

Brief Report

Dupuytren's Disease: Personal Factors and Occupational Exposure

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Background *The etiology of Dupuytren's disease is unknown, and the role of occupational exposure is still debated. Our objective was to study the association between occupational exposures, personal risk factors and Dupuytren's disease.*

Methods *In this cross-sectional survey, nine occupational physicians performed clinical examinations, focused on Dupuytren's disease, of 2,406 French male civil servants employed at the Equipment Ministry in 1998 and interviewed them about medical history, leisure manual exposure and occupational biomechanical exposure to vibrations and manual work. A cumulative occupational exposure score was defined, with three levels of exposure.*

Results *Dupuytren's disease was diagnosed in 212 men (8.8%). The occupational exposure score was significantly higher in this group of cases than in the rest of the sample (377 (SD280) vs. 223 (SD250), respectively; $P < 0.0001$). Occupational exposure was associated with Dupuytren's disease (adjusted Odds Ratio = 2.20 [1.39–3.45] for the intermediate and 3.10 [1.99–4.84] for the high exposure groups), with adjustment for age, leisure physical activities, alcohol consumption (≥ 5 servings per day), history of diabetes, epilepsy, hand trauma, and familial history of Dupuytren's disease.*

Conclusion *Manual work exposure was associated with Dupuytren's disease after adjustment for personal risk factors. Longitudinal studies are needed to confirm these results.* Am. J. Ind. Med. 2007.   2007 Wiley-Liss, Inc.

KEY WORDS: Dupuytren's contracture; risk factors; occupational disease

INTRODUCTION

Dupuytren's disease is characterized by chronic contracture of the fourth and fifth fingers of the hand toward the palm, usually accompanied by ridging of the palmar skin [Calif and Stahl, 2007]. This abnormality has been reported in the medical literature since the early 1600s [Dembe, 1996]. Baron Guillaume Dupuytren, in his presentation of December 5, 1831, at the Hotel-Dieu in Paris, clearly identified the disorder's lesion as contracture of the palmar fascia, which he asserted could be surgically treated by excision of the palmar aponeurosis. Although one of the

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earliest references to the relation between this disease and occupational activities dates back to that conference, its etiology remains unknown today and the role of occupational exposure is still debated [Townley et al., 2006]. In most studies, exposure was assessed as manual work versus non manual, based on job title [Early, 1962; Chanut, 1963; Hueston, 1968; Bennett, 1982; Attali et al., 1987; Liss and Stock, 1996; Gudmundsson et al., 2000; Khan et al., 2004; Galimard et al., 2006]. Two studies with a more precise assessment of exposure did not take into account personal factors, such as alcohol consumption, diabetes mellitus, epilepsy or anticonvulsant drug intake, hand trauma, family history of Dupuytren's disease [Mikkelsen, 1978; de la Caffiniere et al., 1983]. Only two studies had considered both occupational and personal risk factors, with a precise assessment of exposure of vibrations but without taking into account other occupational factors [Cocco et al., 1987; Bovenzi, 1994].

Our objective was to study the association between occupational exposure, personal risk factors and Dupuytren's disease in a cross-sectional survey of French men in the regions of Pays de la Loire and Brittany.

METHODS

Population

In 1998, 9 of the 12 occupational physicians at the Ministry of Equipment in these regions included all of the male civil servants they saw that year in this study in their usual work. In France, occupational physicians are responsible for monitoring occupational exposures and performing annual health examinations, which are mandatory for all workers. Workers could refuse the statistical analyses of their personal data and the France's national committee for data protection was informed of the study (CNIL: Commission Nationale Informatique et Liberté).

Exposure

Physicians conducted a structured interview to obtain subjects' age and biomechanical exposure and medical history.

Work tasks defined as entailing biomechanical exposure were: (i) using a tool with handle, (ii) using a vibrating tool, (iii) manual handling, and (iv) repairing mechanical equipment. Subjects were asked separately about whether they performed each task, for how many years they had done so, and for each of those years, if they were exposed for less than 1 month a year, from 1 to 6 months, or 6 months or more.

