Acta Orthop. Belg., 2020, **86 e-SUPPLEMENT** 1, 87-93

ORIGINAL STUDY

Factors associated with the prevalence of incidental disease in the upper extremity

Sjoerd Th. MEIJER, Joost STROOKER, Bart LUBBERTS, David RING

From the Orthopaedic Hand and Upper Extremity Service, Massachusetts General Hospital, Boston, US

To learn more about the benefits of resiliency to upper limb health, we studied the null hypothesis that there is no difference in the prevalence of incidental disease between patients who seek care for an injury compared to those with a nontraumatic condition. Our secondary aim was to look for factors associated with incidental disease.

One hundred and sixty five patients provided their demographics and completed measures of psychological factors and upper extremity-specific symptoms and disability. A hand surgeon examined subjects for objective signs of incidental disease.

Incidental disease was more common in patients with an injury. The only factor independently associated with incidental disease was older age.

The finding that incidental disease is more common in injured patients and more common with age supports the concept that common upper limb diseases are often undiagnosed and adequately adapted.

Prognostic, Level II

Keywords: Coping ; incidental disease ; upper extremity.

INTRODUCTION

Carpal tunnel syndrome, cubital tunnel syndrome, Dupuytren disease, trapeziometacarpal arthrosis, distal interphalangeal arthrosis, trigger finger, ganglion cysts, and other benign masses are common diseases of the upper limb (2,7,9,11,13,17-18). These diseases occur more frequently with advancing age and patients are often diagnosed with more than one disease *(8,12,15-16)*. The clinical presentation is diverse and ranges from incidental/asymptomatic to quite limiting.

There is limited correlation between the degree of objective pathophysiology and the degree of symptoms and limitations *(5-6,10)*. For example, the degree of trapeziometacarpal arthrosis on radiographic images does not correspond well with pain intensity and limitations *(10)*. As another example, Becker et al. noted that patients with abnormal contralateral median nerve conduction tests often had no symptoms of carpal tunnel syndrome *(5-6)*.

The observation that many patients have upper limb disease that is undiagnosed, adapted, and incidental to their reason for seeing a hand surgeon brings the health benefits of adaptation and resiliency to our attention. The strategies that patients with incidental disease use to be able to depend on their hands might be useful to other

Conflict of interest: All authors declare that they have not received any funding or other benefits in support of this study. No relevant financial relationships to disclose.

■ Sjoerd Th. Meijer, MD.
■ Joost Strooker, MD.
■ Bart Lubberts, MD.
■ David Ring, MD., PhD.
Orthopaedic Hand and Upper Extremity Service, Massachusetts General Hospital, 55 Fruit St, Boston, MA, 02114, US
Correspondence: Sjoerd Th. Meijer, Vondelkade 1, 8023AA, Zwolle, the Netherlands.
E-mail : s.t.meijer@gmail.com

patients. As a start, we have begun to document the prevalence of incidental disease and factors associated with it.

The aim of this study was to see if there is a difference in the prevalence of incidental upper extremity disease between patients who seek care for an unexpected reason and patients with a more longstanding or indolent condition. If upper extremity diseases are prevalent and often adequately adapted, we would expect to see a higher prevalence of disease in patients that see a hand surgeon after injury rather than to address an atraumatic condition. We tested the primary null hypothesis that there is no difference in the prevalence of incidental diseases between patients who present with an injury and patients with a non-traumatic condition. Our secondary null-hypotheses were 1) there are no demographic factors associated with the presence of incidental diseases, and 2) there is no association between PROMIS Pain interference, PROMIS Depression, QuickDASH, and SHAI-5 scores and the presence of incidental diseases.

METHODS

This study was approved by our institutional review board and informed consent was obtained from all patients. Between August 2013 and March 2015 new and follow-up patients presenting to the outpatient clinic of one orthopaedic hand surgeon at the Hand and Upper Extremity Service of the *NAME INSTITUTION* were invited to participate in this study. The long study period is explained by a gap between researchers working on this project, a single hand surgeon's practice, and competition with other studies in the office. Inclusion criteria were patients aged 40 years and older, fluent in English, and able to provide informed consent. Pregnant women were excluded due to stipulations in the IRB protocol. Patients were enrolled before their visit with the surgeon. All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

An a priori analysis for our primary study question determined that 165 patients were needed to provide a statistical power of 80% (β=0.20, α=0.05) to detect an effect size of 0.22 (small to medium) difference between incidental conditions in trauma compared to nontrauma patients.

