

Factors Affecting Willingness to Undergo Carpal Tunnel Release

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Background: Factors regarding patient willingness to undergo or avoid joint replacement have been studied; however, these factors have not been studied in patients with carpal tunnel syndrome. To further understand the aspects that are important for a patient with carpal tunnel syndrome in deciding whether to have surgery, we identified factors that affect this decision in women and that are not related to Workers' Compensation status.

Methods: We retrospectively reviewed 282 female patients with electrophysiologically confirmed carpal tunnel syndrome without a known cause who were recommended for carpal tunnel release by a single hand surgeon in a tertiary medical setting. Of those, thirty-six female patients who were not entitled to Workers' Compensation canceled the operation during the waiting period, which averaged four weeks. Thirty-three of them were surveyed with a questionnaire sent by mail, and eighteen completed surveys were reviewed at a mean follow-up of thirty-two months. Furthermore, seventy female patients who underwent carpal tunnel release were randomly sampled, and thirty-eight patients completed the survey. The operation and cancellation groups were compared with regard to the reasons for choosing or canceling surgery.

Results: The groups were similar with regard to age, sociodemographic variables, follow-up length, initial electrophysiological findings, and functional status. The highest-ranked reason for choosing surgery was symptom severity rather than fear of progression or a positive electrodiagnostic result. Those who canceled the operation rated symptom improvement during the waiting period as the leading reason for doing so, but they were also concerned about transient weakness, the financial burden, and a scar or pillar pain. Disease persistence or recurrence was the issue of most concern in both groups. At the time of the final review, the functional status was significantly improved in both groups and no significant difference between the groups was detected.

Conclusions: Women with carpal tunnel syndrome report that subjective symptom severity is the most important reason for undergoing surgery. Understanding this and other patient concerns may help physicians during patient-oriented consultation and decision-making. In particular, recommendations for carpal tunnel release on the basis of symptoms are reasonable from the perspective of the patient who has carpal tunnel syndrome without a known cause.

Carpal tunnel syndrome is the most common compressive neuropathy in the upper extremity. However, no gold standard diagnostic test is available, although the symptoms and signs of carpal tunnel syndrome are widely recognized¹. The diagnosis of carpal tunnel syndrome is essentially clinical, as electrodiagnostic tests are known to have 13% rates of false-negative results² and 18% rates of false-positive results³, and objective confirmation of the diagnosis can often be elusive¹⁻⁵. Furthermore, the natural history of carpal tunnel

syndrome remains unclear⁶⁻⁸. Accordingly, questions have been raised as to when and which treatment is most appropriate^{9,10}.

Treatment options for carpal tunnel syndrome are dependent on the severity of symptoms, the underlying cause, and the needs of the patient¹¹. The general indication for surgical treatment of carpal tunnel syndrome without known cause is a lack of symptomatic improvement following conservative treatment, and a relative indication for surgery is ongoing denervation seen on electrodiagnostic studies¹¹.

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TABLE I Rank Order for Choosing or Avoiding Surgery

Rank	Group That Chose Operation	Score* (points)	Group That Avoided Operation	Score* (points)
1	Severe symptoms including tingling sensation or pain	4.61 ± 0.55	Any improvement in symptoms during the waiting period	4.06 ± 0.94
2	Failure of previous conservative treatment	3.53 ± 1.16	Fear of undergoing surgery	2.39 ± 0.92
3	Fear of symptomatic or functional aggravation	2.55 ± 1.22	Absence of someone to provide care at home	2.06 ± 1.00
4	Knowledge of someone who had a good surgical result	2.21 ± 1.09	Advice not to undergo surgery from family or friends	1.78 ± 0.81
5	Evidence of an electrodiagnostic abnormality	2.05 ± 0.96	Knowledge of someone who had a poor surgical result	1.72 ± 0.75
6	Additional benefits paid from private insurance	1.37 ± 0.49	Economic burden on family to pay the bills	1.50 ± 0.71

*Scores are given as the mean and the standard deviation and are based on a 5-point Likert scale, with 1 indicating strong disagreement and 5, strong agreement.