A score for each exposure was constructed to estimate the total duration of lifetime occupational exposure, expressed in months. The number of years worked was multiplied by an estimate of average annual frequency,

assessed as 0.5 for exposure less than 1 month per year, 3 for 1 to less than 6 months, and 8 for 6 to 12 months. The total exposure score was the sum of the four lifetime scores, one for each defined task. For instance, a man who worked daily for 20 years with vibrating tools (every day = 8; contribution to the score $8 \times 20 = 160$), manual handling (idem) and used a tool with handle (idem) had a score of 480. This score ranged from 0 to 1,344 (mean 237, median 168, standard deviation (SD) 257); 25% of the workers had a score of 421 or more, 33% a score of 326 or more and 33% were not exposed (score = 0).

Three occupational exposure categories were defined: exposure scores of 0 were low-level exposure; scores from 0.5 to 400 intermediate; and a score over 400 high.

An alternative to a global score was considering separately four sub-scores: using a tool with handle, using a vibrating tool, manual handling, and repairing mechanical equipment. Preliminary analyses indicated that the level of exposure to each of these risk factors was significantly higher among cases of Dupuytren's disease. However, a global score was preferred because the levels of exposure to the four risk factors were highly correlated.

The physician inquired about and assessed leisure activities involving the same biomechanical exposures in the same way.

The clinical examination began with a medical history, including history of diabetes mellitus, epilepsy (or anticonvulsant drug intake) and hand trauma, as well as familial history of Dupuytren's disease. Physicians also asked about alcohol consumption and noted those subjects drank more than five servings daily.

The presence of a personal risk factor (any one of history of diabetes mellitus, epilepsy or anticonvulsant drug intake, or hand trauma, family history of Dupuytren's disease, or alcohol consumption of five servings/day or more, compared with none) was also considered.

Diagnosis

The physical examination looked for clinical signs of thickening of the palmar fascia and/or flexion contracture in phalanx 2, 3, 4, or 5.

Statistical Analysis

Data were anonymized, entered, and analyzed with SAS software (SAS v8.2, SAS Institute, Inc., Cary, NC). Bivariate analyses used Student's *t*- and chi-square tests, and multivariate analysis used logistic models, where risk factors were entered into the model all together. Interactions between personal and occupational factors were tested (Proc Logistic under SAS software). Associations were considered significant if the *P*-value was less than 0.05.

RESULTS

The study included 2,406 male civil servants seen in 1998 (less than 5% refused to be included the study). With 212 men suffering from Dupuytren's disease, the point prevalence was 8.8%. Case subjects, that is, those diagnosed with Dupuytren's disease, were older on average than those not so diagnosed (50.7 years (SD 5.4) versus 44.8 years (SD 7.6), degree of freedom (DF) 2404, value of t 11.05, $P < 0.0001$). Table I reports the bivariate associations: all of the suspected personal and occupational factors were associated with disease prevalence. The occupational exposure score was significantly higher among case subjects (377 (SD 280) vs. 223 (SD 250), DF 2404, value of t 8.47, $P < 0.0001$).

Disease prevalence according to occupational exposure category was studied separately for subgroups based on the presence or absence of personal factors (Table II). In all situations, prevalence increased with level of occupational exposure. The crude Odds ratio (OR) associated with occupational exposure had quite similar magnitude among those exposed or not to personal factors and all the interaction tests between these factors were not significant (Table III). This implies that the effects can be considered as multiplicative.

