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## Surgical and therapy update on the management of Dupuytren's disease

Stephanie Sweet MD<sup>a</sup>, Susan Blackmore MS, OTR/L, CHT<sup>b,\*</sup>

The Philadelphia and South Jersey Hand Centers, 700 S. Henderson Road, Suite 200, King of Prussia, PA 19406, USA

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### ABSTRACT

Advancements in surgical and therapy management for Dupuytren's disease are highlighted. Indications for treatment and various surgical options for Dupuytren's disease are described. Non-surgical techniques are also presented. Therapy interventions are reviewed. Treatment techniques for the management of secondary problems resulting from prolonged digit flexion are presented. The benefits, limitations and outcomes of treatments are reviewed to assist the reader to link patient specific problems and goals to the most appropriate treatment choice.

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### Introduction: treatment overview

Ideal treatment for Dupuytren's disease in the hand would involve managing the cellular mechanisms to prevent or control the development of fibroproliferative disorder. The typical disease process causes collagen nodules and cords in the palmar fascia that usually progress to develop joint contractures.<sup>1</sup> Alternatively, the ideal treatment would provide permanent contracture resolution and prevent the recurrence of contractures and diseased fascia. The ideal treatment would also prevent the development of secondary problems from maintained digit flexion; including joint contractures, tendon and digital nerve pathology and complications post surgery or procedure.

Past and current treatments have fallen short of the "ideal treatment." There have been many types of surgical management described, each with specific benefits and limitations. Historically non-surgical management included: radiotherapy, dimethylsulfoxide injections, topical vitamin A and E application, physical therapy, orthotic intervention, ultrasound therapy, corticosteroid injections, 5-fluorouracil treatment, and gamma interferon injections. These generally were found to be ineffective or not suitable for clinical use.<sup>2–4</sup>

The clinician should address both primary (Dupuytren's tissue) and secondary problems resulting from the finger held in flexion in both the surgical and therapy plan, to maximize restoration of motion and function. Until treatment can be designed to eliminate the disease causing factors, perhaps early treatment for minimal contractures, less extensive surgical management, repeated procedures after expected recurrences or extension of the disease, along with a home therapy program or a brief course of therapy is a short-term solution to a complex disease process. Directions for the future course of Dupuytren's disease will likely focus on treating the disease before contracture develops, rather than treating the late sequelae.

Dupuytren's diathesis (the features of Dupuytren's disease predicting an aggressive course) identifies 4 important risk factors.<sup>5,6</sup> These include ethnicity, family history, bilaterality, and presence of ectopic lesions outside the palm. Hindocha<sup>7</sup> modified this description to include male gender and age onset younger than 50 years. Of particular significance was also the recognition of family history with one or more affected siblings/parents and knuckle pads. The presence of all six factors increases the risk of recurrence by 71% compared with a baseline risk of 23% in those with no risk factors. Perhaps an "at risk" population with the diathesis could be identified when they present with early comorbidities such as trigger finger. In the author's opinion, this group of patients might benefit from regular monitoring by a hand surgeon or self-monitoring tool (currently under development) to identify contractures at an earlier stage. Surgical correction of PIP joint contractures over 60° along with the release of Dupuytren's tissue have been reported as having less favorable outcomes.

\* Corresponding author.

E-mail address: [blackmore.sm@gmail.com](mailto:blackmore.sm@gmail.com) (S. Blackmore).<sup>a</sup> Faculty appointment: 2000 to Present: Clinical Assistant Professor, Thomas Jefferson University, USA.<sup>b</sup> Currently: Select Medical, National Director of Hand Therapy.

## Evaluation of tissue specific impairments as a result of Dupuytren's disease: it is more than the cord

A longstanding joint flexion contracture as a result of Dupuytren's disease may contribute to<sup>8</sup>: extensor attenuation especially at the proximal interphalangeal joint (PIPJ); lateral band migration volar to the axis of the PIPJ with oblique retinacular ligament (ORL) adaptive shortening associated with a PIPJ contracture; joint capsular contracture including volar plate and collateral ligament shortening; joint capsular attenuation dorsally; adaptive digital nerve shortening and digital nerve entrapment within the Dupuytren's cord; vascular adaptive shortening; flexor, lumbrical and interossei muscle adaptive shortening and contracture of the flexor tendon sheath; joint surface incongruity; and secondary skin contracture or breakdown. Also, as noted in other patient populations there may be a potential for changes in the sensory motor cortex when the digit does not move normally for a period of time, resulting in motor planning deficits, even after the local tissues are released, impacting active motion.<sup>9–11</sup> While the Dupuytren's patient does demonstrate limited motion, the sensory motor changes have not been studied specifically in the Dupuytren's population to date. If the impairments described above are not managed surgically, these areas should be addressed in therapy to maximize the restoration of active motion and function.

Evaluation and review of these secondary conditions is presented. Evaluation of tissue specific limitations pre-operatively are often extremely difficult if the joint contracture is fixed or the cord limits testing, not allowing for specific tensioning to confirm secondary tissue impairments. Surgical planning involves an appreciation for altered anatomy based on the Dupuytren's cord displacement of tissues such as digital nerves and vessels. Also, patients may first seek care due to the appearance of Dupuytren's knuckle pads. Finally, outcomes from various interventions are often difficult to compare, due to the additional tissue structures that may/may not be addressed in the specific procedure performed.

