

Indications of the Continuous Extension Technique (TEC) for Severe Dupuytren Disease and Recurrences

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cases of severe progressive stage or severe recurrence are seen in specialized hand surgery centres (Moschella 2012). The treatment performed in order to extend and restore contracted fingers, in one or both hands, is usually aiming at lengthening of the skin, extending the retracted joints and re-establishing the flexo-extension functionality of the fingers and the physiological prehension of the hand. But even for an experienced surgeon, it is difficult to select the right surgical treatment for functional recovery. This has inspired us to propose a physiological lengthening of contracted fibrous structures of the fingers and of the hand by means of the Continuous Extension Technique (Messina 1989; Fig. 42.1).

Many fibrous structures are involved in the progressive contracture due to the disease (Millesi 1986): collateral ligaments; checkreins, volar plate; flexor tendon sheaths together with the pretendinous band, lateral cord, natatory ligaments, spiral cords and collateral neurovascular bundles; and at last the dermal fibrous structures together with a real alteration of sensitivity and trophism of collateral nerve endings. Additionally, having to re-establish useful sliding of different thick, fibrotic and contracted layers of soft tissues, many surgical procedures utilized until today create new and worse biological damage and scarring as in fact happens after the total anterior teno-arthrolysis (TATA Operation) (Saffar 1983) or radical and total fasciectomy (McIndoe and Bear 1958; Skoog 1948) or a large

42.1 Introduction

The treatment and knowledge of Dupuytren Disease has evolved in the last few years and has become widely known. Treatment is now performed with techniques as fasciotomy (Dupuytren 1831); needle aponeurotomy (Cheng et al. 2008) and partial or limited fasciectomy (Luck 1959; Hamlin 1952) or with the injection of collagenase (Hurst et al. 2009). Nevertheless, still some

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Fig. 42.1 Severe Dupuytren contracture of the little finger. This situation is presenting a difficult surgical approach; ankylosis of MP and IPP joints; contracture with important loss of digito-palmar and palmar skin (2–3 cm) and of digito-palmar fascia; severe retraction of collateral ligaments, checkreins and palmar plate of IPP joint; even the lateral and spiral cords are retracted as well as the natatory ligament. Due to complexity of reconstructive surgery, we suggested to utilize the Continuous Extension Technique



dermofasciectomy (Hueston 1984). Today, in the presence of a progressive disease, there is a worsening post-operation healing of sliding tissues of fingers together with poor functionality even of the hand; surgeons suggest performing a secondary or tertiary surgery; this choice additionally worsens all soft finger tissues and may ultimately lead to the indication of partial or total amputation of the finger. On the other hand, it is known that even in some severe cases, loss of vascularity of the contracted finger or alteration of its sensibility and trophism often leads to the indication of amputation. The Continuous Extension Technique can be used in cases of severe progressive Dupuytren Disease; avoiding and may help avoid an amputation.

42.1.1 Advantages and Indications of the TEC Methodology

The Continuous Extension Technique (TEC) is a minimally traumatic, painless and advanced technique performed by an external device which allows the restoration of the extension of the fingers and their function.

The Continuous Extension Technique:

1. Provides the option of conserving severely contracted fingers and restoring their functionality; this had previously strained the technical limits of classical operations or been downright impossible (progressive cases with persistent recurrences) (Messina 2011).
2. Facilitates all procedures, greatly reducing surgical tissue trauma, the complexity, length and difficulties of the surgery in long-term retracted joint stiffness.
3. Simplifies the finger and palmar skin incision and surgical approach; it avoids complementary articular procedures in the finger, such as capsulotomy and arthrolysis; the release of checkreins, collateral ligaments and palmar plate; and the release of the digital cord and the retracted lateral, spiral and natatory ligaments. This especially in advanced stage or in patients who have already been operated on.
4. Avoids the sudden surgical extension of the contracted finger with consequent stretching and tearing of collateral neurovascular bundles which cause devascularization and trophic trouble in fingers that have been retracted for many years in severe flexion due to progressive disease and recurrences (Fig. 42.2).
5. It is an alternative to dermofasciectomy and difficult plastic surgery for correcting severe digital or palmar skin loss and contracture.
6. Surpasses the McCash “open palm” technique both in theory and in its practical applications (no exposure of deep and sensible palmar tissues, no secondary healing, no deep scarring risk, no risk of flogosis, no risk of palmar reflex dystrophy, etc.).
7. TEC is a possible definitive solution in some cases of chronic Dupuytren contracture; this is confirmed by the disappearance of the pretendinous cord in the extended finger and of the contracted palmar fascia as well as the palmar