Both personal and occupational risk factors were associated with Dupuytren's disease in the multivariate analysis (borderline significance for history of diabetes mellitus), with a dose effect for occupational exposure

TABLE I. Potential Risk Factors for Dupuytren's Disease, Bivariate Analyses

		Number of subjects	Number of cases	Prevalence %	OR (95% CI)	$P = (\chi^2 \text{ test})$
Total		2,406	212	8.8		
Occupation exposures						
Using a tool with handle ^a	No	1,070	54	5.1	1	<0.0001
	Yes	1,336	158	11.8	2.5 (1.8–3.5)	
Using a vibrating tool ^a	No	1,746	131	7.5	1	<0.001
	Yes	660	81	12.3	1.7 (1.3–2.3)	
Manual handling ^a	No	915	49	5.4	1	<0.0001
	Yes	1,491	163	10.9	2.2 (1.6–3.0)	x
Repairing mechanical equipment ^a	No	1,604	139	8.0	1	<0.05
	Yes	590	73	11.0	1.4 (1.1–1.9)	
Work exposure groups	Low level	783	33	4.2	1	<0.0001
	Medium level	979	73	7.5	1.8 (1.2–2.8)	<0.0001 ^b
	High level	643	106	16.5	4.5 (3.0–6.7)	
Leisure manual activities	No	1,229	66	5.4	1	<0.0001
	Yes	1,177	146	12.4	2.5 (1.8–3.4)	
Personal factors						
Familial history of Dupuytren's disease	No	2,186	168	7.7	1	<0.0001
	Yes	220	44	20.0	3.0 (2.1–4.3)	
History of diabetes mellitus	No	2,354	198	8.4	1	<0.0001
	Yes	52	14	26.9	4.0 (2.1–7.5)	
History of epilepsy ^c	No	2,390	206	8.6	1	<0.0001
	Yes	16	6	37.5	6.4 (2.3–17.7)	
History of hand traumatism	No	2,007	164	8.2	1	<0.05
	Yes	399	48	12.0	1.5 (1.1–2.2)	
Alcohol consumption ≥ 5 drinks/day	No	2,043	146	7.2	1	<0.0001
	Yes	363	66	18.2	2.9 (2.1–4.0)	
Any personal factors	No	1,822	120	6.6	1	<0.0001
	Yes	584	92	15.8	2.7 (2.0–3.5)	

OR, odds ratios; CI, confidence interval.

^aUsing a tool with handle, using a vibrating tool, manual handling and repairing mechanical equipment are defined broadly here, to mean at least once during the year.

^bTendency test.

^cOr anticonvulsant drug intake.

Significant results ($P < 0.05$) are in bold characters.

TABLE II. Prevalence (Pr.) and Crude Odds Ratios (OR) for Occupational Factors (Compared to Subjects With Low Exposure) in Subjects With and Without Each Personal Factor

	Low exposure category			Intermediate exposure category			High exposure category		
	N=	Pr. %	OR (95% CI)	N=	Pr. %	OR (95% CI)	N=	Pr. %	OR (95% CI)
Total	784	4.2		979	7.5		643	16.5	
Manual hobbies	No 14	2.7	1	27	5.2	2.0 (1.04–3.87)	25	13.6	5.8 (2.9–11.3)
	Yes 19	7.4	1	46	10.0	1.4 (0.8–2.4)	81	17.7	2.7 (1.6–4.6)
Personal factors									
Familial history of Dupuytren's disease	No 25	3.5	1	53	6.1	1.8 (1.1–2.9)	90	15.1	5.0 (3.1–7.8)
	Yes 8	12.7	1	20	18.2	1.5 (0.6–3.7)	16	34.0	3.5 (1.4–9.2)
History of diabetes mellitus	No 32	4.2	1	69	7.2	1.8 (1.2–2.7)	97	15.7	4.3 (2.8–6.5)
	Yes 1	7.1	1	4	26.7	4.7 (0.5–48.8)	9	39.1	8.4 (0.9–75.4)
History of hand trauma	No 25	3.7	1	57	7.2	2.0 (1.3–3.3)	82	15.3	4.7 (3.0–7.5)
	Yes 8	7.8	1	16	8.5	1.1 (0.5–2.7)	24	22.2	3.4 (1.4–8.0)
Alcohol consumption ≥ 5 drinks/day	No 30	4.0	1	54	6.4	1.6 (1.03–2.57)	62	13.7	3.8 (2.4–6.0)
	Yes 3	7.7	1	19	14.3	2.0 (0.6–7.1)	44	23.0	3.6 (1.1–12.2)
Any personal factors	No 18	2.9	1	36	5.1	1.8 (1.02–3.23)	66	13.5	5.3 (3.1–9.0)
	Yes 15	9.5	1	37	13.6	1.5 (0.8–2.8)	40	26.0	3.3 (1.8–6.4)

N, number of cases in the group; CI, confidence interval.

