Cellulose Implants in Dupuytren's Surgery

25

Ilse Degreef and Luc De Smet

Contents

25.1 Introduction

Surgery in Dupuytren's disease is performed to correct contractures in the fingers and to maintain this effect after the operation (Bulstrode et al. 2005). Recurrent contracture is a frequent "complication" in the long term. In some cases, this occurs in a close period after surgery (within weeks), during the healing process. Although not all diseased tissue is removed in minimally invasive surgery, we have seen earlier that segmental fasciectomy does not hold a higher recurrent contracture rate (Degreef et al. 2009a). We concluded that although the surgeon can cut the strands to correct contractures, he cannot cure the disease with the knife. It is not the surgical technique that precludes recurrence, but the fibrosis diathesis. Patients at risk can be identified based on clinical parameters (Abe et al. 2004; Degreef et al. 2009b). In high risk patients with a high diathesis for Dupuytren's disease, recurrence can be fast and furious, within weeks after surgery. Myofibroblasts within the scar tissue and extending around the operated areas can initiate rapidly progressing and disabling contractures. Often, the skin is involved and diffusely retracted in these cases. The myofibroblasts align and attach to the deepest layers of the epidermis (Fig. 25.1).

We intended to improve the firebreak effect of segmental fasciectomy and disconnect the skin with the fibroblastic tissue in Dupuytren's surgery with a metabolically inert mechanical barrier. This inspired us to use cellulose implants, a known adhesion barrier (Farquhar et al. 2000).

25.2 Impact

Dupuytren's surgery is an important part of the hand surgeon's practice. At our department alone, we perform about 100 interventions for Dupuytren's disease every year, which is about 8% of the elective hand surgery. With a mean incidence of once a year, an amputation is chosen. This makes Dupuytren's disease a predominant reason for elective finger amputation in adults (Degreef and De Smet. 2009). An amputation in Dupuytren's disease is mostly done after surgery for recurrent disease with a hindering hooked finger deformity. In recurrent disease, surgery is more prone to complications (Coert et al. 2006; Roush and Stern 2000).

The high incidence in hand surgery practice is a direct consequence of the very high prevalence (1 male in 3) of the disease in all stages in people over 50, as

I. Degreef (✉) • L. De Smet
Department of Orthopaedic Surgery,
Leuven University Hospitals, Weligerveld 1, 3212, Pellenberg, Belgium
e-mail: ilse.degreef@uzleuven.be

C. Eaton et al. (eds.), *Dupuytren's Disease and Related Hyperproliferative Disorders*,
DOI 10.1007/978-3-642-22697-7_25, © Springer-Verlag Berlin Heidelberg 2012

