Hand & Wrist

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Dupuytren's disease: where do we stand?

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- Dupuytren's disease is a fibroproliferative disease that involves collagen deposition, leading to hand contractures that ultimately affect hand mobility and grip strength.
- It is a benign disorder but can cause high morbidity by limiting daily activities.
- Many factors have been proposed for its aetiology: namely genetics, smoking, alcohol intake and diabetes. However, there is still controversy as to the main aetiological cause of the disease.
- Treatment is not yet uniform around the world and still varies with the surgeon's experience and preference.
- In this review, the authors review the pathogenesis and treatment options for Dupuytren's disease in an attempt to summarize the current state of the art.

Keywords: Dupuytren; management; diagnosis

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Introduction

Dupuytren's disease is a fibroproliferative disease that involves collagen deposition and ultimately affects hand mobility and grip strength.[1] The first reference to this pathology dates back to 1614, when Plater referred to a flexion contracture of the hand that he attributed to trauma to the flexor tendon.[2,3] In France, Dupuytren described the anatomy of the disease as well as clinical history and presentation. He believed that trauma was the main causative factor of this pathology.[2]

Epidemiology

The reported prevalence of this disorder is in the range of 2% to 42%.[2,3] This heterogeneity might be related to populational differences.[4] It might also be related to the difference between Dupuytren's disease and contracture. The first is a general nomenclature, including both asymptomatic patients with only minor soft-tissue changes that do not limit function and those with severe disease and contracture. Contracture, on the other hand, defines only those patients with affected function.[5]

Prevalence varies according to geographic location, being more common among Northern European men.[6] On the other hand, it is rare in black and Asiatic populations. Nevertheless, in some parts of Japan and Taiwan, a prevalence as high as that of Northern Europe has been registered.[2,7]

Dupuytren's disease affects men more than women and affects them at a younger age.[6,8] Sex predisposition might diminish with age.[6] Post-operative results also tend to be better in men.[8] In addition, there is bilateral involvement in 59% of affected men *versus* 43% of women.[2,9] Regarding age, the estimated prevalence of the disease in people aged 55 years is 12%, rising to 29% at 75 years.[4]

Aetiology

The aetiology of Dupuytren's disease is as yet poorly understood.[6] In fact, despite being a benign disorder, it has similarities with malignant processes.

In the early stages of the disease, the common type 1 collagen usually found in hand tissues is replaced by type 3 collagen, which is a main component of reticular fibres.[1,8]

The pathogenesis of this disorder has been compared to wound healing, which goes along with the microtrauma theory. This generates an inflammatory response, producing superoxide-free radicals and hydrogen peroxide, stimulating a reparative response.[1,8,10]

Many other factors have been related to the pathogenesis of Dupuytren's disease, particularly heredity. An autosomal dominant pattern of inheritance with varying penetrance has been proposed by many authors. Additionally, when a positive family history is present, the disease is more likely to progress faster than usual.[6,8,11-13] In

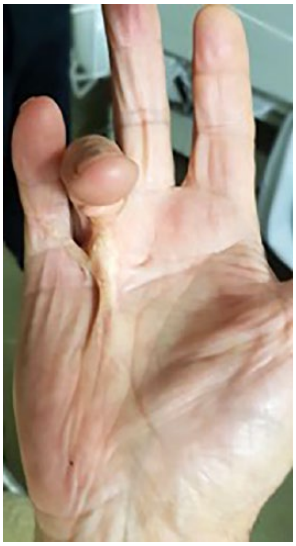

Fig. 1. Volar view of the hand showing a cord.

fact, according to the works of Hindocha et al,[14] positive family history correlates with greater severity and earlier onset. Genetic influence has also been proven by the study of Larsen et al, that found a concordance rate of 0.37 between monozygotic twins *versus* 0.07 in dizygotic twins.[15]

A genetic component has been related to the development of Dupuytren's disease.[16] Some studies revealed a positive association with specific human leukocyte antigens system (HLA) classes, namely HLA-B12,[17] HLA-A1 and DR4,[18] HLA-DR3,[19] HLA-DRB1*15 (HLA-DR2)[20] and HLA-DRB1*01 (HLA-DR1).[16] Additionally, in their genome-wide association study, Dolmans et al[21] concluded that non-different loci are involved in susceptibility to Dupuytren's disease. These include three WNT genes, one gene for secreted frizzled related protein (SFRP) and one gene for R-spondin (RSPO2). This association with proteins in the Wnt pathway suggests that anomalies in the pathway confer genetic susceptibility to this pathology.[21]