^aNo stratification on history of epilepsy or anticonvulsant drug intake, due to small number of cases (n = 16).

Significant results ($P < 0.05$) are in bold characters.

(adjusted OR of 2.20 for intermediate level and of 3.10 for high exposure level in the detailed model, Table IV).

DISCUSSION

Main Results

This is one of the first studies of Dupuytren's disease in the workplace to take occupational and most of the clearly

established personal risk factors into account [Galimard et al., 2006]. It is also one of the first to include a precise quantitative assessment of occupational exposure, especially for manual work [Liss and Stock, 1996].

Limitations and Strength of the Study

The first limitation in this study is the cross-sectional design and exposure assessment by questionnaire. Workers

TABLE III. Interaction Study Between Work Exposure and Each Other Factor Separately

	OR (95%CI)	P=
Intermediate work exposure age	1.03 (0.96–1.10)	0.45
High work exposure age	1.01 (0.94–1.08)	0.84
Intermediate work exposure manual hobbies	0.70 (0.29–1.65)	0.41
High work exposure manual hobbies	0.47 (0.20–1.11)	0.08
Intermediate work exposure familial history of Dupuytren's disease	0.86 (0.31–2.37)	0.77
High work exposure familial history of Dupuytren's disease	0.73 (0.25–2.10)	0.56
Intermediate work exposure history of diabetes mellitus	2.66 (0.25–28.53)	0.42
High work exposure history of diabetes mellitus	1.95 (0.21–18.33)	0.56
Intermediate work exposure history of hand trauma	0.54 (0.20–1.48)	0.23
High work exposure history of hand trauma	0.71 (0.27–1.88)	0.50
Intermediate work exposure alcohol consumption ≥ 5 drinks/day	1.23 (0.32–4.77)	0.76
High work exposure alcohol consumption ≥ 5 drinks/day	0.95 (0.26–3.50)	0.94
Intermediate work exposure personal factors	0.83 (0.35–1.95)	0.67
High work exposure personal factors	0.63 (0.27–1.47)	0.29

OR, odds ratios; CI, confidence interval.

The interaction with history of epilepsy or anticonvulsant drug intake, due to small number of cases (n = 16), could not be studied.

TABLE IV. Potential Risk Factors for Dupuytren's Disease in Multivariate Analysis Based on Logistic Models

	"Detailed model"		"Interaction model"	
	aOR (95%CI)	P=	aOR (95%CI)	P=
Age				
—	1.15 (1.12–1.19)	< 0.0001	1.15 (1.12–1.18)	< 0.0001
Work exposure				
Low	1	< 0.0001	1	< 0.0001
Intermediate	2.20 (1.39–3.45)	< 0.001	2.60 (1.43–4.71)	< 0.01
High	3.10 (1.99–4.84)	< 0.0001	3.91 (2.24–6.80)	< 0.0001
Manual hobbies				
—	1.75 (1.25–2.44)	< 0.01	1.78 (1.28–2.47)	< 0.01
Personal factors				
Familial history of Dupuytren's disease	4.61 (3.02–7.03)	< 0.0001	—	—
History of diabetes mellitus	1.95 (0.97–3.93)	0.06	—	—
History of epilepsy	5.08 (1.63–15.78)	< 0.01	—	—
History of hand trauma	1.58 (1.08–2.30)	< 0.05	—	—
Alcohol consumption ≥ 5 drinks/day	1.44 (1.01–2.05)	< 0.05	—	—
Any personal factors	—	—	4.05 (1.94–8.43)	< 0.01
Interaction terms				
Low work exposure personal factors	—	—	1	0.74
Intermediate work exposure personal factors	—	—	0.78 (0.32–1.91)	0.59
High work exposure personal factors	—	—	0.71 (0.30–1.69)	0.42

