som
Supporting occupational health and wellbeing professionals

Dupuytren's Disease (DD) and work with hand-held vibrating tools

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1. INTRODUCTION

1. The following summary of Dupuytren's Disease (DD) and work with hand-held vibratory tools has been produced by members of The Society of Occupational Medicine HAVS Special Interest Group (SIG) as a resource to assist those involved in the diagnosis and management of workers with DD as a result of using hand-held vibratory tools.

2. This guide does not aim to be a comprehensive overview of DD and vibratory tool use, nor does it seek to replace existing guidelines or formal education. Rather, it is a practical summary intended to provide background information and assist practitioners undertaking surveillance of those using hand-held vibratory tools.

3. The guide has been prepared by members of a working group set up by The Society of Occupational Medicine but each section does not necessarily represent the views of any individual member of the group, and the working group makes no assumption that its recommendations represent the views of all the members of the SOM.

4. While the guide is presented in good faith, it is the responsibility of the reader to ensure that their approach to matters relating to HAVS and DD accords with best current practice, and legal requirements, and the SOM will accept no responsibility resulting from the failure of any reader to ensure that they do so.

5. The Special Interest Group (SIG) welcomes any comments or suggestions regarding this publication. The SOM will assist members by directing specific enquiries about HAVS, carpal tunnel syndrome (CTS) or DD to an appropriate member of the Group.

6. The Society of Occupational Medicine would like to thank Dr Roger Cooke and Dr Ian Lawson who gave their time and expertise in developing this guide, and members of the SOM HAVS SIG for support, comments and suggestions.

7. Occupational health practitioners assessing vibration related hand conditions play a pivotal role in the identification of HAVS, CTS and Dupuytren's contracture in workers using hand-held vibratory tools. They will also be involved in advising employees and employers when there is a need to reduce exposure to vibration so as to limit the progression of disease. The correct diagnosis and subsequent management of vibration related symptoms can be challenging to the health practitioner who sees occasional cases of HAVS, CTS or DD given the complexity of the medical and employment issues.

8. According to modern practice standards, clinical activity is expected to be reliable and based on the current best evidence. In medicine this is usually based on peer-reviewed, published scientific literature. Evidence based medicine provides a framework for clinical decision-making processes and integrates the evidence with clinical experience and individualised subject factors. However, the evidence may be limited in its relevance and applicability.

9. The aim of this document is to provide general advice on DD and combine a review of the best available evidence for management with current expert practice. Accordingly, the document aims to summarise the substantial amount of evidence currently available for the management of DD in a concise and easily readable form. It provides consensus views of the Group in respect of best practice, some key evidence and includes useful tips and advice to avoid common pitfalls.

10. The document has been developed primarily for occupational health practitioners who are engaged with managing and supporting workers with DD. It may also be accessed by other health professionals or technicians who may find the content useful. The intention is not to provide prescriptive rules for individual cases but to assist with diagnosis and management of DD in the workplace.

2. KEY MESSAGES

1. Dupuytren's disease (DD) is one of the commonest hand conditions.

2. With the inclusion of Dupuytren's contracture to the list of prescribed diseases (PD A11) from work with hand-held vibrating tools, occupational health practitioners will need to be more aware of the natural history and risk factors associated with the condition to address questions regarding work causation.

3. Health surveillance of workers exposed to hand transmitted vibration from hand-held vibrating tools should ask questions about Dupuytren's disease and diathesis. Tier 3 and tier 4 assessments should include palmar examination for the presence of nodules, cords, contractures and consider differential diagnoses.

4. Not all cases of Dupuytren's disease progress to contracture, nor is it clear whether traditional risk factors, now including vibration exposure, affect this progression once initiated.

5. Fitness for work advice should be by individual case consideration and primarily based on functional limitations and task specific safety issues.