In addition, diabetes mellitus seems to be a risk factor.[6,8] According to Broekstra et al,[22] patients with diabetes mellitus carry a risk 3.06 times higher of developing Dupuytren's disease. This risk is higher for type 1 diabetes mellitus, justifying the fact that the pathology is commoner among insulin-dependent patients, when compared with those taking oral antidiabetic drugs.[6,8,22]

Smoking and alcohol intake have also been related to the development of Dupuytren's disease. Both smoking and alcohol carry a dose-response association with the disease. Interaction between both factors is not yet consensual among studies.[8,23]

Some authors have suggested an association between occupation and the development of Dupuytren's disease.[1] In fact, Lucas et al[24] concluded in their study of 2406 male workers that manual work, mainly that associated with vibratory tools, was associated with the development of this pathology. Similar conclusions were reached by Palmer et al[25] in their study of 2287 manual workers.

The relationship between epilepsy and the development of this disorder is not clearly defined.[8] However, these patients have an incidence of Dupuytren's disease that can reach 56%[26]; Broekstra et al[22] concluded from their studies that the risk of the disease in these patients is 2.08 higher. In 1963, Hueston proposed the concept of Dupuytren's diathesis, concerning those patients that develop the pathology at younger ages, have bilateral disease, a positive familiar history, ectopic disease and a higher rate of recurrence.[27]

Clinical presentation

The condition most commonly affects the ring and little fingers but it can actually involve any digit.[6] It usually starts in the palm of the hand and then presents a distal progression (Fig. 1).[2] Skin changes might also be present, namely pitting and dimpling.[2]

Along its course, Dupuytren's disease evolves through a variety of stages. The first one, called proliferative, is characterized by the development of nodules, typically over both metacarpophalangeal and proximal interphalangeal (PIP) joints. When these nodules start to contract, the disease enters the involutional stage, when collagen production increases and myofibroblasts become the predominant cell type. Nodule-cord units develop. In the last phase of the disease, the residual phase, myofibroblasts decrease resulting in hypocellular nodules and cords formed predominately by types I and III collagen.[8,28]

Even though the presentation of this pathology might seem constant, it is not, as the involved structures might actually vary.[29] The palmar fascial complex is composed by the radial, ulnar and central aponeurosis and the palmodigital and digital fasciae. All these structures might be involved in the pathology.[29] The palmar fascia consists of a deep and a superficial layer. Only the superficial layer (or palmar aponeurosis) is involved in Dupuytren's disease.[28] The palmar aponeurosis is a triangular-shaped fascial structure consisting of longitudinal, transverse and vertical fibres with its apex in continuity with the palmaris longus tendon.

Longitudinal fibres form the pre-tendinous bands; transverse fibres form two distinct bands, one proximal (the proximal transverse palmar ligament) and one distal (the natatory ligament), and the vertical fibres (Legueu and Juvara septa) connect the superfial and deep layer of palmar fascia dividing the longitudinal compartments of flexor tendons from those containing the lumbricals and neurovascular bundles.[28,29]

In the digit, the neurovascular bundle is surrounded by the palmar Grayson ligament, the dorsal Cleland

ligament, the lateral digital sheet and the mediodorsal Thomine fascia.[29] The connection between the palmar and the digital fascial structures is made by the spiral band.[29]

In the diseased hand, a pre-tendinous cord develops from the pre-tendinous band, being responsible for the flexion contractures of the metacarpophalangeal joints. Legueu and Juvara septa, when affected, give rise to a vertical cord. The so called 'spiral cord', more common in the little finger, results from a diseased pre-tendinous band, spiral band, lateral digital sheet and Grayson ligament.[29]

Concerning diseased digits, the most common cords are the central, which is an extension of the pre-tendinous cord, the lateral cord that has the lateral digital sheet as origin, causes contracture of the PIP joint and has the potential to deviate the neurovascular bundle, and the spiral cord. The abductor digiti minimi tendon may also be responsible for an isolated digital cord.[29] Other cords are the distal commissural cord from the distal commissural ligament (radial continuation of the natatory ligament) and the proximal commissural cord from the proximal commissural ligament (radial continuation of the transverse ligament) that cause contracture of the first web space.[28,29]

Tubiana et al[25] proposed a classification in an attempt to objectively assess patients and evaluate not only prognosis but also treatment results.