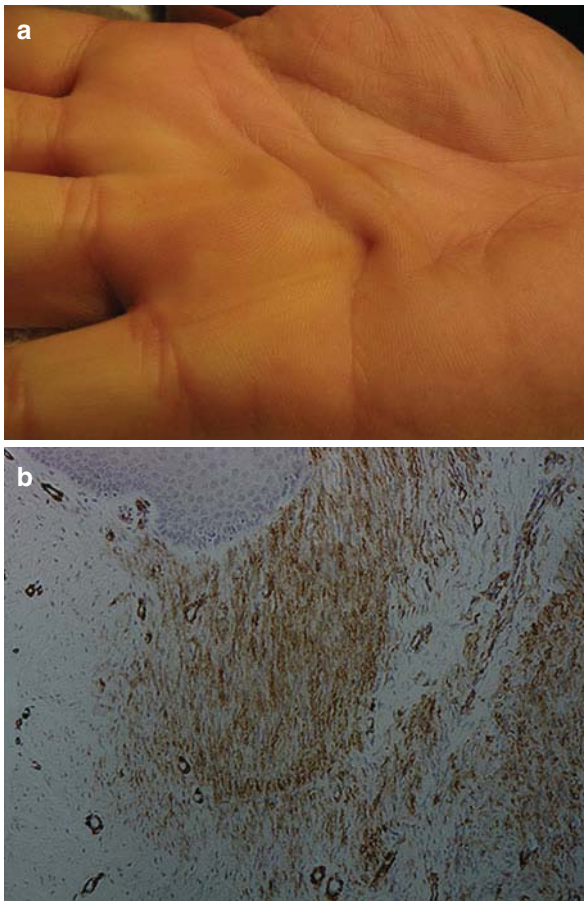

Fig. 25.1 Clinical (**a**) and immunohistological (**b**) picture of the skin retraction in Dupuytren's disease. Skin retractions are often seen in more severe Dupuytren's disease, with the formation of skin "dimples" (**a**). This immunohistological micrograph illustrates the aligned myofibroblasts (stained with alfa-smooth-muscle actin, original magnification, ×400), attached to the deepest edge of the epidermis, actively retracting the skin (**b**)

we have seen ourselves in Flanders in a study of random people on market places (Degreef and De Smet 2010). Thus, there are a lot of patients needing advice from a lot of doctors. Since the disease is incurable, it is important that patients are well informed, soundly assisted within their disease, and surgical treatment is limited to the necessary for keeping the fingers mobile. "Doctor shopping" and over-treatment of patients by compromised caretakers with commercial interests is a risk that needs to be avoided. We need to optimize the efficiency of any treatment option.

25.3 Cellulose Implant

25.3.1 Firebreak Augmentation

In minimally invasive surgery, the contractures are treated without the intention to cure the patient or to remove all diseased tissue. In fasciotomy, strands are interrupted with a knife or with a needle. In segmental fasciectomy, a small "firebreak" is created by removing a centimeter or less of the strands (or nodules). The intention of this firebreak is to avoid fast recurrent contractures caused by sectioned strands that may reattach if they make a direct contact. However, the hematoma that forms in these firebreaks, which are actually surgically created free spaces, may induce new adhesions that may bridge the interrupted strands in some cases. A collection of new myofibroblasts appears, forming recurrent nodules, skin retraction, and finger contractures in patients with a high fibrosis diathesis. Adhesion barriers are well known from infertility surgery (adhesiolysis). Its use has been extended in neurosurgery and also in hand surgery, where it is used to prevent adhesions and fibrosis after tenolysis (Temiz et al. 2008). This inspired us to use the cellulose implant (we use Divide™, DePuyMitek, Johnson & Johnson Medical Inc, New Brunswick, NJ) in Dupuytren's surgery.

25.3.2 Surgical Technique

Segmental fasciectomy is performed with small curved incisions overlying the strands on one to three places with intervals of 1 cm (Moermans 1991). Often, it is chosen to take out the most prominent nodules. After dissecting the strands, 5–10 mm of the strand is removed and by gentle manipulation, the fingers are forced to regain full extension. Care is taken not to harm neurovascular bundles.

In case of important skin retraction, we have extended the technique to loosen the skin (Figs. 25.2 and 25.3). The skin is further undermined, in some cases even centimeters from the incision site to loosen the retractions. In case of diffuse fascia retraction, a subcutaneous fasciotomy is performed in the neighboring palmar finger rays, to loosen the fascia palmaris.

After the fasciotomies, segmental fasciectomy and skin releases are all performed, careful hemostasis needs to be done with cauterization to prevent significant