Although carpal tunnel release is believed to be the definitive treatment for carpal tunnel syndrome, some patients are unwilling to undergo surgery. In view of the recent paradigm change of emphasis to the perspective of the patient during medical decision-making^{12,13}, several studies have been performed on patient willingness, concerns, and avoidance of surgery to identify factors affecting the patient's decision to undergo total hip and knee arthroplasty¹⁴⁻¹⁹. To further understand the decision-making process with respect to the treatment of carpal tunnel syndrome, we attempted to identify the factors that affect the willingness of the patient to undergo or to avoid carpal tunnel release when the cause of carpal tunnel syndrome is not known. We hypothesized that patients with carpal tunnel syndrome would have a specific reason for choosing to undergo carpal tunnel release or not and that those who had undergone surgery or had avoided surgery would differ in terms of sociodemographic data, preoperative concerns regarding surgery, and/or functional status.

Materials and Methods

Study Population

This retrospective study was conducted after obtaining approval from our institutional review board. Between May 2004 and May 2007, 282 patients with the diagnosis of carpal tunnel syndrome without a known cause were recommended for carpal tunnel release by a single hand surgeon (H.S.G.) at an urban, tertiary referral hospital. We excluded patients who had associated diseases, including cervical radiculopathy, cubital tunnel syndrome, diabetes mellitus, hypothyroidism, chronic renal failure, other peripheral neuropathies, arthritis, and Buerger disease. The average duration of symptoms prior to surgery was greater than thirty months. Surgery was recommended when the clinical symptoms of tingling, pain, or weakness did not improve following at least two months of conservative treatment consisting of splinting and the use of

nonsteroidal anti-inflammatory drugs and/or corticosteroid injections. We used a rigid brace to hold the wrist in a neutral position. We did not routinely recommend corticosteroid injections unless a patient refused surgery and asked for a second-best choice or temporary relief, or when the diagnosis was unclear because of multiple sites of nerve compression. Electrodiagnostic studies confirmed the diagnosis in all patients.

During discussions, the operating surgeon briefly explained that (1) the surgical procedure consisted of an open carpal tunnel release performed under local anesthesia on an outpatient basis, (2) there would be three to four days of postoperative splint immobilization and no formal physiotherapy, (3) functional outcomes should include some degree of symptom relief, and (4) complications could include transient weakness, scar, or pillar pain, and, rarely, symptom recurrence and nerve damage. Patients with bilateral involvement were offered a choice of staged or simultaneous surgery. Patients were also given a brochure on carpal tunnel syndrome, and informed consent was obtained when patients decided to undergo surgery.

Of the 282 patients, thirty-six (13%) canceled the scheduled operation during the waiting period, which averaged four weeks. These thirty-six patients were all female homemakers, and none had a Workers' Compensation issue. These thirty-six patients were then contacted by mail and were asked to complete the questionnaire. Three were considered ineligible because they had undergone surgery at other hospitals, and eighteen (55%) of thirty-three returned completed questionnaires, which is slightly lower than the average survey response rate of 60% for patients that has been reported in other medical studies²⁰. Of the 246 patients who underwent surgery, seventy female homemakers were randomly selected as controls and were contacted by mail and asked to complete the survey; thirty-eight (54%) of them returned completed

TABLE II Characteristics of Operation and Cancellation Groups

Characteristics	Operation Group	Cancellation Group
No. of patients who completed survey	38	18
Age* (yr)	56 ± 8	54 ± 8
Symptom duration* (mo)	30 ± 25	34 ± 30
Bilateral involvement†	14 (37)	8 (44)
Duration of follow-up* (mo)	30 ± 7	32 ± 8
Married patients†	35 (92)	18 (100)
Experience of surgery†	10 (26)	3 (17)
Annual income of <\$20,000†	21 (55)	11 (61)
Less than a high-school education†	10 (26)	4 (22)
Existence of a caregiver at home†	13 (34)	5 (28)
Existence of private insurance†	14 (37)	7 (39)
Distance from home of <1 hr†	18 (47)	9 (50)
History of improvement with steroid injection†	8 (21)	3 (17)
History of improvement with other medication†	6 (16)	3 (17)
Thenar muscle atrophy†	8 (21)	3 (17)
Electrodiagnostic grade according to Bland system ²⁴		
Overall grade*	3.0 ± 0.9	2.9 ± 0.6
Grade 1 or 2†	9 (24)	4 (22)
Grade ≥3†	29 (76)	14 (78)