The classification varies from a stage 0, in which a nodule or cord without contracture is present, to a stage IV. Every stage from I to IV corresponds to an increase in 45º of overall extension loss.[30] The classification is completed by the addition of letters that allow to classify the location and severity: P for palmar disease mainly, D for digital disease mainly, H for the presence of a hyperextended distal phalanx and (-) for the absence of contracture.[30] Later, the same authors adapted this classification to a numerical one that allowed the calculation of the surgical benefit.[30] However, we believe that this classification is more difficult to use in clinical practice.

Ectopic locations of Dupuytren's disease can occur. It is most often found on the dorsum of the hand, presenting as Garrod's nodes or knuckle pads. These are related to bilateral disease as well as other sites of ectopic disease, namely in the plantar fascia in about 5% of patients (Ledderhose disease) and as penile indurations in 3% of the patients (Peyronie's disease).[2,8]

Treatment

The main objective of treatment is to improve digit extension and hand function.[31] Therefore, treatment is usually proposed before hand function is severely affected, that is, before long-dated severe finger contractures which might cause joint stiffness, as relative newly developed contractures carry a higher probability of success.[6]

Fig. 2. Hueston 'table top' test.

Due to its generally benign nature, treatment is not mandatory, so the patient must have a part in the decision as observation is a perfectly viable option in patients with mild disease.[6] Different treatments have been proposed for Dupuytren's disease, according to its severity and patient and surgeon's preference.

I) Early disease

Non-surgical treatment

Both steroids and vitamin E have been tested in the treatment of Dupuytren's disease. However, studies are still lacking to prove the benefit of these agents.[32]

Physical therapy seems to improve digital extension, hand span and grip strength. However, evidence is still not conclusive.[32,33]

Radiotherapy allegedly reduces the development of myofibroblasts[34,35] and it is claimed to have indications in early disease. However, toxicity might preclude its use.[32]

II) Contracture treatment

The threshold for invasive treatment (classically surgery) is usually the existence of a metacarpophalangeal joint contracture > 30º (Fig. 2) or a PIP joint contracture > 15º, as these are commonly disabling.[6,28] However, the disability must be evaluated before surgery is proposed, along with simultaneous degenerative joint disease and other factors that might negatively affect outcome.[8]

Hueston[36] described a simple test that can be easily completed in the clinic, the so-called 'table top' test. This test is positive when the hand cannot be placed in a flat position on the table (Fig. 3). Patients usually report discomfort when the flexion deformity is ≥ 15°.[36]

Collagenase

This treatment poses as an alternative to surgery which is still the standard of care for Dupuytren's disease (Fig. 4).[37]

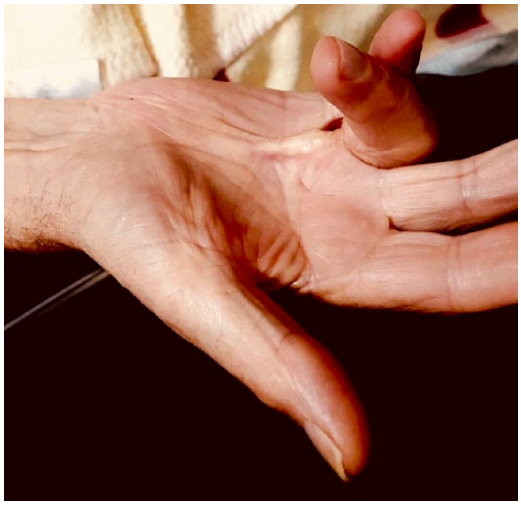

Fig. 3. Metacarpophalangeal joint contracture > 30°, a surgical indication.

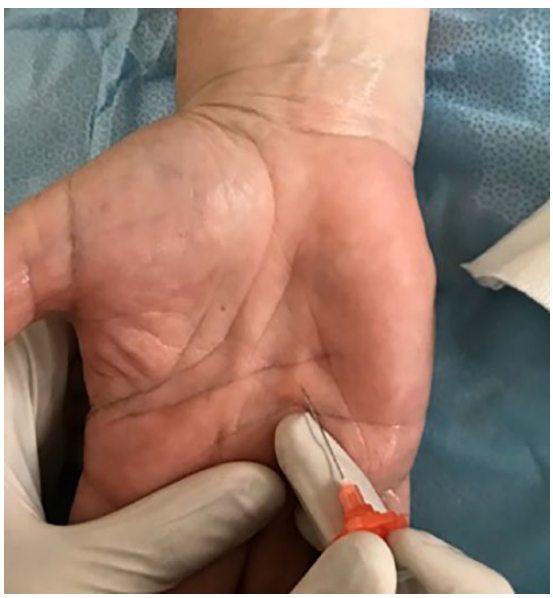

Fig. 4. Illustrative photograph of collagenase injection.

