Trapeziometacarpal Arthrosis: Predictors of a Second Visit and Surgery

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Abstract Trapeziometacarpal arthrosis is expected with advancing age and a limited percentage of people seek medical attention for it. We studied patients after their first appointment to address trapeziometacarpal arthrosis with a hand surgeon to determine factors associated with return for a second visit and eventual election of operative treatment. A billing database identified 306 patients in the practice of three hand surgeons with a new diagnosis of TMC arthrosis and no associated diagnoses. Bivariate and multivariable logistic regression analyses sought factors associated with a second visit and operative treatment among demographic and visit related factors. One hundred and forty-three patients (47 %) returned for one or more additional visits and 46 (15 %) eventually elected operative treatment within the study period. Independent predictors of a return visit included injection at first visit, splint at first visit, and doctor's recommendation for a return visit. The predictors of surgery were treating surgeon and prescription of a splint at the first visit, but splint at first visit was only predictive for one of the three surgeons. When patients first learn about their trapeziometacarpal arthrosis, the behavior of the hand surgeon may have a strong influence on return visits and eventual choice of operative treatment.

Keywords Trapeziometacarpal arthrosis · Surgery · Injection · Splint · Return visit

Level of Evidence: Prognostic, Level 4.

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Introduction

Trapeziometacarpal arthrosis can be considered a normal and inevitable part of human aging [1]. It can be assumed that only a modest percentage of people seek medical advice for trapeziometacarpal arthrosis. Among those that do see a doctor, there is substantial variation in symptoms, disability, and treatment choice [2]. Since pathophysiology (e.g. radiographic findings, deformity, etc.) has not, to date, been shown to correlate with this variation, personal and circumstantial factors are important to consider [3].

Our objective was to study new patients presenting with TMC arthrosis in order to determine factors associated with return for a second visit and eventual election of operative treatment.

Method and Materials

Study Design

Using a protocol approved by our Human Research Committee, billing records were used to identify all patients seen by one of three hand surgeons for an initial evaluation of trapeziometacarpal arthrosis between 2002 and 2009. Exclusion criteria included other associated diagnoses such as carpal tunnel syndrome or trigger finger. Patients that had any prior hand surgery were excluded. After review of the medical records of 759 patients, 306 met the inclusion and exclusion criteria.

The following were collected from the medical record: doctor's recommendation for a return visit, age, sex, race, educational level, the treating surgeon, one or both hands affected, the total number of visits, number of "no showed" and cancelled visits, radiographs obtained at the first visit,

injections received, if the patient was prescribed a splint, and operative treatment. Each surgeon has their own style, but otherwise no specific protocols were used.

Statistical Analysis

All recorded variables were analyzed to determine if they were associated with a return visit. Bivariate analysis consisted of Student's *t*-test for age and Pearson chi-square test for nominal or categorical variables. To adjust for possible confounding and correlated variables, multivariable logistic regression analysis with backward selection was applied to identify significant predictors of return visit with the likelihood ratio test used to assess significance of the variables [4]. Maximum likelihood estimation was used to derive probabilities of return visit based on the combinations of significant predictor variables. For both outcomes, the *c* index was used to judge the predictive ability of the multivariable logistic regression model [5]. Two-tailed $p < 0.05$ were considered statistically significant.

A similar approach was applied in determining predictors of surgery within the study period using the candidate variables described above except for doctor's recommendation to return. In addition, a two-way interaction term was tested to assess whether splinting at first visit was related to eventual surgery for all three surgeons or whether this relationship depended on the particular treating surgeon.

Results

Predictors of Return Visit

Among all 306 patients, 143 (47 %) returned for one or more additional visits. In bivariate analysis five of the ten variables were significantly associated with a return visit: treating surgeon ($p < 0.001$), injection at first visit ($p < 0.001$), splint at first visit ($p < 0.001$), radiographs at first visit ($p = 0.006$), and doctor's recommendation to return ($p < 0.001$) (Table 1).