The first model ("detailed model") included age, work exposure, manual hobbies and each personal factor. The second model ("interaction model") included age, work exposure, manual hobbies, any personal factors, and interactions terms between any work exposure and any personal factors.

aOR, adjusted odds ratios; CI, confidence interval.

Or anticonvulsant drug intake.

Significant results ($P < 0.05$) are in bold characters.

with Dupuytren's disease may be more likely to describe their work as strenuous. To avoid such recall bias, exposure was assessed by the occupational physicians, who knew the workers and their jobs. In addition, the relative precision of the questions should have limited recall bias.

The population was composed of male civil servants in the Ministry of Equipment assigned to Brittany and the Pays de la Loire. Men were chosen because the disease mainly affects men, and most workplace studies have focused on male workers [Chanut, 1963; Mikkelsen, 1978; de la Caffiniere et al., 1983; Thomas and Clarke, 1992; Bovenzi, 1994; Gudmundsson et al., 2000; Khan et al., 2004]. This population was selected precisely because the occupation physicians in this French department had observed many cases of Dupuytren's disease in their working populations and decided to participate in the study by including it in their daily work for a year. Three lacked the time to participate. This is not expected to lead to a bias, since all the occupational physicians are in charge of similar samples of workers. Since the annual medical examination by the occupational physicians is compulsory, the study includes all the civil servants surveyed by the occupational physicians during the year, except those who refused to be included the

study (less than 5%). Globally, the sample in this study can be considered as representative of the target population. Prevalence in the literature varies from 1 to 20%, depending on the population, which may range from those whose work involves no biomechanical exposure to older and highly exposed populations [Galimard et al., 2006]. The prevalence of Dupuytren's disease in this study was similar to that in the Reykjavik cross-sectional survey, estimated at 10.5% among men in the 45–59-year age group [Gudmundsson et al., 2000] and to that in the cross-sectional study by Mikkelsen (9.3%) [Mikkelsen, 1978].

Our study did not consider tobacco consumption. The role of smoking habits in Dupuytren's disease was not clearly shown until after this study was designed. Since then, two studies have concluded that tobacco consumption is a risk factor: a cross-sectional study in 1997 and a prospective study in 2004, both of which also adjusted for other personal risk factors [Burge et al., 1997; Godtfredsen et al., 2004]. However, neither study took precisely occupational risk factors into account [Galimard et al., 2006]: Burge et al. did not recorded occupational exposure; Godtfredsen et al. only studied the proportion of physical activities at work (not significantly associated with Dupuytren's disease), and low

education level (considered by authors as a proxy of manual work and significantly associated with Dupuytren's disease) [Burge et al., 1997; Godtfredsen et al., 2004].

Association Between Personal Factors and Dupuytren's Disease

This study demonstrates the association between personal risk factors and Dupuytren's disease. Most studies report positive associations between Dupuytren's disease and alcohol intake [Bradlow and Mowat, 1986; Attali et al., 1987; Noble et al., 1992; Burge et al., 1997; Zerajic and Finsen, 2004; Godtfredsen et al., 2004], age [Gudmundsson et al., 2000; Godtfredsen et al., 2004], diabetes mellitus [Gudmundsson et al., 2000; Geoghegan et al., 2004; Godtfredsen et al., 2004], familial history of Dupuytren's disease [Townley et al., 2006], and hand trauma [Hueston, 1968; Mikkelsen, 1978; Attali et al., 1987; Livingstone and Field, 1999]. The role of epilepsy and anticonvulsant drug intake, however, remains controversial [Thurston, 2003; Geoghegan et al., 2004], although studies have found a high prevalence of Dupuytren's disease in patients with epilepsy [Critchley et al., 1976; Arafa et al., 1992].