Our primary outcome variable was presence of any incidental disease. At the end of the consultation, the surgeon examined subjects for objective signs (e.g. atrophy, deformity, crepitation, weakness) of the following conditions: carpal tunnel syndrome, cubital tunnel syndrome, Dupuytren contracture, trapeziometacarpal arthrosis, distal interphalangeal arthrosis, trigger finger, ganglion cysts, and other benign masses. The presenting diagnosis was defined as trauma related or atraumatic.

Subjects completed demographic, condition-specific, and outcome questionnaires including an 11-point ordinal rating of pain intensity, an arm specific disability measure (QuickDASH), a measure of health anxiety (the Short Health Anxiety Inventory; SHAI-5), and the Patient Reported Outcomes Measurement Information System (PROMIS) Computer Adaptive Tests (CAT): Pain Interference and Depression. The questionnaires were administered and data collected through Assessment Center on either a laptop or a tablet computer.

The 11-item QuickDASH is used to assess upper extremity-related disability on a scale from 0-100, each answered on a 5-point Likert scale. It is a shortened version of the 30-item Disabilities of Arm, Shoulder, and Hand Questionnaire (1). A higher score indicates greater disability.

The SHAI-5 is used to measure anxiety about health. This is an abbreviated 5-item questionnaire based on the original SHAI-18 questionnaire. Each item has a score ranking from 0 to 3 with the total range of score between 0 and 15. A higher score indicates higher health anxiety (2).

PROMIS CAT instruments are composed of 5 response options. Each item increases confidence in the score and reduces the potential for error. The questionnaire continues administering questions until the standard error drops to less than a specified level or until the patient has answered a maximum number of questions (set at 12 for these questionnaires). A t-score of 50 represents the average for the general population (in the United States), with a standard deviation of 10 in most PROMIS instruments. A higher t-score

represents more of the concept being measured (ref). The PROMIS CAT pain interference measures the effect of pain on the physical, mental, and social aspects of one's life (3). The PROMIS depression measures self-reported negative mood (sadness and guilt), views of self (worthlessness and self-criticism), social cognition, and decreased positive affect and engagement. Somatic symptoms are not included, as these can be influenced by comorbid physical conditions (4). PROMIS instruments used in this study inquire about the past 7 days and are not disease specific.

Bivariate and multivariable analyses were conducted to test our hypotheses. The Fisher's exact test was used to assess the association between dichotomous and categorical variables. The Mann-Whitney U test (also known as the Wilcoxon rank-sum test) was conducted for continuous variables. We used nonparametric analysis for continuous variables as visual inspection of histograms suggested non-normal distributions.

Multivariable logistic regression analysis was used to assess the independent relationship of explanatory variables with reoperation by including all variables with a P value below 0.05 in bivariate analysis. All statistical analyses were performed using Stata® 13 (StataCorp LP, College Station, TX, USA) and a two-tailed P value below 0.05 was considered significant.

A total of 165 patients were enrolled for this study. No invited patients declined participation. The median age of the enrolled patients was 60 years (interquartile range 50 to 70 years), ninety-one (55%) were women. Most common reasons for visiting the hand service were carpal tunnel syndrome, fracture of the wrist, and fracture of one or more fingers (Table I).

RESULTS

We found that injured patients (P= 0.017) were more likely to have incidental disease of the upper extremity than patients presenting for care of a nontraumatic condition (Table II). The most common incidental diseases in our cohort were trapeziometacarpal arthrosis (65% [64 of 98 cases]), distal interphalangeal arthrosis (57% [56 of 98 cases]), and Dupuytren disease (20% [20 of 98 cases]) (Table III).

