Expanded Dermofasciectomies and Full-Thickness Grafts in the Treatment of Dupuytren’s Contracture: A 36-Year Experience

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26.1 Introduction

In 1967, the author performed a limited fasciectomy on a patient with a 40° contracture of the PIP joint of the left fourth digit (Fig. 26.1).

Full release of the contracture was obtained, but within a year the contracture recurred to the same degree as before the first surgery; at reoperation very...
similar findings were encountered as were seen at the original procedure, which were both frustrating and enigmatic. In 1970, the author attended a symposium in which Richard Gonzalez demonstrated the technique of using multiple incisions to release a cord of a Dupuytren’s contracture and then inserted firebreak grafts to resurface the defects, as Berger and Lexer used to release burn scar contractures (Berger 1892; Gonzalez 1985; Lexer 1931) (Fig. 26.2).

Inspired by the potential of this technique, the author performed a series of such firebreak grafts. Although there were no recurrences under the grafts, tantalizing extensions occurred around the edges of the grafts, reproducing the contractures. This was not the answer that had been sought. Not knowing how or why the extensions developed, fortuitously the dermofasciectomies and grafts were expanded so that on the palmar side, the grafts extended from mid-lateral to mid-lateral line in the digit, and from the mid-lateral line on the ulnar side of the hand to the level of the second web space at the distal palmar crease, if the disease was limited to the ulnar side of the hand (Fig. 26.3a, b).

Each graft was at least 2 cm in width from proximal to distal. If the disease also involved the radial side of the hand, the grafts were extended from mid-lateral line ulnarly to mid-lateral line radially (Fig. 26.4c). This did make a significant difference as not only were there no recurrences of disease under the grafts, but extension disease was minimized.

![Fig. 26.2 Schematic illustration of Dupuytren’s contracture being released by a series of incisions into a cord and insertion of multiple firebreak skin grafts](image)

![Fig. 26.3 Contracture release of palm and digit with dermofasciectomy. (a) Flexion contractures of the right palm and fifth digit from Dupuytren’s disease. (b) That hand after the contractures were released with dermofasciectomies and the defects were resurfaced with full-thickness skin grafts from the medial aspect of the upper arm](image)
Fig. 26.4  Example of dermofasciectomy.  (a) Patient is post-op dermofasciectomy and full-thickness grafts on the right hand and pre-op on the left after recurrent contractures bilaterally following limited fasciectomies. (b) The left hand immediately after dermofasciectomies of the left palm and digits 2–5. (c) The fresh grafts immediately after the bolus dressings were removed at 21 days. (d, e) The patient’s flexion and extension 12 years post-op.
In the last 36 years, the author has used the expanded full-thickness grafts after the release of Dupuytren's contracture with a dermofasciectomy in the palm and/or fingers. An initial study of 36 hands in 24 patients treated with this technique from 1970 to 1984 was published in 1987 (Ketchum and Hixson 1987). In that initial study, there was no recurrence of Dupuytren's disease in the area of the palm and/or fingers covered with the full-thickness grafts, and the extension rate (new disease outside of the parameters of the original surgery) using this technique was 8.3%. Considering the substantially higher percentages of recurrences and extensions reported in the literature (Tubiana 1985), with an average of 50% for limited fasciectomy and a 32% recurrence rate and a 48% extension rate for the McCash technique, as well as flexion loss in one or more digits in 41% of involved hands, as reported by Schneider et al. (1986), the question was, were the recurrence and extension rates for the expanded grafts realistic, or were they an aberration? To answer that question, the second cohort of patients was studied from 1985 to 2005 with an additional 168 hands in 129 patients using the same protocol as in the original study for a total of 204 hands in 153 patients.

26.2 Material and Methods

Patients with the nodular form of Dupuytren's disease, but no contracture, were offered an intranodal injection of triamcinolone at 6 week intervals until softening and/or flattening of the diseased area occurred. The patients with contracture were offered release and graft if they had any of the facets of the Dupuytren's diathesis or any proximal interphalangeal (PIP) joint contracture or any contracture of the fifth digit. The procedure is usually performed in ambulatory surgery with the patient under regional block anesthesia. After the patient is anesthetized, the upper extremity is prepped and draped, and the dermofaciectomies of the palm and fingers, if contracted, are performed (Fig. 26.5a).

The fascia is removed en bloc with involved skin, sparing the transverse fibers of the palmar aponeurosis, which are not involved in the disease process.