3. BACKGROUND

Dupuytren's disease (DD) is a common fibroproliferative connective tissue disorder of the palmo-digital fascia (aponeurosis) of the hand resulting in the formation of nodules and cords, which in turn can result in irreversible flexion contracture of the digits.[1,2] A systematic review reported DD is commoner in men with prevalence rising with age; median prevalence ranging from 12% at 55, 21% at 65 and 29% at 75 years of age.[3] A systematic review and meta-analysis found a consistent association between Dupuytren's disease and diabetes, liver disease, and epilepsy.[4] There is also a strong genetic component leading to DD at a younger age.[5]

4. PRESENTATION

The early stages of DD are characterised by thickening, pitting and nodule formation of the palmo-digital fascia between the attached skin and deeper fascia. This is often described by the individual as puckering of the skin. A nodule can progress to form a cord which over the course of months to years can contract pulling the finger down into the palm. The resulting contracture depends on which part of the palmo-digital and digital fascia undergoes fibrosis (Figure 1).

A pretendinous cord contracture leads to fixed contracture of metacarpophalangeal joints (MCPJ); a central cord contracture to fixed flexion contracture of the proximal interphalangeal joints (PIPJ); a lateral cord contracture to fixed flexion contracture of the PIPJ and distal interphalangeal (DIPJ) or combinations of these.[6]

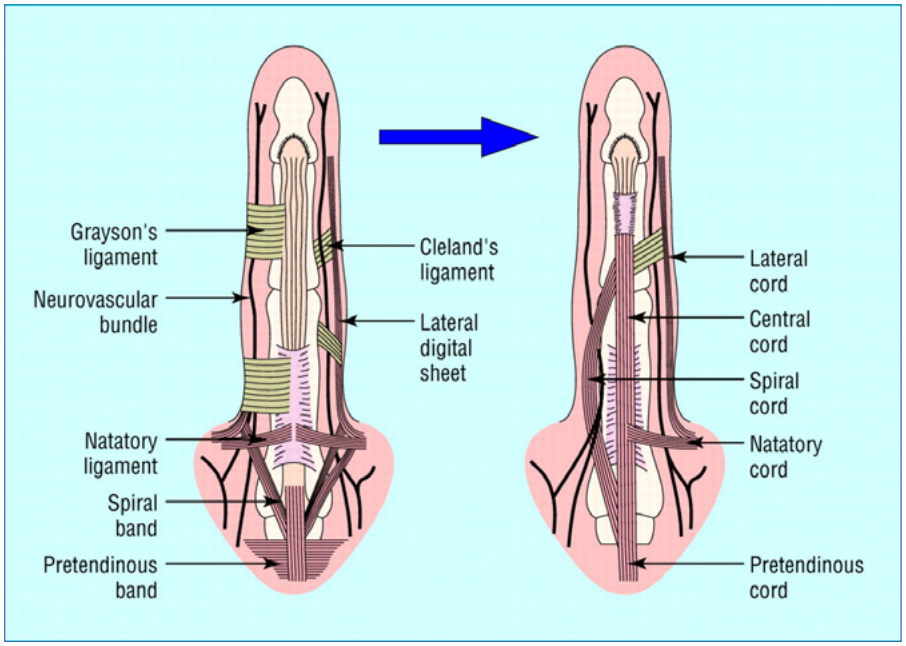
The little and ring fingers are the most commonly affected and very occasionally the thumb. The condition is frequently bilateral with MCPJ and PIPJ both contributing to the overall contracture. It should be however stressed that isolated contracture just affecting the MCPJ is common.

Those with a family history of Dupuytren diathesis often have bilateral disease and develop ectopic Dupuytren tissue deposits at a younger age and in other areas such as dorsal surface of PIPJ (Garrods knuckle pads), plantar fascia (Ledderhose disease) or penis (Peyronie's disease).

The majority of cases do not progress to contracture, developing nodules only. In a study of 306 hand clinic diagnosed cases of palmar fibromatosis only 8% had contractures.[7] A prospective study of 398 participants followed for seven years (n=763 in original study) found a greater degree of progression in those with a higher initial stage of disease (21.5%).[8]

The question of progression and individual management is discussed further in section 10.