Table I. — Baseline characteristics between the three groups

	Median	Interquartile range
Age	60	50-70
	n	%
Male	74	45
Marital status		
Single	31	19
Living with partner	3	1.8
Married	103	62
Separated/Divorced	18	11
Widowed	10	6.1
Work status		
Working full-time	78	47
Working part-time	24	15
Homemaker	6	3.6
Retired	41	25
Unemployed (unable to work)	12	7.3
Unemployed (able to work)	2	1.2
On workers compensation	0	
Currently on sick leave	2	1.2
Race		
White	148	90
Black or African American	6	3.6
Asian	3	1.8
More than one race	2	1.2
Other or unknown	6	3.6
Presenting diagnoses		
Carpal tunnel syndrom	20	12
Dupuytren	5	3.0
Epicondylitis	7	4.2
Trigger finger	14	8.5
Ganglion	2	1.2
Arthritis in the hand and/or fingers	8	4.9
Laceration hand and/or finger	12	7.3
Fracture thumb/finger	16	9.7
Fracture wrist	21	13
Fracture elbow	7	4.2
Other*	20	12
Nonspecific pain	34	21

* Other diagnoses e.g. Mallet finger, de Quervain's disease, and amputation.

Table II. — Bivariate analysis of factors associated with presence of incidental disease

	No incidental disease (n=67)	**Incidental disease (n=98)**	
	Median (interquartile range)	**Median (interquartile range)**	**P value**
Age	52 (45-60)	66 (58-73)	**<0.001**
BMI*	26 (24-30)	26 (23-30)	0.71
Smoking	4 (6.0)	9 (9.2)	0.56
Education*	16 (13-18)	16 (12-18)	0.29
	n (%)	**n (%)**	
Male	34 (51)	40 (41)	0.27
Married	45 (67)	58 (59)	0.33
Working full-time	40 (60)	38 (39)	**0.011**
Race white	55 (82)	93 (95)	**0.017**
Right hand dominant*	60 (90)	88 (90)	0.99
Trauma	28 (42)	60 (61)	**0.017**
Additional conditions	28 (42)	53 (54)	0.15
Diabetes mellitus type 1 or 2	7 (10)	8 (82)	0.78
Cardiovasculair disease	9 (13)	27 (28)	**0.035**
Dyslepidemia	1 (1.5)	4 (4.1)	0.65
Arthritis, except for the hands	4 (6.0)	6 (6.1)	0.99
Cancer	2 (3.0)	6 (6.1)	0.48
Psychiatric disorder	1 (1.5)	4 (4.1)	0.65
Other**	14 (21)	20 (20)	0.99

Bold indicates significant (P value below 0.05), * Variable total number of patients deviates from total n: total patients in study (total number of patients with subclinical disease) BMI 162 (95), Education 164 (98), and Hand dominance 162 (96). ** Other: e.g. eczema, cataract, and COPD.

Older age (P<0.001), working full-time (P=0.011), white race (P=0.017), and cardiovasculair disease (P= 0.035) were also associated with incidental disease of the upper extremity. Accounting for potential confounding using multivariable analysis, only older age (OR 1.1, Standard Error 0.024, 95% CI: 1.1-1.2, P<0.001) was independently associated with an increased risk of incidental disease (Table IV).

We found no association between incidental disease and disability, health anxiety, ineffective coping strategies, or symptoms of depression (Table V).

DISCUSSION

Among the common diseases of the upper limb, there is notable discrepancy between objective pathophysiology and the degree of symptoms and limitations. Pain intensity, magnitude of disability, and seeking care are sometimes better explained by mindset and circumstances more than pathophysiology. In this study, we looked for factors associated with incidental disease. We found more incidental diseases in injured patients than in patients with non-traumatic conditions. Incidental disease was more common with older age.

This study has a number of limitations. First, there were some missing answers on the demographics and the questionnaires, but given the small number of omissions, this should have limited influence. Second, because the diagnoses were based on clinical signs by a single surgeon there may be variation from what other surgeon's would diagnose.