Extensor mechanism and tendon attenuation can occur over a period of several months at zone 3 over the dorsum of the PIPJ when the PIPJ is maintained in flexion. Over time the lateral bands may migrate volar to axis of rotation of the PIPJ. As this occurs the ORL adaptively shortens and a Boutonniere deformity results.<sup>12</sup> Smith et al<sup>13</sup> reported using a central slip tenodesis test intra-operatively. This test places the patient's hand in full wrist and Metacarpophalangeal joint (MCPJ) flexion. If the PIPJ extends, the central slip is competent. Also, the tendon can also be imaged through ultrasound to identify attenuation.<sup>14</sup> Extensor attenuation does not typically occur at the MCPJ level.

Joint capsular contracture occurs at the MCPJ and PIPJ volar plate and collateral ligaments when the joint is maintained in flexion. The extensor side of the distal interphalangeal joint (DIPJ) capsule can also contract if a PIPJ flexion contracture is present. Evaluation for joint capsular contracture is performed by placing any tight muscle tendon units and Dupuytren's cords in a slack position and assessing isolated joint PROM. Additionally, passive accessory motion is compared between involved and uninvolved joints. This may be a challenge in some patients though, as the contractures may occur on both hands.

Adaptive shortening of digital nerves can occur when the MCP and/or PIP joints are held in flexion. The digital nerves may become entwined in the cords,<sup>15</sup> resulting in displacement of the nerves from their normal anatomical location. Digital nerve involvement is evaluated with by testing light touch using Semmes-Weinstein monofilaments<sup>®</sup> (Patterson Medical, Warrenville, IL) and two-point discrimination using a discriminator<sup>®</sup> (Patterson Medical, Warrenville, IL). A patient may have no neuritic symptoms at rest, but may have numbness and tingling when the finger is moved

passively into extension. Therefore, the clinician should also test sensibility with the digit in a passively extended position.

Digital vessels can also become encased and surrounded by the Dupuytren's cords, especially in the digits. Clinical evaluation is performed by passively extending the digit and observing for decreased vascularity (the fingertip becomes pale).

Flexor muscle-tendon unit tightness, e.g. adaptive shortening, can occur secondary to either MCPJ or PIPJ maintained flexion contracture. Intrinsic (lumbrical and interossei) muscle tendon unit tightness/adaptive shortening occurs with an MCPJ flexion contracture. In severe cases of MCPJ flexion contractures, active and passive PIPJ flexion can be limited due to intrinsic muscle tightness. Evaluation is performed by selectively tensioning these tissues. This testing may be extremely difficult to perform pre-operatively if there is a fixed joint contracture.

Joint surface incongruity may result in the loss of articular cartilage from the proximal phalangeal head that is not in contact with the middle phalanx. Secondary adherence of the extensor tendon can occur in this location. X-rays may demonstrate articular changes.

Skin contracture and breakdown is evaluated through observation and comparison to normal tissue. Garrod knuckle pads are an ectopic lesion associated with Dupuytren's disease.<sup>16</sup> The presence of a knuckle pad alone does not typically impact joint motion. Knuckle pads do limit the ability for the patient to wear rings and may affect the patient's perspective of the cosmesis of their hand. Observation is used to evaluate for knuckle pads.

Changes in the sensory motor cortex directly related to Dupuytren's contracture will require further investigation.<sup>17</sup>

## Advances in surgical management

There has been a seismic shift in the hand surgeon's management of Dupuytren's disease over the last several years. Ongoing debate exists as to the roles of traditional open fasciectomy, limited fasciectomy and dermofasciectomy versus less invasive techniques. These shift in techniques include: minimally invasive needle aponeurotomy (NA) or percutaneous needle fasciotomy (PNF); segmental fasciectomy through multiple transverse incisions; and collagenase histolyticum (CCH) Xiaflex<sup>®</sup> (Auxilium Pharmaceuticals, Inc, Malvern, PA) injection and manipulation. Alternative operative techniques include: "wide-awake" open release and two stage treatments using a joint distraction device. Also steroid injection, an irrigation used in combination with techniques has been investigated. New hand surgery fellows are learning more about limited treatment and are not as familiar with open surgical techniques as their mentors were. The open palm technique has been heralded in the past as being both effective and yet without complications such as hematoma, skin necrosis or infection.<sup>18,19</sup> However, most hand fellows today have never seen or performed this technique. In addition, not only is there a trend toward less invasive procedures, there is a push for office-based treatment as opposed to surgical management in the operating theater.

The criteria for needle aponeurotomy (NA) are a contracture due to a palpable cord lying beneath redundant skin in a cooperative patient. Contraindications are inadequate skin or excessive scar, absence of a palpable cord and contracture not due to Dupuytren's disease.<sup>20</sup> The technique described by Lermusiaux<sup>21</sup> and more recently by Beaudreuil<sup>22</sup> and Eaton<sup>20</sup> can be an office-based procedure whereby fasciotomy portals are planned in areas where the skin is soft and the cord is discrete and linear. Local anesthetic is utilized and a 25-gauge needle is used percutaneously as a scalpel. Cords are insensate, but vital structures are not, which allows NA to be performed safely without either sedation or tourniquet. Nerve

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