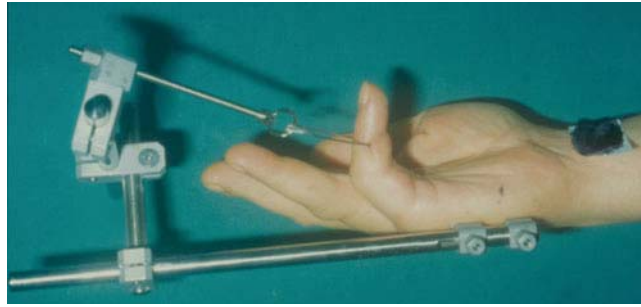


Fig. 42.2 The TEC device. The TEC device is an advanced apparatus to perform continuous extension treatment of the retracted fingers. The device is not cumbersome (its size can be adapted to the elongated fingers and it weighs only 190 g). The extension is minimally traumatic and painless; it can be applied simultaneously to several retracted fingers.

The TEC avoids the sudden surgical extension of the contracted finger with consequent stretching and tearing of collateral neurovascular bundles which may cause disturbance of blood circulation and trophic trouble in fingers that have been retracted for many years in severe flexion due to progressive disease and recurrences

Fig. 42.3 Complete extension of the little and ring fingers (also partially contracted) after 3 weeks. The elongation is carried out by the patient at home. The fasciectomy of diseased fascia must be performed at the same time the TEC device is removed. The surgical approach is as simple as in the first stage of Dupuytren Disease. Plastic skin surgery, including Z-plasties, skin graft, etc., was not necessary in this case and in other cases treated by TEC methodology



nodules (compression test) (Fig. 42.3; Messina and Messina 1997).

8. TEC treatment might also benefit post-traumatic retraction scars accompanying flexion ankylosis and deformity of the fingers (caused by burns, tendon and osteoarticular trauma, skin loss, etc.).
9. Finally, TEC is indicated in severe progressive recurrences and extensions of advanced Dupuytren, reducing stages III and IV to the first stage of beginning of contracture (Messina 2011).

Repeated surgery can potentially lead to amputation of the retracted finger, and the TEC device reduces this risk. For severe pathological contracture, the Continuous Extension Technique methodology is indicated to ease surgery and reduce complications. By lengthening of the digito-palmar fascia and of the contracted skin as

well as of all retracted soft tissues, it re-establishes the first stage of the disease (Fig. 42.3).

42.2 Materials and Methods

We treated 130 patients from 2004 to 2014; they were affected by stages III and IV of Dupuytren contracture according to the Tubiana classification (Tubiana 1996). Of the 86 patients reviewed, the TEC procedure was applied to 21 previously not operated hands and 65 hands that showed recurrence or extension after a previous operation performed in another hospital. One third of cases (28 patients) had been indicated as needing amputation: 9 cases as first indication, 7 as a consequence of progressive recurrence and worsening after total fasciectomy, 5 after dermofasciectomy, 6 after secondary articular surgery and 1 after tertiary procedure.

42.2.1 Technique

Under regional or axillary block anaesthesia, two self-drilling pins with continuous threads are inserted on the cubital side of the hand through the skin. The pins are inserted transversally through the fifth and the fourth metacarpal bones at the proximal and distal metaphyses (Fig. 42.2).

Clinical and radiographic control of the length and position of the inserted pins confirms that they have completely penetrated both cortices of the fifth and fourth metacarpal bones. In this way we obtain a very stable and painless assembly that supports the TEC device in order to achieve a physiological, continuous elongation of the retracted fingers (Messina 1989; Messina and Messina 1991, 1993, 1995, 1997; Fig. 42.2).

A Kirschner wire is then inserted transversally through the distal metaphysis of P2, through the proximal metaphysis of P3 if this is retracted or through both metaphyses if both the proximal and the distal interphalangeal joints are flexed together in severe contracture (Fig. 42.2). The Kirschner wire is bent to form a traction loop. The TEC device is assembled on the metacarpal pins outside the operating room. The phalangeal traction loop is connected to a threaded screw allowing a 2 mm. per day lengthening of the retracted finger (2 mm. distributed four times a day: 8 am, 12 pm, 4 pm, 8 pm). The device is regulated with regard to adequate direction and height according to the respective extent of flexion and direction until complete elongation of the retracted finger has been achieved (Fig. 42.3).

After its positioning the extension is performed by the patient himself for 3 weeks.

Then the pins, the Kirschner wire (s) and the TEC device are removed, and a partial palmar fasciectomy can be performed through a simple palmar surgical approach as the finger is completely extended so that even a less experienced hand surgeon can perform it. The hand and the finger(s) are then immobilized until stitches are removed. Afterwards a rehabilitation session begins together with paraffin baths and TENS sessions (TENS=Transcutaneous Electronic Nerve Stimulation). In the beginning it is better to reduce the functional stress of the finger(s) and the palmar skin to avoid forced and stretching rehabilitation of the operated finger and to carefully massage the palmar-digital skin.