Table III. — Incidental diagnoses in the hand (n=98)

Diagnosis	Total patients	Right hand	Left hand
	n (%)	n	n
Carpal tunnel syndrome	8 (8.2)	6	7
Cubital tunnel syndrom	8 (8.2)	5	6
Dupuytren disease	20 (20)	12	17
Ganglion cyst	13 (13)	8	8
Benign mass	3 (3.1)	1	2
Trapeziometacarpal arthrosis	64 (65)	56	57
Distal interphalangeal arthrosis	56 (57)	48	47
Index finger		36	32
Long finger		20	7
Ring finger		12	4
Small finger		23	15
Trigger finger	6 (6.1)	5	2
Thumb		1	1
Index finger		1	1
Long finger		3	0
Ring finger		1	1
Small finger		0	1

Table IV. — Multivariable logistic regression of factors associated with presence of incidental disease

	Odds Ratio	**95% Conficence Interval**		**Standard Error**	***P***
Age	1.1	1.1	1.2	0.024	**<0.001**
Heart & vasculair disease	1.3	0.50	3.5	0.67	0.57
Trauma	0.61	0.28	1.3	0.24	0.20
White race	3.0	0.83	11	2.0	0.094
Working full-time	0.96	0.43	2.1	0.39	0.92

Bold indicates significant (P value below 0.05).

Table V. — Function in association with incidental disease of the hand

	No Incidental Disease (n=67)	Incidental Disease (n=98)	
	Median (interquartile range)	Median (interquartile range)	P
PROMIS pain interference	56 (53-62)	54 (50-60)	0.11
Quick-DASH-11*	33 (16-52)	27 (14-48)	0.56
PROMIS depression	46 (39-52)	48 (43-54)	0.10
SHAI-5 (Short Health Anxiety Inventory)	3 (2-6)	3 (2-5)	0.38

On the other hand since only objective findings such as crepitation, deformity, weakness, and atrophy were used to make diagnoses (i.e. fairly advanced disease), the diagnoses are likely reliable. Finally, we would anticipate more incidental diagnoses if diagnostic tests such as radiographs or electrodiagnosis were used.

We found more incidental disease in patients with trauma. It is plausible that more adaptive patients would be less likely to bring common hand illnesses such as arthrosis to the attention of a doctor and would be more likely to see a hand surgeon for trauma. Becker et al strengthen this theory. They found having more adaptive coping strategies, such as less catastrophic thinking, is one of the most important contributors for fewer symptoms and less disability *(3-5)*.

It makes sense that age was the only factor independently associated with incidental disease. Many upper limb illnesses accumulate with age. For instance, arthrosis, Dupuytren disease, atrophy from late state peripheral mononeuropathy, and untreated benign masses--along with age-related skin changes—do not resolve and result in the characteristic appearance of the aged hand *(2,7-9, 11-13,15-18)*. The human capacity for adapting to these changes is a meaningful component of good health *(5-6,10,14,19)*. One risk of doing this study was calling attention to these diseases in a way that might make them more symptomatic or limiting. There was also a risk of medicalizing these findings – of making them into a condition needing treatment rather than normal aspect of human development.

If patients with incidental disease are more adaptive, one might expect to measure differences in magnitude of disability, symptoms of depression, ineffective coping strategies in response to pain, and health anxiety between patients with and without incidental disease, but these were not observed in our study. This may be due to the influence of injury or age on psychological factors (i.e. confounding). Or it may be that these measurable psychological factors don't completely capture the construct of resiliency.

These data support the concept that many common upper limb diseases go undiagnosed and are adequately adapted in a substantial portion of the population. This supports the health benefits of adaptation and resiliency. It also emphasizes the important role that hand surgeons play in helping patients understand and adapt to their body's changes and the impairments that are not yet amenable to medical treatment. It may help to script and practice explanations of the benign and adaptable nature of most upper limb diseases using empathetic, hopeful, enabling language that is culturally sensitive and understood by patients of all levels of health literacy. This approach can be used both in our conversations with patients as well as in balanced, dispassionate decision aids in the form of web sites, pamphlets, or videos. The influence of such focused communication efforts on patient reported outcomes, satisfaction with care, and surgeon-to-surgeon variations in care (the foci of the new emphasis on value in health care) merit additional study