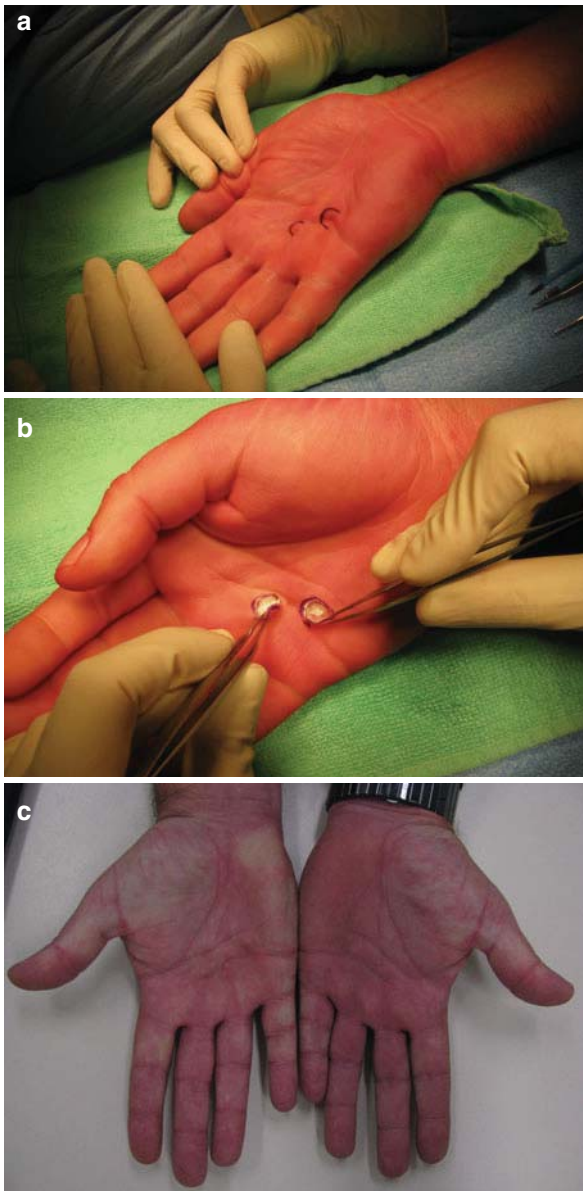

Fig. 25.2 Clinical and intraoperative images of a correction of skin retraction with cellulose implant and clinical results after 7 months. The skin retraction (**a**) is addressed with a curved mini-incision, the skin is dissected off the underlying fascia and a segmental strand resection is performed. After hemostasis, the cellulose implant is sized as needed and implanted in a horizontal single-layer fashion (**b**). Clinical result after 7 months (**c**), the retraction is corrected, skin and fingers are supple

hematoma formation. Then, the cellulose patch is cut into small pieces, to fit the free spaces that were created. The cellulose patch should be implanted in a horizontal single layer and cannot be "overstuffed." This could lead to prolonged wound drainage (as we encountered in the beginning of cellulose use in tenolysis, but until now, we have not seen in Dupuytren's surgery). The cellulose will liquefy within 48 h, forming a 3 dimensional passive adhesion or firebreak barrier. Dissolving skin sutures are used and the hand is wrapped with a firmly compressing softly padded dressing.

25.3.3 Postoperative Regime

Within 5 days after surgery, small band-aids are put on the skin wounds and early mobilization is initiated. An extension splint is manufactured to wear nightly for 8 weeks, the first 4 weeks also during daytime by means of an intermittent mobilization and splinting regime (2 h on – 2 h off).

25.3.4 Outcome

In a randomized controlled trial within 29 patients, segmental fasciectomy was compared with and without a cellulose implant (Degreef et al. 2011, summary reported with permission). All patients had a high fibrosis diathesis with scores of 4 and higher as described by Abe (Abe et al. 2004). They were known with knuckle pads, Peyronie's disease, Ledderhose disease, a young age of onset, multiple ray, bilateral and/or radial side involvement, and a positive family history. Patients were monitored with visual analogs scales for pain and satisfaction, DASH scores, and most importantly with goniometric measuring of the contractures, which was documented with standardized digital photography (Smith et al. 2009).

A significant improvement of the mobility of the fingers was confirmed in the trial (Degreef et al. 2011). A relative correction of 87% with the implant versus 51% without the implant was seen (goniometric coefficient in Tubiana et al. 1968). This reflected in superior satisfaction scores which increased by 27% with cellulose implants. After 3 months, the results remained unchanged (with a follow-up now of over 2 years). Although the correction is complete during the surgical procedure, a short period of rebound is