Multivariable logistic regression analysis confirmed that the independent predictors of a return visit included injection at first visit, splint at first visit, and doctor's recommendation (all $p < 0.001$). We pooled the results across all three treating surgeons and determined the likelihood of a return visit using logistic regression (Fig. 1). Specifically, if a patient receives an injection at first visit, we estimate a 100 % return rate. For patients not receiving an initial injection, 58 % to return for another visit if they were initially splinted and the doctor recommends a return visit. Among patients who do not have splinting at their visit and the doctor does not explicitly recommend a return visit, the likelihood of a return visit is only 5 % (1 in 20 cases). The *c*

index for this predictive logistic model is 0.78 (95 % confidence interval: 0.73–0.84), which represents very good to excellent prediction.

Predictors of Surgery

Forty-six of the 306 (15 %) patients elected operative treatment within the study period. In comparing the 46 patients who had surgery and the 260 who did not, bivariate analysis indicated only two significant differences: treating surgeon ($p < 0.001$) and prescription of a splint at the first visit ($p < 0.001$). (Table 2)

Multivariable logistic regression indicated a highly significant two-way interaction between treating surgeon and the use of splinting at first visit (likelihood ratio test = 55.5, $p < 0.001$), which confirmed that the influence of splinting on subsequent surgery depended heavily on the particular surgeon. For surgeon 1, a significantly higher percentage of patients who were initially splinted underwent subsequent surgery, however the influence of splinting had no relationship with eventual surgery among patients treated by surgeons 2 and 3. The *c* index for this predictive logistic model is 0.78 (95 % confidence interval: 0.72–0.84).

Discussion

Just under half of patients with TMC arthrosis return for a second visit and a small percentage eventually choose surgery. The factors associated with a return visit— injection or splint at the first visit, and recommendation for a return visit—likely reflect both patient and surgeon preferences. In contrast, election of operative treatment was strongly surgeon-related. This is counterintuitive to many hand surgeons who assume that patients that have more treatment have worse pathology.

This data should be interpreted in light of the fact that few patients had radiographs defining the degree of pathophysiology. Also, we were limited to data available in the medical record. On the other hand, the strict inclusion criteria are likely to result in a representative cohort of patients from all three surgeon's practices. For instance, age—a strong correlate of disease severity—was not a significant factor. With only three surgeons there was substantial variation in treatment, but a larger cohort of surgeons would be worthwhile.

There is wide variation in both patient and surgeon preferences [6]. Spaans et al. documented substantial variation in both radiographic classification and treatment strategy [7]. In another study the surgeon's training and experience were the primary determinant of the operative procedure offered [8]. There is insufficient evidence to determine the optimal rate of operative treatment for trapeziometacarpal

Table 1 Analysis of factors associated with return visit

Variable	Return Visit (<i>N</i> =143)	No Return Visit (<i>N</i> =163)	Bivariate <i>p</i> -value	Multivariable <i>p</i> -value
Age, years	61.3±10.0	60.6±10.6	0.58	
Gender			0.56	
Female	117 (48 %)	129 (52 %)		
Male	26 (43 %)	34 (57 %)		
Education			0.47	
Some high school	3 (30 %)	7 (70 %)		
High school graduate	24 (53 %)	21 (47 %)		
Some college	14 (58 %)	10 (42 %)		
College graduate	60 (44 %)	75 (56 %)		
Unknown	42 (46 %)	50 (54 %)		
Surgeon			<0.001*	<0.001*
1	94 (59 %)	65 (41 %)		
2	44 (34 %)	85 (66 %)		
3	5 (28 %)	13 (72 %)		
Number of hands			0.97	
One hand	95 (47 %)	108 (53 %)		
Both hands	48 (47 %)	55 (53 %)		
Injection at first visit			<0.001*	<0.001*
No	132 (45 %)	163 (55 %)		
Yes	11 (100 %)	0 (0 %)		
Splinting at first visit			<0.001*	<0.001*
No	6 (10 %)	51 (90 %)		
Yes	137 (55 %)	112 (45 %)		
Radiographs at first visit			0.006*	0.40
No	39 (36 %)	69 (64 %)		
Yes	104 (53 %)	94 (47 %)		
Doctor recommended			<0.001*	<0.001*
No	7 (11 %)	57 (89 %)		
Yes	136 (56 %)	106 (44 %)		