Figure 1. Normal fascia and diseased fascial cords, after Townley et al[5]



5. DIAGNOSIS

The diagnosis is made by clinical examination based on observation of contractures or palpation of thickening, nodules or cords. Tendons and skeletal structures are unaffected. Once encountered it is unlikely to be confused with other conditions. History of possible Dupuytren's diathesis should be excluded. In addition, the following conditions albeit uncommon, apart from trigger finger, should be considered in any atypical presentation of palmar nodules or finger contractions in the differential diagnoses:

Volkmann's contracture

Whilst this rare eponymous condition can cause permanent deformity of the fingers it is usually accompanied by deformity of the hand and wrist. It results from ischaemia in the forearm, sometimes the result of compartment syndrome but more often following a history of significant injury and supracondylar fracture of the humerus. The resulting long term damage to nerve and muscle tissue results in the later presentation of contractures. It presents with a 'claw-like' appearance from fixed flexion in the flexor tendons of the forearm.

Keloids

Keloid is an uncommon fibroproliferative disorder characterised by the deposition of collagen in a wound.[9] Keloids are abnormal scar tissue formations following on from a wound which presents as painful, pruritic nodules. Unlike hypertrophic scars they extend beyond the border of the wound. They can occasionally form spontaneously particularly if there is a family history of keloids. They are diagnosed clinically presenting as enlarged skin-, red- or dark-coloured raised scars that feel firm and smooth to touch. They usually appear several weeks following a skin wound and may continue to grow for several months or even years. It is extremely rare for a keloid to occur in the palms. [10,11]

Trigger finger (stenosing flexor tenosynovitis)

Trigger finger is a common condition particularly in 50-60 year old women with a reported population prevalence of approximately two percent.[12] It is caused by either thickening of the tendon or tendon sheath such that the tendon is restricted from gliding, resulting in it catching at the palmar edge of the annular A1 pulley at the MCPJ. It can result in difficulty flexing or extending the finger sometimes releasing with a 'triggering' effect. Several fingers can be affected, sometimes in both hands but most commonly in the ring finger. It is commoner in diabetes, rheumatoid arthritis and carpal tunnel syndrome. It is unlikely to lead to a fixed flexion deformity although later untreated stages can present with fixed PIPJ. A palpable snapping along with tenderness over the A1 pulley may be found on examination.

Ganglions

Ganglions are harmless synovial sheath cysts that usually occur on the dorsal surface of the wrist. Occasionally they occur on palmar aspect of wrist or flexor tendon sheaths. The latter tend to occur in young adults presenting with a pea sized lump at the base of a finger.

Epidermoid cysts

An epidermoid cyst results from an occluded pilosebaceous gland. They generally present in young to middle aged adults and are commoner in men. On glabrous skin (hairless) such as the palm of the hand an epidermoid cyst may result from traumatic 'implantation' of epidermal cells into the dermis forming an epithelium-lined sac when it may be known as an "implantation dermoid". They present as a nodule or papule 1-3 cm in size attached to the surface skin along with a central punctum.

These should not be confused with dermoid cysts which arise from foetal developmental germ cells that form into a cyst. These usually present at birth or early childhood as solitary lumps between 0.5-6 cm and can present on the palm or finger.

Investigations are usually unnecessary unless there is an atypical presentation such as concomitant skin ulcers. This may include ultrasound, magnetic resonance imaging or histology to exclude rare spindle cell sarcoma, synovial sarcoma, malignant peripheral nerve sheath tumour (MPNST), or epithelioid sarcoma.[13]

6. STAGING AND SEVERITY

The Hueston table top test was developed to assist in determining which patients were suitable to proceed to surgery. It is a simple way to determine the presence of a fixed flexion contracture.[14] The palmar surface of the hand is placed on a flat surface such as a table top. If it is not possible to place the palm flat to the surface without a gap remaining the test is deemed positive.

Another measure, incorporating the degrees of total flexion contracture can be assessed using a goniometer. Using this method Tubiana developed a scale to stage the condition into four stages (Figure 2).[15] The angle made by the dorsum of the hand with the dorsal surface of the middle phalanx of the affected finger is the measured angle for total flexion deformity (TFD) (Appendix 1).