REFERENCES

1. **Allegrante JP, Marks R.** Self-efficacy in management of osteoarthritis. *Rheum Dis Clin North Am.* 2003 ; 29 : 747-768.
2. **Armstrong AL, Hunter JB, Davis TR.** The prevalence of degenerative arthritis of the base of the thumb in post-menopausal women. *J Hand Surg Br.* 1994 ;1 9 : 340-341.
3. **Bagge E, Bjelle A, Eden S, Svanborg A.** Osteoarthritis in the elderly: clinical and radiological findings in 79 and 85 year olds. *Ann Rheum Dis.* 1991 ; 50 : 535-539.
4. **Becker SJ, Briet JP, Hageman MG, Ring D.** Death, taxes, and trapeziometacarpal arthrosis. *Clin Orthop Relat Res.* 2013 ;471 : 3738-3744.
5. **Becker SJ, Makarawung DJ, Spit SA, King JD, Ring D.** Disability in patients with trapeziometacarpal joint arthrosis: incidental versus presenting diagnosis. *Hand Surg Am.* 2014 ; 39 : 2009-2015.
6. **Bingham RC, Rosecrance JC, Cook TM.** Prevalence of abnormal median nerve conduction in applicants for industrial jobs. *Am J Ind Med.* 1996 ; 30 : 355-361.
7. **Bongers FJ, Schellevis FG, van den Bosch WJ, van der Zee J.** Carpal tunnel syndrome in general practice (1987 and 2001): incidence and the role of occupational and non-occupational factors. *Br J Gen Pract.* 2007 ; 5 7: 36-39.
8. **Florack TM, Miller RJ, Pellegrini VD, Burton RI, Dunn MG.** The prevalence of carpal tunnel syndrome in patients with basal joint arthritis of the thumb. *J Hand Surg Am.* 1992 ; 17 : 624-630.
9. **Gudmundsson KG, Arngrimsson R, Sigfusson N, Bjornsson A, Johnsson T.** Epidemiology of Dupuytren's disease: clinical, serological, and social assessment. *J Clin Epidemiol.* 2000 ; 53 : 291-296.
10. **Haara MM, Heliovaara M, Kroger H,** *et al.* Osteoarthritis in the carpometacarpal joint of the thumb. Prevalence and associations with disability and mortality. *J Bone Joint Surg Am.* 2004 ; 86-A : 1452-1457.
11. **Kaufmann RA. Logters TT, Verbruggen G, Windolf J, Goitz RJ.** Osteoarthritis of the distal interphalangeal joint. *J Hand Surg Am.* 2010 ; 35 : 2117-2125.

12. **Kim JH, Gong HS, Lee HJ** *et al.* Pre- and post-operative comorbidities in idiopathic carpal tunnel syndrome: cervical arthritis, basal joint arthritis of the thumb, and trigger digit. *J Hand Surg Eur* 2013 ; 38 : 50-56.
13. **Latinovic R, Gulliford MC, Hughes RA.** Incidence of common compressive neuropathies in primary care. *J Neurol Neurosurg Psychiatry.* 2006 ; 77 : 263-265.
14. **Lozano-Calderon SA, Souer JS, Jupiter JB, Ring D.** Psychological differences between patients that elect operative or nonoperative treatment for trapeziometacarpal joint arthrosis. *Hand* (N Y). 2008 ;3 : 271-275.
15. **Melone CP, Beavers B, Isani A.** The basal joint pain syndrome. *Clin Orthop Relat Res*. 1987 ; 58-67.
16. **Sless Y, Sampson SP.** Experience with transtrapezium approach for transverse carpal ligament release in patients with coexisted trapeziometacarpal joint osteoarthritis and carpal tunnel syndrome. *Hand* (N Y). 2007 ;2 : 151-154.
17. **Swigart, CR, Eaton RG, Glickel SZ, Johnson C.** Splinting in the treatment of arthritis of the first carpometacarpal joint. *J Hand Surg Am.* 1999 ; 24 : 86-91.
18. **Trumble TE, Rafijah G, Gilbert M** *et al.* Thumb trapeziometacarpal joint arthritis: partial trapeziectomy with ligament reconstruction and interposition costochondral allograft. *J Hand Surg Am.* 2000 ; 25 : 61-76.
19. **Vranceanu AM, Barsky A, Ring D.** Psychosocial aspects of disabling musculoskeletal pain. *J Bone Joint Surg Am.* 2009 ; 91 : 2014-2018.