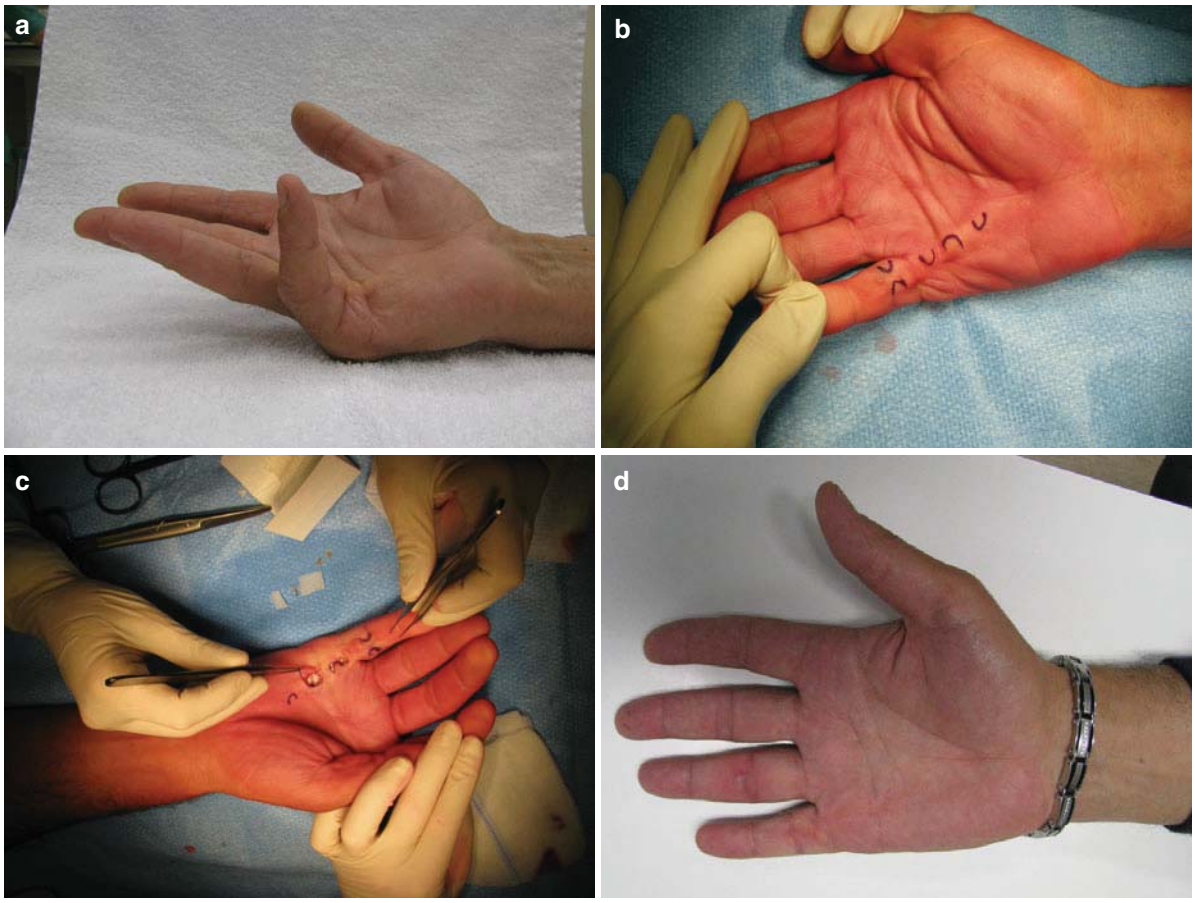

Fig. 25.3 Clinical and intraoperative images of a fifth ray contracture, which is treated with segmental fasciectomy and cellulose implants (**a**). The contracture of both the MCP and PIP joints is addressed with numerous small curved skin incisions (**b**). After segmental strand resection on all levels needed to achieve full finger extension, thorough hemostasis is done and cellulose is implanted in all wounds (**c**). A supple hand is seen days after the operation with a good clinical result after 7 months (**d**)

often seen, in which some of the correction is lost during the initial scar tissue formation during the first 12 weeks. Remember, these are all high-risk patients with a high fibrosis diathesis. This rebound phenomenon was reduced if the cellulose was implanted and no complications were seen.

Although difficult to measure, we saw an impressive quick and easy rehabilitation in the patients with the implants. When the small band-aids were set at 5 days, they all had a supple and painless full range of motion. After 8–10 weeks, the scar tissue did harden again in most cases, as it did in the patients without the implant. However, all patients with the implant had easily regained a normal mobility at that point, contrasting to the patients without.

We now use the cellulose implant at a regular basis at our office and we continue to see easy rehabilitation and good skin mobility after the surgery, without recurrent contraction.