* Statistically significant

Fig. 1 Graphical depiction of factors associated with likelihood of return visit

Table 2 Analysis of factors associated with surgery for TMC arthritis

Variable	Surgery (<i>N</i> =46)	No Surgery (<i>N</i> =260)	Bivariate <i>p</i> -value	Multivariable <i>p</i> -value
Age, years	60.4±9.6	61.0±10.4	0.69	
Gender			0.10	0.06
Female	41 (17 %)	205 (83 %)		
Male	5 (8 %)	55 (92 %)		
Education			0.84	
Some high school	1 (10 %)	9 (90 %)		
High school graduate	9 (20 %)	36 (80 %)		
Some college	4 (17 %)	20 (83 %)		
College graduate	18 (13 %)	117 (87 %)		
Unknown	14 (15 %)	78 (85 %)		
Surgeon			<0.001*	<0.001*
1	42 (26 %)	117 (74 %)		
2	4 (3 %)	125 (97 %)		
3	0 (0 %)	18 (100 %)		
Number of hands			0.13	
One hand	26 (13 %)	177 (87 %)		
Both hands	20 (19 %)	83 (81 %)		
Injection			0.07	0.53
No	42 (14 %)	252 (86 %)		
Yes	4 (33 %)	8 (67 %)		
Injection at first visit			0.25	
No	43 (15 %)	252 (85 %)		
Yes	3 (27 %)	8 (73 %)		
Splint at first visit			<0.001*	<0.001*
No	0 (0 %)	57 (100 %)		
Yes	46 (19 %)	203 (81 %)		
Radiographs at first visit			0.08	0.17
No	11 (10 %)	97 (90 %)		
Yes	35 (18 %)	163 (82 %)		
Total time of follow-up	6.6 (5.4–7.4)	6.3 (5.4–7.2)	0.20	

* Statistically significant

arthrosis. Indeed, it's notable that a planned American Academy of Orthopaedic Surgeons Evidence Based Guideline was cancelled for lack of evidence.

Trapeziometacarpal arthrosis is an expected part of normal human ageing to which most people adapt well. All treatments for arthritis are discretionary and address quality of life.

Patients request treatment, they don't require or need it. If arthritis is the grey hair of the thumb, then treatment with splints and injections might medicalize (create a disease needed treatment) changes in the human body that are expected normal and routinely adapted to, thereby leading patients to choose more treatment, including more invasive or risky treatments. If coping strategies and adaptation are emphasized, arthritis may be considered expected and normal rather than a disease requiring treatment.

Prospective studies should examine the shared decision-making process, the determinants of patient preferences, and the influence of psychological and sociological factors in addition to the specific surgeon's management style on the decision for a second visit and election of surgery. In particular, decision aids merit study for quality of life issues such as arthritis and discretionary surgeries such as trapeziometacarpal arthroplasty.

Decision aids are informative handouts, videos and websites that facilitate the shared decision making by helping patients and their healthcare providers choose among reasonable treatment options. In growing body of evidence decision aides consistently improve patient knowledge and generate a more realistic perception of outcomes when compared to usual care [9]. In addition, decision aides reduce the use of discretionary surgery without apparent adverse

effects on health outcomes or satisfaction [10]. Hand surgeons should evaluate the ability of decision aids such as structured handouts, videos, or web-based tutorials to decrease symptoms and disability and improve patient satisfaction in the treatment of arthritis and other common conditions.

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