*The values are given as the mean and the standard deviation.
†The values are given as the number of patients, with the percentage in parentheses.

questionnaires. The average time interval between the day when the patient enlisted for surgery and the date of the follow-up questionnaire was thirty months (range, seventeen to forty-two months) for the group that had an operation and thirty-two months (range, sixteen to forty-four months) for the cancellation group. Responses from members of these two groups were analyzed to identify the reasons for choosing to undergo or avoid surgery.

Survey Design

The survey was composed of four parts. In part one, patients answered questions concerning the reasons for choosing or canceling surgery; the questions were "I chose surgery because of the following reasons. . ." for the operation group, and "I canceled surgery because of the following reasons. . ." for the cancellation group. Each question was rated by the patient on a 5-point Likert scale (with 1 indicating strong disagreement; 2, disagreement; 3, neutral; 4, agreement; and 5, strong agree-

ment). In part two, the patients were asked to answer questions regarding demographic characteristics, including marital status, experience with surgery, response to nonsteroidal anti-inflammatory treatment or corticosteroid injection, the existence of a caregiver, the distance between home and hospital, annual income, and educational status, and whether they had private health-care insurance that would reimburse medical bills associated with surgery. (In South Korea, all patients are partially covered by the national health system and are personally responsible for approximately 30% of the total medical cost. Patients with private medical insurance can claim a portion or all of the remaining costs from insurance companies.)

In part three of the questionnaire, the questions were based on a questionnaire designed by Trousdale et al.¹⁶ regarding preoperative concerns of patients related to total hip and total knee arthroplasty. Patients responded using a 4-point descriptive scale (with 1 indicating he or she was not concerned; 2, somewhat concerned; 3, very concerned; and 4, extremely concerned). Part four investigated current functional status, and patients were requested to complete two validated outcome surveys, the Boston carpal tunnel questionnaire²¹ and the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire^{22,23}, which also had been completed when the patients first enlisted for surgery. The Boston carpal tunnel questionnaire is a disease-specific status scale that incorporates a symptom severity scale and a functional scale. The symptom severity scale is composed of eleven items that address severity, frequency, and duration of symptoms, whereas the functional status scale is composed of eight questions that assess the difficulty of performing eight daily tasks. Each question offers five possible responses of increasing severity, which are scored from 1 (none) to 5 (most severe); the mean values of all of the items in the Boston carpal tunnel questionnaire were calculated. The DASH quantifies general disabilities related to the upper extremity. The questionnaire contains thirty items; twenty-one concern difficulties with specific tasks, five evaluate symptoms, and one each evaluates social function, work function, sleep, and confidence. The DASH scores are scaled between 0 and 100, with higher scores representing more disability of the upper extremity.

Data Analysis

In part one of the survey, ranks of items associated with the decision to undergo or not to undergo surgery were identified. In part two, sociodemographic characteristics were compared with use of Mann-Whitney U tests for continuous variables and with use of chi-square and Fisher exact tests for categorical variables. In part three, patient concerns were ranked and compared between the groups with use of the Mann-Whitney U test. Finally, in part four, the functional status of the patient was assessed with use of the Boston carpal tunnel²¹ and DASH questionnaire scores^{22,23}. These scores were compared between the groups and between the time of first enrollment for surgery and the time of the survey, with use of the Mann-Whitney U test and the Wilcoxon signed-rank test. Significance was set at $p < 0.05$.