25.4 Discussion

We have stated that surgery is only used in Dupuytren's disease to correct contractures, not to cure the disease. We saw that minimally invasive surgery does not imply higher recurrence risks. Fibrosis diathesis remains the most important way to determine if recurrence is imminent (Degreef et al. 2009c). In severe diathesis, recurrence is often fast within the period of scar tissue formation. In the technique of segmental fasciectomy, firebreaks are created within the strands. To augment this firebreak effect, we have now added the dissolving adhesion barrier and passive fibrosis inhibitor cellulose. We have seen an easy rehabilitation with an improved outcome and high satisfaction rate in high-risk patients with a severe fibrosis diathesis. Our group now uses the implant on a regular basis to improve the results of minimally invasive surgical techniques and to release retracted overlying skin. Future studies are conducted

to continue the monitoring of the results of this innovative technique. It looks promising and holds new possible pathways, in which active myofibroblast inhibiting substances may be added to the implant material.

25.5 Conclusions

- Cellulose implants significantly improve surgical outcome in patients with diathesis.
- The firebreak effect is augmented and skin retractions are released.
- Finger extension is improved and satisfaction is high.
- The implant is well-tolerated and rehabilitation is facilitated.
- Future pathways of adding an active substance to the implant are considered.

References

Abe Y, Rokkaku T, Ofuchi S, Tokunaga S, Takahashi K, Moriya H (2004) An objective method to evaluate the risk of recurrence and extension of Dupuytren's disease. J Hand Surg [Br] 29B:427–430

Bulstrode NW, Jemec B, Smith PJ (2005) The complications of Dupuytren's contracture surgery. J Hand Surg [Am] 30A: 1021–1025

Coert JH, Nérin JP, Meek MF (2006) Results of partial fasciectomy for Dupuytren disease in 261 consecutive patients. Ann Plast Surg 57:13–17

Degreef I, De Smet L (2009) Dupuytren's disease: predominant reason for elective finger amputation in adults. Acta Chir Belg 109:494–497

Degreef I, De Smet L (2010) A high prevalence of Dupuytren's disease in Flanders. Acta Orthop Belg 76(3):316–320

Degreef I, Boogmans T, Steeno P, De Smet L (2009a) Surgical outcome of Dupuytren's disease. No higher self-reported recurrence after segmental fasciectomy. Eur J Plast Surg 32:185–188

Degreef I, De Smet L, Sciot R, Cassiman JJ, Tejpar S (2009b) Beta-catenin overexpression in Dupuytren's disease is unrelated to disease recurrence. Clin Orthop Relat Res 467: 838–845

Degreef I, Vererfvre PB, De Smet L (2009c) Effect of severity of Dupuytren contracture on disability. Scand J Plast Reconstr Surg Hand Surg 43:41–42

Degreef I, Tejpar S, De Smet L (2011) Postoperative outcome of segmental fasciectomy in Dupuytren's disease improves by creating firebreaks with an absorbable cellulose implant. J Plast Surg Hand Surg 45(3):157–164

Farquhar C, Vandekerckhove P, Watson A, Vail A, Wiseman D (2000) Barrier agents for preventing adhesions after surgery for subfertility. Cochrane Database Syst Rev 2:CD000475

Moermans JP (1991) Segmental aponeurectomy in Dupuytren's disease. J Hand Surg [Br] 16B:243–254

Roush TF, Stern PJ (2000) Results following surgery for recurrent Dupuytren's disease. J Hand Surg [Am] 25A:291–296

Smith RP, Dias JJ, Ullah A, Bhowal B (2009) Visual and computer software-aided estimates of Dupuytren's contractures: correlation with clinical goniometric measurements. Ann R Coll Surg Engl 91:296–300

Temiz A, Ozturk C, Bakunov A, Kara K, Kaleli T (2008) A new material for prevention of peritendinous fibrotic adhesions after tendon repair: oxidised regenerated cellulose (Interceed), an absorbable adhesion barrier. Int Orthop 32:389–394

Tubiana R, Michon J, Thomine JM (1968) Scheme for the assessment of deformities in Dupuytren's Disease. Surg Clin North Am 48:979–984