No further dissection is done or dead spaces created by this procedure. A digital proximal interphalangeal contracture is released by a mid-lateral to mid-lateral transverse dermofasciectomy on the palmar side of the proximal phalanx. Occasionally, it is necessary to develop short proximally and distally based flaps to sufficiently release a cord or accessory collateral ligaments that are contributing to a contracted PIP joint. Care is taken not to open the tendon sheath in the area to be covered by the full-thickness graft. The main caveat is prevention of a hematoma under the graft by obtaining absolute hemostasis in the palm and fingers prior to the application of full-thickness skin grafts. The tourniquet is then released and removed after a long-acting local anesthetic is injected around the skin edges; hemostasis is achieved while the graft is being taken and the donor site is being closed.

Whereas Gonzalez reported taking grafts from the groin and Hueston reported a vertical excision of skin from the medial aspect of the upper arm (Hueston 1962), we found that a large swathe of skin that can cover the entire width of the arm (Hueston 1962), we found that a large swathe of skin that can cover the entire width of the arm can be obtained obliquely from the anteromedial aspect of the upper arm, leaving a relatively obscure scar. The average graft measures 10 by 2 cm, and is harvested after the upper arm is prepped and re-draped, and the area to be excised is marked and injected with 1% Lidocaine, containing 1/100,000 epinephrine.

The grafts are supported by bolster dressings that are left in place for 3 weeks (Fig. 26.5b, c). After this period of compression and elevation, graft survival is assured.

The donor site wound edges are undermined and closed per the surgeon's choice; it is our choice to close such wounds with interrupted subcuticular absorbable sutures and steri-strips on the skin (Fig. 26.6a–d).

Both wounds are covered with compression dressings, including a volar splint on the hand, crossing the wrist, with the PIP joints in extension and the MP joints in enough flexion to permit extension of the interphalangeal joints. In 10 days, the dressings are freshened; the donor site dressing is either eliminated except for the steri-strips, or a very light dressing is applied. The hand wound dressing is lighter, and the splint is worn at night only for the next 6 weeks to 6 months. When the bolster dressing and sutures are removed at 21 days, a light coating of antibiotic ointment is applied to the grafts, which are then covered with a nonadherent light gauze dressing, supported with a layer of self-adherent coban.

The grafts can be exposed in the shower and the dressing changed daily for 21 days, at which time all dressing are removed. The grafts mature rapidly, allowing for gripping of sport handles within a week to 10 days thereafter. If the patient has a history of, or tendency to stiffness, hand therapy is started at the first dressing change, or at any appropriate time during the first 6 weeks after surgery.
26.3 Results

In total, 153 patients with contractures from Dupuytren’s disease were treated surgically with the above protocol from 1970 to 2005. Two-hundred-and-four hands of 153 patients were reviewed. One hundred and fourteen patients were male, and 39 were female. Twenty-two percent of the patients had plantar involvement; 49% had a positive family history. The average age of onset was 51.6 years. The disease was bilateral in 76.1%, and the individual finger involvement was as follows: thumb 7.5%; index finger 6.4%; long finger 12.0%; ring finger 27.3%; small finger 46.7%. The average follow-up for the last 129 patients was 2.8 years.

In the early part of the series when the bolster dressing over the graft was left in place for 2 weeks only, there had been occasional partial loss of the graft; this occurred because of the inability of the immature capillaries nurturing the graft to withstand the increased hydrostatic pressure created when a hand inadvertently assumed a dependent position. In the middle 1970s, we began leaving the bolster dressing on for 3 weeks and since that time skin graft loss has been a rare occurrence.

There were no infections except for an occasional suture abscess. Patients were able to return to light duty in a mean of 2 weeks after removal of the bolster. Occasionally, a light growth of hair was reported in the grafts, which was easily handled with a depilatory; after a year, hairs were rarely seen, being worn away by regular usage. The color match and general appearance of the graft from the upper arm to the palm was satisfactory in 95% of patients; hyperpigmentation was not uncommon and was mentioned, but was not a complaint. Decreased sensibility in the grafts was tested for and noted by many patients, but because the grafts were not in critical areas for sensibility, it was not a complaint.

There were no instances of a flare reaction. There were no differences in functional results, that is, increased range of motion postoperative, compared to preoperative between the two cohorts. There was a 1% higher incidence of recurrence and extensions associated with re-contractures that occurred in the second part of the study. There was a total absence of recurrence of Dupuytren’s disease under the grafted area of the palm. Extension of the disease to areas outside the graft was seen in only 19 of the 204 hands treated, which equated to 9.3% of the total hands treated between 1970 and 2005. These findings validate the conclusion that expanded full-thickness grafts that resurface defects...
Fig. 26.6 Graft harvesting. (a) A full-thickness graft can be harvested using a transverse excision. (b) The graft and defect prior closing. (c) Larger grafts can be taken obliquely from the medial aspect of the upper arm; here the axilla is to the left. (d) The wound edges are undermined and closed with subcuticular sutures. This is the same patient as in (c), but it is the closed wound of his right arm. He underwent staged dermofasciectomy and grafts of both palms and digits 6 months apart.