The severity of contracture and which fingers are affected will determine any functional impairments often associated with a reduced grip. The effect on a variety of normal daily activities as a result of extension deficit may include simply placing hands in pockets, problems putting on gloves or shaking hands.

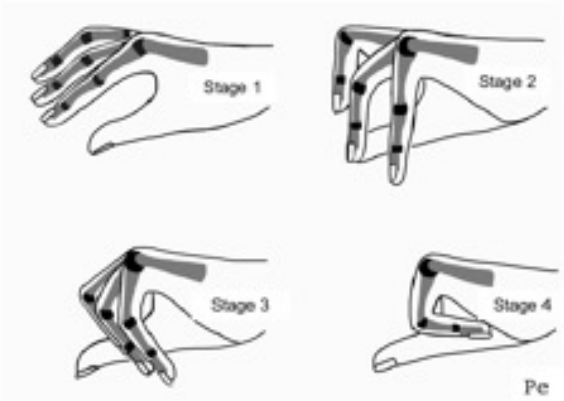


Figure 2: Tubiana stages (Illustration courtesy of Penny Burton)

7. PATHOLOGY

The nodules have been found to consist of myofibroblasts that have the characteristics of both smooth muscle cells and fibroblasts which probably accounts for the contractile nature of Dupuytren's.[16] What causes the fibroblast to proliferate into a myofibroblast is not known but putative mechanisms include micro-vascular ischaemia, inflammatory processes or free radical formation.[17]

It has been suggested that an 'external' or 'internal' stimulus activates macrophages or platelets to produce fibrogenic cytokines such as transforming growth factor, TGF-β leading to the deposition of collagen fibres.[18] The nature of these 'external' and 'internal' stimuli has been informed by prevalence studies, although sometimes conflicting as alcohol, smoking, trauma, diabetes, epilepsy, and genetic predisposition.[3]

A systematic review of non-genetic risks found a '*strong association between Dupuytren's disease and advanced age, male sex, family history of Dupuytren's disease, diabetes mellitus, heavy alcohol drinking, cigarette smoking, and manual work exposure.*' This study also found a dose response for heavy alcohol drinking, smoking and manual work.[19]

8. DUPUYTREN'S CONTRACTURE AND WORK WITH HAND-HELD VIBRATING TOOLS

Dupuytren's contracture as a result of traumatic injury or cumulative trauma arose out of an original case report in a coachman described by Dupuytren in 1831.[1] However as to whether manual work itself is a cause of DD is still considered to be a contentious issue. As with carpal tunnel syndrome separating out ergonomic risk from hand transmitted vibration risk is not necessarily reported in studies.[20] Whilst this ergonomic aspect is not the subject of this review, suffice to say that heavy manual work without significant vibration exposure has been reported to be associated with Dupuytren's disease.[21]

A review of the evidence by Liss and Stock in 1996 reported increased odds ratios (OR) in three statistically significant studies.[22] These included Cocco et al reported an OR of 2.3 (CI 1.5- 4.4); Thomas and Clarke an OR of 2.1 (CI 1.1-3.9); and Bovenzi et al an OR of 2.6 (CI 1.2-5.5).[23, 24, 25]

Bar Bovenzi these studies were of relatively small sample size showing minimal evidence for a dose response relationship. Despite this, Liss and Stock concluded that there was enough support for a causal association between vibration exposure and Dupuytren's contracture. Thomas and Clarke[24] suggested a possible microvascular pathophysiological process having found a statistical association between vibration white finger (VWF) and Dupuytren's contracture.

A large cohort of 212 civil servants diagnosed with palmar fascia thickening with or without contracture found a higher prevalence in those using vibrating tools (adjusted for age, family history, diabetes, epilepsy, hand trauma and alcohol consumption).[26]

Some research has produced contradictory findings. A review of over 97,000 United Kingdom miners seeking compensation for HAVS found age to be the prime determinant regarding prevalence of Dupuytren's disease (prevalence in 35-39 year age group was 1.7% rising to 19.6% in 80-84 year group).[27] Although this compensation scheme did not award benefit for DD, reducing possible bias in presentation, the authors acknowledged limitations in controls and in exposure assessment necessary to define a dose response relationship.