42.3 Results

Around 86 hands and 119 fingers were reviewed with a mean follow-up of 4 years (8 months to 10 years).

1. Excellent and good functional results were obtained in 85 % of cases (Figs. 42.3 and 42.4).
2. Fair in 15 % (without perceptible improvement).
3. No poor result.
4. Stiffness 16 %.
5. Recurrence was observed in 8 patients with appearance of a nodule and small scar retraction on the previous incision line without deep

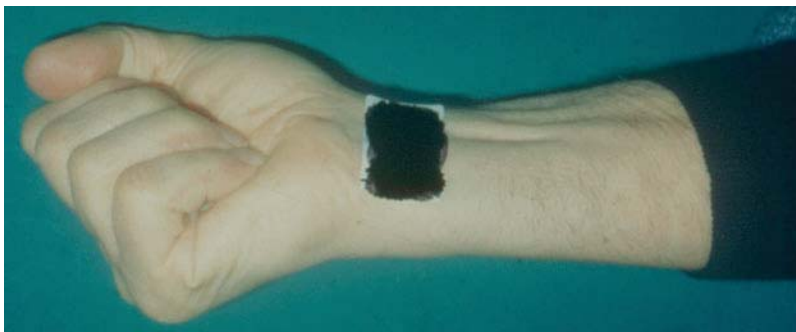


Fig. 42.4 Hand function after TEC. Active flexion of the fingers after application of the Continuous Extension Technique. Now joints are completely mobile without residual thickness and retraction of collateral and

checkrein ligaments; volar plate and all fibrous structures of the contracted finger are physiologically lengthened and their elasticity restored

fibrosis; in 10 cases extension of disease appeared on the border of the operated area, with little nodules or light cords on the radial side of the hand.

6. No pain or painful scars were noted and skin sensitivity was found to be normal (comparable to the surrounding normal skin).
7. No flogosis, no algodystrophy was observed.

For 180 years Dupuytren Disease was considered a degenerative, progressive and irreversible disease. The Continuous Extension Technique may modify this view because the degenerative fascia can become regenerated by continuous lengthening; progression can be stopped by the external traction, and the irreversibility of the disease can be reversed and the progression stopped by means of our mechanical action.

The TEC methodology, by bringing the contracture back to the initial stage of the disease, has shown that the contraction process can be stopped and reversed.

The Continuous Extension Technique opens the way for new basic research into the morphological and biochemical processes of collagen in the retracted palmar fascia (Bailey et al. 1994; Brandes et al. 1994). Research by the laboratories of cell biology and electron microscopy of the Medical School of Hannover (Brandes et al. 1996) has revealed the unexpected appearance of “stress fibres” in the endothelial cells of both arterioles and venules in the contracted fascia of Dupuytren Disease after application of a TEC device. These fibres have never been seen before in these structures. This confirms the scientific importance of the TEC method in studies of Dupuytren Disease and its clinical originality. It could explain the morphological basis of the mechanism of the contracture of the fascia in Dupuytren Disease and its recurrence.

42.4 Discussion and Conclusion

The Continuous Extension Technique (TEC) represents an alternative to finger amputation in severe cases of Dupuytren Disease. It is a means for avoiding necrosis, loss of vascularity and

functional impairment that may result from classical operations. At the end of the continuous extension, a considerable improvement in elasticity, skin trophism and microvasculature of the extended skin was always observed. This technique is an advanced method and achieves the elongation of contracted skin and of the digitopalmar fascia in severe and inveterate Dupuytren Disease (Figs. 42.3 and 42.4); it enables the retracted fibrous tissues to revert to the first Tubiana stage of the disease. TEC is a minimally traumatic and painless method for the rational treatment of some cases where there is interdigital mycotic intertrigo, together with a severe or progressive disease of one or several digits. It avoids the sudden surgical extension of the retracted finger and the stretching of collateral vasculo-nervous bundles which are the cause of devascularization and trophic difficulties in fingers retracted for many years in complete flexion. The resulting elongation of the retracted skin and the contracted fascia goes up to 3 cm (Messina and Messina 1997), thus avoiding plastic skin surgery and complementary articular procedures.

The treatment is indicated as an alternative to a proposed finger amputation or if a multiple operation plan is needed. A fasciectomy after TEC procedure is as simple as in stage I of Dupuytren Disease.

Conflict of Interest Declaration The authors have no conflict of interest to declare.

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