TABLE III Levels of the Issues of Concern*

Issues of Concern	Operation Group†	Cancellation Group†	P Value
Pain during surgery	1.44 ± 0.77	1.78 ± 1.00	0.202
Pain immediately after surgery	2.11 ± 1.12 (2)‡	1.72 ± 1.07	0.197
Pain after discharge from the hospital	1.50 ± 0.91	1.50 ± 0.92	1.000
Chance surgery will not alleviate pain	1.72 ± 1.11	1.89 ± 1.28	0.538
Persistent or recurrent carpal tunnel syndrome	2.28 ± 1.26 (1)‡	2.61 ± 1.20 (1)‡	0.437
Persistent scar or pillar pain	1.06 ± 0.23	1.39 ± 0.61	0.007§
Length of general recovery	1.44 ± 0.77	1.78 ± 0.94	0.162
Length of time to use hands	1.61 ± 0.96	1.83 ± 0.92	0.245
Need to take physical therapy	1.39 ± 0.60	1.33 ± 0.59	0.701
Need to immobilize hands for a few days	1.22 ± 0.42	1.56 ± 0.78	0.122
Transient weakness of the hand	1.56 ± 0.97	2.11 ± 1.02 (2)‡	0.035§
Inability to do sports for a month	1.44 ± 0.97	1.44 ± 0.78	0.732
Ability to drive a car	1.28 ± 0.66	1.28 ± 0.67	1.000
Ability to dress	1.28 ± 0.74	1.39 ± 0.85	0.606
Ability to feed oneself	1.83 ± 1.13 (3)‡	1.38 ± 0.70	0.226
Perineal hygiene	1.39 ± 0.83	1.50 ± 0.71	0.283
Hand hygiene	1.22 ± 0.64	1.22 ± 0.55	0.659
Bilateral hand surgery	1.50 ± 1.13	1.28 ± 0.75	0.865
Risk of nerve injury during surgery	1.67 ± 0.96	1.67 ± 1.32	0.469
Risk of infection after surgery	1.50 ± 0.77	1.39 ± 0.85	0.451
Risk of sudden death during surgery	1.36 ± 0.23	1.44 ± 0.78	0.436
Risk of heart attack during surgery	1.39 ± 0.69	1.44 ± 0.79	0.766
Risk of operation on incorrect side	1.44 ± 0.84	1.22 ± 0.73	0.328
Unightly scar	1.28 ± 0.57	1.06 ± 0.24	0.119
Experience of the operating surgeon	1.00 ± 0	1.17 ± 0.71	0.157
Patient not knowing procedures	1.00 ± 0	1.17 ± 0.71	0.157
Operation noise during surgery	1.00 ± 0	1.00 ± 0	1.000
Ability to pay the bills	1.17 ± 0.51	1.61 ± 0.85	0.017§
Burden on family to pay bills	1.17 ± 0.51	1.56 ± 0.86	0.045§
Inability to take care of home	1.22 ± 0.64	1.78 ± 0.94	0.008§
Inability to take care of family	1.22 ± 0.64	1.94 ± 1.00 (3)‡	0.002§

*The level of concern was scored on a 4-point system, with 1 indicating the least concerning level and 4, the most concerning level. †The values are given as the mean and the standard deviation. ‡One of the top three issues of concern, with ranking shown in the parentheses. §The difference was significant ($p < 0.05$).

For the purpose of retrospective power analysis, a pre-specified effect size and the observed variance were used and the power for comparison of the follow-up DASH scores was calculated. The estimate of the pooled standard deviation of the follow-up DASH scores was 9.8. With eighteen patients in the cancellation group and thirty-six patients in the operation group, there was 93% power to detect a difference of 10 points in the DASH scores between the groups. Inasmuch as a 10-point difference in the DASH scores represents a meaningful change (10% of the total score of 100) in clinical outcome status, a difference of 10 points detectable with 93% power

provides good assurance that clinically meaningful differences were not missed because of low power.

An assessment of internal consistency among the responses was made to determine whether the responses were sufficiently stable to be considered reliable. The Cronbach alpha coefficient was 0.78 for the symptom domain and 0.81 for the function domain on the Boston carpal tunnel questionnaire and 0.91 for the tasks domain and 0.71 for the symptom domain on the DASH questionnaire. As all coefficient values exceeded 0.6, there was evidence of acceptable internal consistency for the instrument.