It is more commonly used in North America and Australia compared with Europe, where fewer surgeons report having experience with this technique.[31]

The main indication for Collagenase treatment is patients with cooperative capacity who have contracture due to a palpable cord and have adequate skin coverage.[38]

Collagenase clostridium histolyticum acts through the lysis of collagen, thus leading to the disruption of the cords. The day after the injection, manipulation is carried out in order to rupture the cord.[37] The injection is completed by inserting the needle perpendicularly in the cord. The finger must be manipulated in order to certify that the needle is not inserted in the flexor tendon. After insertion of about one-third, the needle should be repositioned by inclining it distally and then proximally in order to administer the rest of the product.[8]

Collagenase has economic advantages over surgery. In addition, it is an office-based procedure that does not require any anaesthetic.[37,39,40] This treatment carries important rates of complications. According to Hurst et al,[37] 96.6% of the patients have at least one complication, which is important when compared with the 21.2% rate of placebo. Most complications are mild/moderate and include bruising, injection-site haemorrhage or pain, upper limb pain, tenderness, ecchymosis, pruritus, swelling, skin lacerations, lymph node enlargement, erythema and blisters.[37]

Needle fasciotomy

This technique consists of the division of the cord using a hypodermic needle. Its main advantage is that it is a low-invasive procedure that can be performed on an outpatient basis. A recurrence rate as high as 75% at five years has been reported along with a risk of tendon and neurovascular injury.[6,41,42]

Indications: Its use is considered in the same situations as collagenase treatment.[38]

It is useful mainly for the treatment of metacarpophalangeal contractures.[6]

A recently introduced modification, percutaneous aponeurotomy and lipofilling, relies on the benefits of fat grafting on cords after their percutaneous disintegration (decreases myofibroblasts, acts as interposed tissue and replaces the subdermal fat deficiency associated with Dupuytren's disease). This technique seems to result in a quicker recovery and fewer long-term complications.[43,44]

Collagenase versus needle fasciotomy

When comparing the results of collagenase injection with needle fasciotomy, Stromberg et al[45] concluded that there is no significant difference between the results of the two techniques for metacarpophalangeal contractures. However, collagenase injection carried a higher incidence of haematomata and when skin ruptures happened, these tended to be larger in the collagenase group.

Scherman et al[46] also failed to find differences in the reduction of contractures between collagenase injection and needle fasciotomy at the three-year follow-up. Nevertheless, patients treated with collagenase had a better improvement of the extension deficit right after treatment, but not at three or twelve months. The authors performed collagenase treatment under a block with total finger anaesthesia and attribute their results to this fact.[46]

On the other hand, pain after treatment was greater in the collagenase group and patients treated with needle fasciotomy had a greater reduction in the QuickDASH scores at the three-month follow-up.[46]

Fig. 5. Limited fasciectomy: intra-operative view.

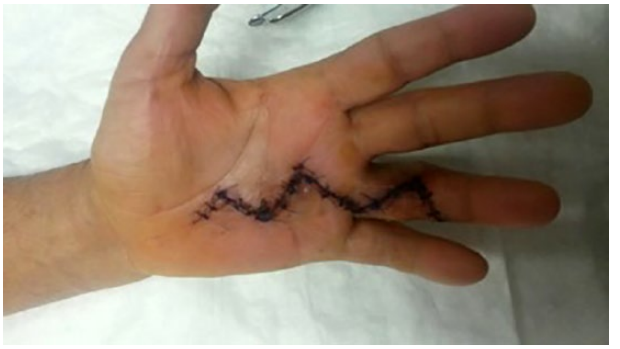

Fig. 6. Post-operative photograph of the limited fasciectomy, showing the incision used in our centre.