Association Between Occupational Factors and Dupuytren's Disease

We found that manual work was significantly associated with Dupuytren's disease and observed a clear dose-response relation, with an aOR of 1.75 for manual hobbies, of 2.2 for an intermediate manual occupational exposure category, and of 3.1 for the high exposure category. Manual labor, including hand vibration exposure and manual handling was one of the first causes of occupational disease discussed in the medical literature [Dembe, 1996]. However, the role of manual occupational exposure as a risk factor for this disease is still debated [Townley et al., 2006].

In a study about hand-arm vibration syndrome in working Italian men, Bovenzi et al. observed a significant association between vibration and Dupuytren's disease (aOR = 2.6 [1.24–5.49], adjusted for age, alcohol and tobacco consumption [Bovenzi, 1994]). Cocco et al. 1987 found that a history of vibration exposure was more frequent among case subjects than controls. Similarly, Thomas et al. found a significant association between hand-arm vibration syndrome and Dupuytren's disease with a dose-response relation, but no relation to the severity of the hand-arm vibration syndrome [Thomas and Clarke, 1992]. These studies led Liss et al. to conclude that there is a good support for an association between vibration exposure and Dupuytren's disease [Liss and Stock, 1996].

Some studies report no significant association between this disease and either handling or gripping with force. In 2004, a study using data from the National Morbidity Survey

in England and Wales found that manual occupational social class was not associated with an increased incidence of Dupuytren's disease [Khan et al., 2004]. Two other studies reported prevalence was similar in groups of manual and non-manual workers [Early, 1962; Chanut, 1963]. All three studies, however, limited exposure assessment to a yes/no question. Some specific exposure associated with manual handling in this population might increase the risk of Dupuytren's disease more than other exposures in manual workers and thus explain our results. For example, some of these workers excavate trenches with pickaxes or clear bushes from spring through autumn, with a billhook before the 1980s and with a brush cutter after. Mikkelsen et al. distinguished different levels of occupational exposure and found a clear dose-response relation between manual work and Dupuytren's disease, with a prevalence in the high exposure group similar to our results (15% in their study and 16% in ours). Bennett et al. found a lower prevalence than we did in both the low (prevalence 1%) and high (7%) exposure groups [Bennett, 1982]. De la Caffiniere et al. found hard manual labor over many years was correlated with Dupuytren's disease, especially in the younger age group [de la Caffiniere et al., 1983]. In the Reykjavik study, Gudmundsson et al. found a prevalence of Dupuytren's disease among male manual workers (including manual laborers, seamen and farmers) and in tradesmen (carpenters, blacksmiths, and masons) of 15% compared with 6% in other occupations (with university degrees) [Gudmundsson et al., 2000]. Manual workers and tradesmen had an OR for Dupuytren's disease significantly higher than all other men in the study.

CONCLUSION

In conclusion, our study found that after consideration of personal risk factors, manual work exposure appears to be associated with Dupuytren's disease. Longitudinal studies are needed to confirm these results with precise details about the kinds of physical exposure involved and taking tobacco intake into account.