Descatha et al carried out a meta-analysis attempting to address the conflicting findings from previous studies.[28] Using high quality methodological criteria (HQMC) that included pooled vibration exposure data (MOOSE and PRISMA checklists) they found pooled meta-OR of 2.88 (CI 1.36-6.07) and 2.14 (CI 1.59-2.88) for those studies that met the high quality methodological criteria.

A cross-sectional analysis of data previously sourced by postal survey requesting information on the previous week's sources of vibration exposure and presence of flexion contracture of ring or little fingers was analysed by Palmer et al.[29] Contracture was reported in 72 (1.4%) of male respondents (n= 4969). In men who reported vibration exposure (2287) the prevalence ratios (PR) showed a 1.5 fold increase and in those with estimated exposures above 2.8ms-2 there was an adjusted PR of 2.85 (CI 1.37-5.97; after adjustment for age, social class, occupational manual activities). Their conclusion was that the risks of Dupuytren's contracture was more than doubled in men with high levels of vibration exposure.

A recent updated meta-analysis on vibration exposure has added support to the conclusion that vibration is an independent risk factor for the development of DD with age and environmental factors having no effect on DD prevalence.[30]

Another recent retrospective case control study of males with 13% prevalence of DD (n = 515) divided into those exposed to hand transmitted vibration (HTV=193), heavy manual work (HMW=107) and controls (215) found significant associations between DD and HTV with an OR 4.59 (95% CI 2.05–10.32) and HMW an OR 3.10 (95% CI 1.21–7.91) with an increased risk after 15 years of exposure.[31]

Based on this epidemiological evidence, health surveillance of workers exposed to hand transmitted vibration from hand-held vibrating tools should ask questions about Dupuytren's disease and diathesis including palmar examination for the presence of nodules, cords, contractures along with consideration of a differential diagnosis.

9. TREATMENT

The majority of cases of Dupuytren's do not require treatment and should only be considered in cases with functional impairment. Some surgeons use the simple table top test. However, the British Society for Surgery of the Hand (BSSH) proposed a classification system of mild, moderate and severe contracture to assist decisions on intervention (Appendix 1). Based on this scale the mainstay of treatment is surgical intervention for MCPJ > 30 degrees or any degree of PIPJ contracture. Fasciectomy and dermofaciectomy are the main surgical interventions for moderate to severe disease. Percutaneous needle fasciotomy can be used for MCPJ involvement. However, recurrence is common particularly in those with Dupuytren's diathesis.

It should also be recognised that surgical intervention is not without risks. A study by Asler et al found re-operation rates of 33.7% for percutaneous needle fasciotomy, 19.5% for limited fasciectomy, and 18.2% for dermofasciectomy with re-operation for the latter carrying a high risk of amputation.[32] Non-surgical alternatives to surgery, particularly injection with collagenase, have been compared with surgical intervention. A questionnaire study by Altziebler found lower complication rates, quicker return to work and higher satisfaction values.[33] A systematic review on collagenase treatment, whilst indicating it was significantly better than placebo, found there was no evidence that it was clinically better or worse than surgical treatments.[34]

A determination from the National Institute for Health and Care Excellence (NICE Technology appraisal guidance [TA459]) in 2017 was that collagenase clostridium histolyticum (Xiapex) should only be used for research purposes in the UK. The Dupuytren's Interventions Surgery vs. Collagenase (DISC) Trial is still ongoing (https://www.bssh.ac.uk/professionals/disc_trial.aspx).