TABLE IV Comparison of the Functional Status as Assessed by Self-Reported Questionnaires

	Operation Group*	Cancellation Group*	P Value
Boston carpal tunnel questionnaire			
Symptom score			
Initial score	2.89 ± 0.46	2.73 ± 0.51	0.262
Follow-up score	1.56 ± 0.28	1.71 ± 0.42	0.159
Change in score	1.33 ± 0.53	1.01 ± 0.61	0.066
Function score			
Initial score	2.91 ± 0.47	2.83 ± 0.43	0.545
Follow-up score	1.50 ± 0.27	1.67 ± 0.35	0.077
Change in score	1.41 ± 0.58	1.16 ± 0.55	0.130
DASH questionnaire†			
Initial score	42.76 ± 16.62	40.78 ± 12.64	0.624
Follow-up score	19.84 ± 9.82	20.61 ± 9.87	0.787
Change in score	22.92 ± 13.12	20.17 ± 7.70	0.329

*The values are given as the mean and the standard deviation. †DASH = Disabilities of the Arm, Shoulder and Hand questionnaire.

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We received no funds to do this study.

Results

Our primary hypothesis was that patients with carpal tunnel syndrome would have a specific reason for choosing or not choosing to undergo carpal tunnel release. Accordingly, patients were directly asked for the reasons underlying their decisions. The highest-ranked reason for choosing surgery was the severity of the symptoms (tingling or pain) rather than fear of progression or a positive electrodiagnostic result. The highest-ranked reason for canceling surgery was some degree of symptom improvement during the waiting period, rather than fear of undergoing surgery or economic burden. Items ranked in order of importance for the operation and cancellation groups are presented in Table I.

Our secondary hypothesis was that the groups would differ in terms of sociodemographic data, concerns, and functional status. The groups were found to be similar in terms of age, sociodemographic variables, follow-up length, and electrophysiological findings²⁴ (Table II). However, our analysis of the levels of patient concerns showed that a persistent scar or pillar pain and transient weakness of the hand concerned the cancellation group significantly more than the operation group. Furthermore, members of the cancellation group were also more concerned about their ability to pay bills, the financial burden imposed on their family, and an inability to care for home and family, which suggested that socioeconomic concerns were significantly greater in the cancellation group, although the mean annual incomes were similar in the groups. Disease persistence and recurrence was the issue of greatest concern in both groups (Table III).

The Boston carpal tunnel and DASH questionnaires were completed when the patients were first put on the waiting list for surgery, and no significant difference was identified between the groups. Interestingly, the second set of questionnaires revealed that both the Boston carpal tunnel and the DASH scores improved significantly in both groups ($p < 0.001$ for both), with no significant intergroup difference identified (Table IV).

Discussion

In this study, we identified factors that affect the willingness of patients with carpal tunnel syndrome without a known cause to undergo carpal tunnel release. This was done in an attempt to understand the decision-making process from the patient's perspective. Previous studies have identified factors that patients consider when they are deciding to undergo total joint arthroplasty, e.g., future expectation of pain relief, improved walking, restoration of quality of life^{16,25}, fear of surgery^{26,27}, arthritis severity, risks of surgery, the opinions of others^{14,15}, past negative experience with surgery or unwanted treatment, and the advice or apathy shown by health professionals toward surgery¹⁹. In the present study, subjective symptoms were found to be the most important reason for undergoing surgery from the patient's perspective. Electrodiagnostic findings tend to affect a physician's choice of treatment^{9,28,29}, but they were not found to be compelling reasons for undergoing surgery from the patient's perspective.