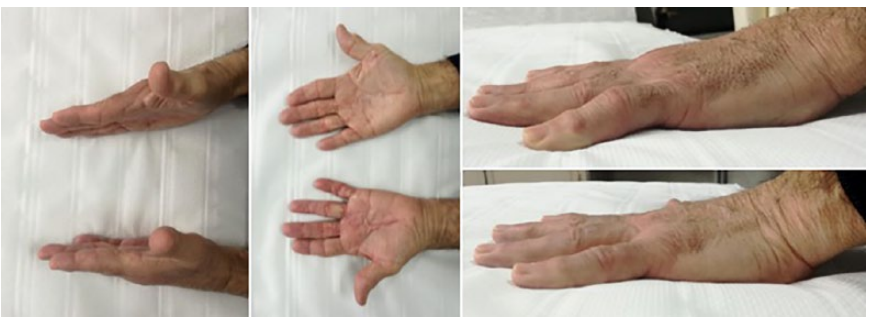

Fig. 7. Post-operative results of the limited fasciectomy.

Concerning recurrence, Peimer et al[47] found a 47% recurrent rate at five years after treatment, which is similar to that found for surgical treatment.

Open surgery

Fasciectomy is indicated when less-invasive procedures fail, when the disease is diffuse, recurrent or according to surgeon/patient preference.[38]

Limited fasciectomy

This procedure consists of the removal of the cords, in order to release the contracted digits (Figs 5, 6 and 7). This is the most popular surgical technique.[5] However, it carries important recurrence rates (around 20% at five years).[6] Although smaller in comparison with needle fasciotomy, the risk of neurovascular damage is not negligible.[6]

Dermofasciectomy

This procedure is more extensive and aims to remove all the diseased tissue, including the subcutaneous fat and palmar skin. The defect is allowed to heal secondarily or is covered with a full-thickness skin graft. The aim of this intervention is to reduce the recurrence rate.[6,28]

Dermofasciectomy is a more radical procedure that has to be considered under certain situations, namely[38]:

- longitudinal lack of skin that cannot be solved by local flaps;
- recurrent disease with scarring and skin involvement;
- devascularization of the skin during surgery; and
- initial procedure in young patients with Dupuytren's diasthesis.

Splinting after open surgery

Few studies have evaluated the advantages of splitting after surgery for Dupuytren's disease. In their systematic review, Larson and Jerosch-Herold[48] identified only four studies providing low-level evidence for static and dynamic post-operative splinting and they concluded that while total active extension deficit improved in some patients that had been splinted, there were also deficits in composite finger flexion and hand function.[48]

The more recent multicentred research of these authors reported no differences in self-reported upper-limb disability or active range of motion between a group of patients who were splinted after surgery and a group of patients receiving hand therapy and only splinted if and when contractures occurred.[49]

III) Salvage procedures for severe disease

Staged procedure

This procedure is indicated for patients with severe PIP contractures. At the first stage, an external fixator is placed across the joint. The tension across the fixator is progressively increased over a period of six weeks to correct the deformity. The second stage consists of fasciectomy or dermofasciectomy of the affected digits. The fixator is removed after wound healing.[8,50]

According to White et al,[51] this technique might be an alternative to patients otherwise proposed for amputation. The authors obtained good to excellent results with a mean contracture correction of the PIP joint of 37°.[51]

Amputation and arthrodesis

These procedures are options for patients with severe contractures of the PIP joint. Amputation, most commonly of the little finger, can be performed when other procedures are not expected to achieve a sufficient degree of correction. One of the possible complications is the formation of a painful neuroma. Joint resection and arthrodesis results in shortening of the finger but avoid recurrence.[8]

Where do we stand?

Dupuytren's disease has been subject to significant research and we are now able to understand better predisposing factors and even genetic associations. Treatment greatly depends on the severity of the disease and patient/surgeon's preference. In our daily practice, we prefer to intervene only in those patients with contracture (positive Hueston ('table top') sign). All others are evaluated annually in order to detect early evolution of the contracture. Limited fasciectomy is our preferred method of treatment, due to the lesser potential for neurovascular complications (*versus* needle fasciotomy) and quick recovery time when compared to more aggressive surgical options. The high economic impact of collagenase makes it a less-used procedure, with surgeons having little experience with its use. Amputation and arthrodesis are considered salvage procedures.

Conclusions

Dupuytren's disease is a moderately common pathology. However, it carries many uncertainties with it. Its aetiology is not clearly defined and treatment is far from being consensual. Treatment recommendations vary throughout the world, relating to patient's preference and surgeon's expertise. Guidelines for adequate treatment of each stage of the disease are still lacking.

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