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REFERENCES

- Arafa M, Noble J, Royle SG, Trail IA, Allen J. 1992. Dupuytren's and epilepsy revisited. *J Hand Surg [Br]* 17:221–224.
- Attali P, Ink O, Pelletier G, Vernier C, Jean F, Moulton L, Etienne JP. 1987. Dupuytren's contracture, alcohol consumption, and chronic liver disease. *Arch Intern Med* 147:1065–1067.
- Bennett B. 1982. Dupuytren's contracture in manual workers. *Br J Ind Med* 39:98–100.
- Bovenzi M. 1994. Hand-arm vibration syndrome and dose–response relation for vibration induced white finger among quarry drillers and stonemasons. Italian Study Group on Physical Hazards in the Stone Industry. *Occup Environ Med* 51:603–611.
- Bradlow A, Mowat AG. 1986. Dupuytren's contracture and alcohol. *Ann Rheum Dis* 45:304–307.
- Burge P, Hoy G, Regan P, Milne R. 1997. Smoking, alcohol and the risk of Dupuytren's contracture. *J Bone Joint Surg Br* 79:206–210.
- Calif E, Stahl S. 2007. Dupuytren's contracture. *N Engl J Med* 356:e11.
- Chanut JC. 1963. Dupuytren's disease. *Arch Mal Prof* 24:621–625.
- Cocco PL, Frau P, Rapallo M, Casula D. 1987. Occupational exposure to vibration and Dupuytren's disease: A case-controlled study. *Med Lav* 78:386–392.
- Critchley EM, Wakil SD, Hayward HW, Owen VM. 1976. Dupuytren's disease in epilepsy: Result of prolonged administration of anticonvulsants. *J Neurol Neurosurg Psychiatry* 39:498–503.
- de la Caffiniere JY, Wagner R, Etscheid J, Metzger F. 1983. Manual labor and Dupuytren disease. The results of a computerized survey in the field of iron metallurgy. *Ann Chir Main* 2:66–72.
- Dembe A. 1996. Occupation and disease: how social factors affect the conception of work-related disorders. Yale, CT: Yale University Press.
- Early PF. 1962. Population studies in Dupuytren's contracture. *J Bone Joint Surg* 44B:602–612.
- Galimard N, Schnitzler A, Descatha A, Ameille J. 2006. Dupuytren's disease and manual work, can they be related? Review of literature. *Arch Mal Prof* 66:505–512.
- Geoghegan JM, Forbes J, Clark DI, Smith C, Hubbard R. 2004. Dupuytren's disease risk factors. *J Hand Surg [Br]* 29:423–426.
- Godtfredsen NS, Lucht H, Prescott E, Sorensen TI, Gronbaek M. 2004. A prospective study linked both alcohol and tobacco to Dupuytren's disease. *J Clin Epidemiol* 57:858–863.
- Gudmundsson KG, Arngrimsson R, Sigfusson N, Bjornsson A, Jonsson T. 2000. Epidemiology of Dupuytren's disease: Clinical, serological, and social assessment. The Reykjavik Study. *J Clin Epidemiol* 53:291–296.
- Hueston JT. 1968. Dupuytren's contracture and specific injury. *Med J Aust* 1:1084–1085.
- Khan AA, Rider OJ, Jayadev CU, Heras-Palou C, Giele H, Goldacre M. 2004. The role of manual occupation in the aetiology of Dupuytren's disease in men in England and Wales. *J Hand Surg [Br]* 29:12–14.
- Liss GM, Stock SR. 1996. Can Dupuytren's contracture be work-related?: Review of the evidence. *Am J Ind Med* 29:521–532.
- Livingstone JA, Field J. 1999. Algodystrophy and its association with Dupuytren's disease. *J Hand Surg [Br]* 24:199–202.
- Mikkelsen OA. 1978. Dupuytren's disease—The influence of occupation and previous hand injuries. *Hand* 10:1–8.
- Noble J, Arafa M, Royle SG, McGeorge G, Crank S. 1992. The association between alcohol, hepatic pathology and Dupuytren's disease. *J Hand Surg [Br]* 17:71–74.
- Thomas PR, Clarke D. 1992. Vibration white finger and Dupuytren's contracture: Are they related? *Occup Med (Lond)* 42:155–158.
- Thurston AJ. 2003. Dupuytren's disease. *J Bone Joint Surg Br* 85:469–477.
- Townley WA, Baker R, Sheppard N, Grobbelaar AO. 2006. Dupuytren's contracture unfolded. *BMJ* 332:397–400.
- Zerajic D, Finsen V. 2004. Dupuytren's disease in Bosnia and Herzegovina. An epidemiological study. *BMC Musculoskelet Disord* 5:10.