Return to work after surgery will depend on nature of work ranging from one week for sedentary roles to up to six-10 weeks for heavy manual work.[35]

An employee leaflet on Dupuytren's and surgical treatment was prepared by BSSH in 2016: https://www.bssh.ac.uk/_userfiles/pages/files/Patients/Conditions/Elective/dupuytrens_disease_leaflet_2016.pdf

10. WORKPLACE MANAGEMENT

The Industrial Injuries Advisory Council (IIAC) recommended inclusion of Dupuytren's contracture to the list of prescribed industrial diseases in 2014 (PD A15) having reviewed the evidence on exposure to hand-held vibrating tools and concluded that there was more than doubling of relative risk. Their recommendation specified the disease as fixed flexion deformity of one or more digits and included exposure criteria of work with vibrating tools for 'periods in aggregate of at least ten years...the use of tools amounts to at least two hours per day for three or more days per week...'[36]

This pragmatic threshold of exposure was based on the evidence of exposure bands in several studies (most listed in section 8). However, this does not necessarily align with a linear dose response relationship. Assessment for PD A15 Dupuytren's (PD A15) are likely to increase with a concurrent increase in employers liability claims over coming years. As yet Dupuytren's disease is not RIDDOR reportable. This, in turn, will focus employers on risk reduction and occupational health practitioners on providing advice regarding ongoing vibration exposure. Unlike HAVS and CTS there are few interventional studies on reversibility on cessation of exposure or return to work with vibrating tools after treatment. Stirling et al studied the impact of HTV exposure on the outcomes of surgery (n= 425 hands, 111 HTV exposure) using a QuickDASH questionnaire and found that whilst HAV exposure influenced pre- and post-operative function in HTV exposed there was no effect on overall satisfaction or return to work following surgery.[37] Until such evidence is available advice on fitness for work with vibrating tools should be based on function and safety. As with hand transmitted vibration per se management advice should be to reduce vibration exposure to as low as reasonably practicable (ALARP).

In contrast to earlier studies a recent five year prospective cohort study (n=258) suggested that DD is progressive, with respect to disease extent and contracture severity mostly on the little finger side of the hand: i.e. yearly increase of in total passive extension deficit was 1.75 degrees (95% CI, 0.30 to 3.20 degrees) to 6.25 degrees (95% CI, 2.81 to 9.69 degrees).[38]

Although no progression or regression was found in 24% of dominant and 31% of non-dominant hands, none of the recognised risk or diathesis factors were associated with progression. These background levels of progression irrespective of risk make it problematic for occupational health practitioners to advise on continuing vibration exposure. It is conjectural, but possible that once the contractual phase has begun the initiating risks including vibration have little impact on progression.

General points on case management:

- Nodules can be painful but most functional issues result from lack of full finger extension and weakened grip strength.
- Periodic observation every six to 12 months to determine the onset of contracture and the need for referral. A goniometer is an objective means of monitoring degrees of flexion contracture.
- Advise the employee to consider alternative work only if there are functional or safety issues with work tasks.
- Advise the employee regarding return to work after surgery that there is no current evidence to suggest a recurrence of symptoms is any more likely after returning to work with vibrating tools. The caveat is that recurrence of symptoms is common after surgery or collagenase injection.
- Each case should be treated on an individual basis to determine the perception of risk which may have an impact on continuing exposure and successful return to work after surgery.
- Advise the employee that Dupuytren's is a prescribed disease and they may be eligible to a disability assessment (https://www.gov.uk/guidance/claim-industrial-injuries-disablement-benefit-for-dupuytrens-contracture).

APPENDIX 1: CLASSIFICATION SCALES FOR DUPUYTREN'S CONTRACTURE

A. Tubiana stages

Stage	*Deformity*
0	No lesion
N	Palmar nodule without presence of contracture
1	TFD between 0° and 45°
2	TFD between 45° and 90°
3	TFD between 90° and 135°
4	TFD greater than 135°

B. The British Society for Surgery of the Hand (BSSH)

1. Mild: no functional problems, MCPJ contracture of less than 30° but no PIPJ contracture.
2. Moderate: functional problems, MCPJ contracture of 30° to 60°, PIPJ contracture of less than 30°, or first web contracture.
3. Severe: severe contracture of both MCPJ contracture greater than 60° and PIPJ contracture greater than 30°.

C. Details on other classifications scales:

'Notes on Dupuytren Measurement systems, Charles Eaton MD Dupuytren Research Group Jan 2018':
https://dupuytrens.org/wp-content/uploads/2018/02/Notes-on-Dupuytren-Measurement-systems.pdf

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Supporting occupational health and wellbeing professionals