We also compared sociodemographic characteristics, treatment histories, electrodiagnostic findings, and functional status, as assessed by the Boston carpal tunnel and DASH scores, and found no significant difference between the study groups. Previous studies have shown that older people have more unexpressed concerns about orthopaedic surgery³⁰ and

are less willing to undergo total joint replacement. Furthermore, the perceptions of the benefits of total joint replacement were less positive among those with a low socioeconomic status, women¹⁵, and black Americans as opposed to white Americans³¹⁻³³. In a study on factors that affect treatment decisions in life-threatening illnesses such as breast cancer, patients who did not accept their physician's treatment recommendations were found to be better educated and more likely to be risk takers³⁴. The present study was composed entirely of Korean women, and thus we were unable to investigate ethnic or sex differences. We speculate that the reason why no differences in patient characteristics were observed in the present study is that carpal tunnel release is perceived as a relatively minor procedure compared with total joint replacement or cancer treatment.

Starting at the greatest concern and going to lesser concerns among those that were significantly different between the groups (Table III), patients who canceled surgery were most concerned about transient weakness of the hand followed by the inability to take care of family, the inability to take care of the home, the inability to pay bills, the family's financial burden, and persistent scar or pillar pain. These findings indicate that patients have financial concerns although they did not rank economic burden as the major reason for cancellation. It should also be noted that patient concerns can be influenced by differences among health-care organizations, as was shown by a study in the United Kingdom, which found that financial considerations had little effect on the decision to cancel surgery¹⁷. Regardless of the given health-care system, we believe that, by understanding a patient's concerns, the physician can provide more patient-oriented consultation and enhance the quality of health care^{17,19}.

The Boston carpal tunnel and DASH scores improved in both study groups, and those who canceled or underwent surgery had similar self-reported outcome scores, whereas our expectation was that the two groups would have quite different functional status. We are uncertain whether this similarity was due to real disease improvement because outcome assessments were subjective, and no objective data, such as follow-up electrophysiological studies or physical examinations of muscle atrophy and sensibility, were available. Furthermore, this finding does not mean that all patients who canceled surgery would show improvement; in fact, three of the thirty-six patients who canceled surgery underwent surgery at other hospitals and those with improved function may have been more inclined to complete and return questionnaires. In addition, patients who have symptoms such as night pain and severe tingling sensation often have a diminution in symptoms over time as chronic nerve damage progresses¹¹. Another possible explanation is that those who avoided surgery may have rejected the medicalization of carpal tunnel syndrome or adapted to their disability after realizing that carpal tunnel syndrome is neither life-threatening nor likely to result in progressive paralysis of the upper extremity. A similar pattern of surgery avoidance was observed in a study on total joint surgery, in which patients referred to their arthritic conditions as age

normative¹⁹. Nevertheless, the finding that the majority of patients who canceled surgery demonstrated no subjective symptomatic or functional deterioration and reported improvements in outcome scores suggests that recommendations for surgery on the basis of patient symptoms is reasonable from the patient's perspective.

This study has several limitations. The first and most notable was that our sample was subject to selection bias; that is, patients who canceled surgery had actually chosen initially to undergo an operation, and thus they may not represent all those who are unwilling to receive operative treatment, such as those who initially refuse surgery. Second, our sample was also subject to responder bias, as those with improved function may have been more inclined to complete and return questionnaires. Third, conservative treatment of only two months before recommending surgery was short, and treatment protocols including injections were not the same for all patients. Fourth, our sample was small and our patients were all female Korean homemakers who had no possibility of claiming compensation, and thus they do not represent the general population with carpal tunnel syndrome. Furthermore, we acknowledge that restricting our investigation to homemakers could weaken the merits of the study, although it may well have reduced the effects of some confounding factors. Fifth, the study was retrospective, and thus it may not accurately provide the true reasons for choosing to undergo or cancel surgery or the real concerns of patients at the time of decision-making. Furthermore, we relied on a restricted number of questions, which may not have embraced all reasons and concerns. Sixth, this study was based on patients treated by one physician, and the use of different indications for surgery and methods of consultation might have resulted in different patient responses. Finally, the Korean language version of the Boston carpal tunnel questionnaire still requires validation in terms of its reliability, responsiveness, and consistency.

Given these limitations, our study showed that subjective symptoms were the most important decision-making consideration for patients with carpal tunnel syndrome. Furthermore, those who canceled the operation had self-reported functional scores that were similar to those who had undergone surgery. ■

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