...following dermofasciectomy are effective in decreasing the postoperative incidence of recurrence and extension in the treatment of Dupuytren’s contracture.

26.4 Discussion

Just as the progress of untreated Dupuytren’s disease still remains unpredictable, so exists uncertainty concerning its evolution after operation. Is it possible that surgery may aggravate the disease and cause a more rapid development of deformity than would have occurred had it not been performed? This is certainly suggested after seeing numerous hands crippled by contractures in patients with a strong Dupuytren’s diathesis who previously had multiple attempts at release and excision of the involved tissue with a limited fasciectomy. The question is why does recurrent and extension disease recur so frequently after limited fasciectomy, and what effect might the expanded grafts exert in modifying this phenomenon?

Fitzgerald and coworkers have demonstrated through the use of picropolychrome differential stains that type III collagen is in greatest concentration in the papillary layer of the dermis of patients with Dupuytren’s disease and decreases through the reticular...
by developing dense bundles of actin microfilaments have in modifying this process?

That disease process involves the degradation of ATP to xanthine and uric acid with the release of free radicals that generate inflammation with the release of cytokines, growth factors, and arachidonic acid metabolites (Badalamente et al. 1983); along with longitudinal skin tension, growth factors, particularly TGFb1 (Transforming growth factor beta) cause differentiation of fibroblasts into myofibroblasts which, through their contraction in nodules, transmit a deforming force through cords to involved digits (Tomasek et al. 1999).

What effect would expanded full-thickness grafts have in modifying this process?

First, a dermofasciectomy interrupts longitudinal mechanical stresses, which along with the growth factor TGFb1 differentiate fibroblasts into myofibroblasts by developing dense bundles of actin microfilaments that are integral to the contractile mechanism; in addition, they develop a transmembrane fibronexus that transmits the force of the actin/myosin contraction to the extracellular milieu (fibrin/fibronectin/collagen) (Tomasek et al. 1999).

Second, a dermofasciectomy removes diseased dermis as well as fascia that contain all the elements mentioned above for the development and progression of the disease process.

Third, full-thickness skin from areas of the body that do not get involved in the Dupuytren’s process is applied to a healthy recipient bed of normal tissue.

Fourth, Piulachs and Mir and Mir (1952), Hueston (1962), Gordon (1963), Tonkin et al. (1984), and Ketchum and Hixson (1987) have demonstrated experimentally that the disease process does not recur under full-thickness skin grafts; expanding the grafts decreases the areas in which recurrent disease can develop.

Hueston established the parameters for the Dupuytren’s diathesis, the tendency for the full expression of the disease (Hueston 1986). McFarlane demonstrated that the greater tendency there is for that person to have recurrent disease (McFarlane 1995). Hueston reasoned further that if recurrent disease does not occur beneath full-thickness grafts, would it not be feasible to use full-thickness grafts in people with a strong diathesis and tendency to recurrent disease (Hueston 1962)?

Finally, Rudolph et al. demonstrated experimentally in contracting cutaneous wounds that full-thickness grafts cause the myofibroblast population to decrease rapidly, and projected a beneficial effect in the treatment of Dupuytren’s contracture (Rudolph et al. 1977).

26.5 Conclusions

Possibly, the cure for the Dupuytren’s condition will be in the nature of a biochemical modality similar to the use of collagenase and/or triamcinolone to modify collagen metabolism, fibroblastic proliferation, and contraction of myofibroblasts at the onset of the disease (Badalamente et al. 2003; Watt et al. 2010; Ketchum and Donahue 2000). Once the disease has become established and has advanced to contracture of one or more digits, the contractures must be released in a way that reduces morbidity and the incidence of recurrence and extension of the disease. At this time, the use of full-thickness grafts after release of the contractures appears to be a feasible biological approach to the problem. As Hueston suggested, shutting off the mediating organ, or tissue, that he thought was the skin, may account for the lack of recurrences after full-thickness skin grafting (Fig. 26.5a, b) (Hueston et al. 1976).

Our opinion is that the most benign and physiological approach to this disease process is the minimal dissection required to release contracted joints and the interruption of the disease process with a full-thickness graft or grafts as necessary. The result is less edema, inflammation, stiffness, and reduction of the incidence of recurrence. We believe that the use of expanded full-thickness grafts, particularly over the ulnar aspect of the hand, decreases the incidence of extension of the disease process. This technique is appropriate in the surgical treatment of patients with Dupuytren’s disease in whom contracture of one or more digits develops before the age of 40 years, or who have recurrent disease, bilateral disease, a positive family history, or evidence of ectopic disease.
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References


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