ligament; 4CF, four corner fusion; CL, capitulunate fusion; STT, scaphotrapeziotrapezoidal fusion; SC, scaphocapitate fusion; CRPP, closed reduction percutaneous pinning.

Figure 1. Box plot of response rate demonstrating variability. Note. Red horizontal line within each box = median (50th percentile) duration of immobilization. The lower end of each box defines the 25th percentile and the upper end of each box defines the 75th percentile. Whiskers = minimum and maximum values, asterisk and dot characters = outliers. Variability increases from left to right along the horizontal axis. PF, palmar fasciectomy; ORIF, open reduction internal fixation; DRF, distal radius fracture; CRPP, closed reduction percutaneous pinning; PRC, proximal row carpectomy; 4CF, four corner fusion; CL, Capitulate fusion; STT, scaphotrapezotrapezoidal fusion; SC, scaphocapitate fusion; UCL, ulnar collateral ligament; TWA, total wrist fusion; USO, ulnar shortening osteotomy; Fx, fracture; VP, volar plate.

This was purposely done to maintain the simplicity of the survey. We assumed that most intra-articular fractures would be treated operatively. However, this may have introduced ambiguity when answering specific questions. In addition, the validity of the data cannot be assessed with certainty, as outliers may exist due to respondents with less knowledge, less volume of cases per procedure, or from those who did not respond accurately. Despite these limitations, this study demonstrates that wide variations in postoperative immobilization exist for common hand surgery procedures.

There is significant interest in limiting postoperative immobilization in hand surgery when appropriate, as the hand is particularly vulnerable to stiffness that may ultimately impair hand function. Prolonged immobilization with a cast or a splint may result in joint contractures, disuse osteopenia, pressure necrosis, thermal injuries, muscular atrophy, and chronic regional pain syndrome (CRPS).^{4,6} The decision to immobilize a patient for a specific time interval is often based on factors such as the type of procedure performed, patient age, compliance, stability of fixation, fracture healing, wound healing,

Figure 2. Box plot of response rate per surgeon years in practice. Note. Red horizontal line within each box = median (50th percentile) duration of immobilization. The lower end of each box defines the 25th percentile and the upper end of each box defines the 75th percentile. Whiskers = minimum and maximum values, asterisk and dot characters = outliers. Variability increases from left to right along the horizontal axis. PF, palmar fasciectomy; ORIF, open reduction internal fixation; DRF, distal radius fracture; CRPP, closed reduction percutaneous pinning; PRC, proximal row carpectomy; 4CF, four corner fusion; CL, capitulate fusion; STT, scaphotrapezotrapezoidal fusion; SC, scaphocapitate fusion; UCL, ulnar collateral ligament; TWA, total wrist fusion; USO, ulnar shortening osteotomy; Fx, fracture; VP, volar plate.

host-related factors (comorbidities such as smoking, diabetes, immunocompromise, etc), or to protect a repaired structure such as a tendon or nerve through the critical period of healing for these tissues. Although the clinical impact of these factors was not investigated, this study does provide insight into the differences in practice patterns that exist among hand surgeons.

Wide variations in duration of immobilization observed in this study raise the possibility that prolonged immobilization might not be necessary following certain hand surgery procedures. However, further research to investigate the effect of length of immobilization on clinical outcomes is warranted. This study emphasizes the need for better evidence to enhance our understanding of immobilization following hand surgery procedures.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

This article does not contain any studies with human or animal subjects.

Statement of Informed Consent

This study is a survey of the practice patterns of hand surgeons. Permission to administer this survey was obtained from the American Society for Surgery of the Hand. As it does not contain any patient data, informed consent was not required from patients.

Declaration of Conflicting Interests

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