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# Skin Management in Treatment of Severe PIP Contracture by Homo- or Heterodigital Flaps

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## 28.1 Introduction

The classical course of morbus dupuytren is the formation of nodules in the palm, which progresses to the formation of cords and then into the contracture of the finger joints. While metacarpophalangeal joint (MCP-joint) flexion contracture can almost always be corrected at any stage, this is not the case for PIP-joint contractures, especially when seen at an advanced stage (contraction over 30°) when the joints have become fixed. In the classification system of Tubiana and Michon (Tubiana 1985) this difference cannot be appreciated, since it scores the contracture in a complete finger, regardless of the contribution of the MCP-joint or the PIP-joint (Table 28.1).

As a result, whether a finger should be treated conservatively, minimally invasively, or with open surgery cannot be deduced from this classification. For instance, while in Stage 2 a contraction of the MCP-joint of 90°, a needle fasciotomy definitely portrays an alternative to surgical treatment (Foucher et al. 2001), it will be of little success in an exclusive contraction of the PIP-joint of 90°.

The most commonly used incision are the zigzag incision according to Bruner (Bruner 1967), enabling a V-Y Advancement Flap, or the straight line incision, which can subsequently be interrupted using z-plasties (Skoog 1985, Weinzweig 1985). In isolated contractures of the MCP-joint the skin can, in most cases, even with an extended joint, be properly closed by a large area z-plasty. If a moderate degree contracture of the PIP-joint in addition to the contracture of the metacarpophalangeal joint exists, a combination of the Open-Palm-technique in the area of the palm and z-plasties can be carried out over the MCP- and

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**Table 28.1** Stage classification according to Tubiana and Michon

Stage N: No contraction
Stage 1: Contraction of 0–45°
Stage 2: Contraction of 46–90°
Stage 3: Contraction of 91–135°
Stage 4: Contraction over 135°

PIP-joint. Considerably, more problematic is skin handling in severe contractures of the PIP-joints. For this joint, it is at best possible to correct contractures up to 30° using z-plasties (Gonzalez 1990).

In all other cases and especially when the PIP-joint is completely extended after an open arthrolysis, it is necessary to cover the missing palmar skin with flap plasties. In these cases, the use of homodigital or heterodigital flap plasty is a possibility. If thereafter a skin deficit remains in the palm, this can be managed using “the Open-Palm-Technique” (McCash 1964).

The purpose of this study is to report on our experience using these flaps in severe PIP contractures and compare the results with those of a historic cohort, in which we used more standard techniques.

## 28.2 Operative Technique

### 28.2.1 Homodigital Flaps

The skin over the proximal phalanx is elevated as an ulnarly based right-angle flap and the flap that is ultimately used to close the palmer defect after contracture

release is planned and developed on the ulnar side of the midphalanx (Figs. 28.1 and 28.2).

After excision of the pathologic tissue and joint release, the initially planned flap is transposed to the palmer side (Figs. 28.3 and 28.4).

The donor site is closed using a full-thickness skin graft. This can either be taken from the antecubital fossa, the forearm, or from the thenar area (Fig. 28.5).

#### 28.2.1.1 Bilobed Flap

A modification is the so-called bilobed flap: a second flap is taken from the dorsal skin at a 90° angle to the first flap over the midphalanx (Figs. 28.6 and 28.7). This second flap is rotated into the donor site of the first flap (Fig. 28.8). The second donor site is closed primarily (Fig. 28.9). The advantage is that no skin graft is necessary.

#### 28.2.1.2 Combination of Homodigital Flap with Open Palm Technique

The technique of homodigital flap taken from the midphalanx can also be combined well with the open palm technique for severe contractures of the MCP- and PIP-joint (Figs. 28.10 and 28.11).

### 28.2.2 Heterodigital Flaps

A heterodigital flap plasty offers an alternative to the homodigital transposition flap (Figs. 28.12, 13, 14). This in our eyes allows for a very functional and



**Fig. 28.1** The preoperative planning of the incisions and the homodigital flap



**Fig. 28.2** The flaps after excision of the pathology and joint release just prior to closure



**Figs. 28.4 and 28.5** The skin closure of the proximal phalanx and the thenar region



**Fig. 28.3** Rotating of the homodigital flap into the defect of the proximal phalanx

exceptionally nice cosmetic coverage. The donor site also needs to be treated with a full thickness skin graft (Fig. 28.15).

### 28.2.3 Postoperative Treatment

The postoperative treatment is very important for a good outcome: We advise to apply a daily manual lymphatic drainage for 14 days beginning on the first postoperative day. In addition, after the second postoperative day, 30 min hand therapy everyday plus an individually customized splint to be worn the first 14 days permanently and then for several months at night to avoid a reappearance of the flexion contracture.

After taking out the stitches, which should be done on the 14th postoperative day, it is necessary to treat the at this time often thickened scar with a silicon bandage at night and a scar massage combined with mechanical vibration therapy several times a day.

## 28.3 Patient Characteristics

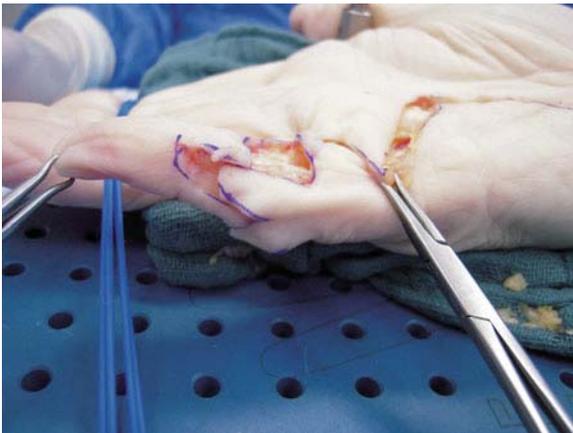
Between January 2005 and November 2009 homo- and heterodigital flap plasty was used on a total of 40 patients, 5 of which were women and 35 men. The



**Fig. 28.6** Preoperative planning of a second flap over the dorsal PIP-joint



**Fig. 28.9** Closing the donor site of the second flap



**Fig. 28.7** Rotating the first flap to the palmar defect (other patient)



**Figs. 28.10 and 28.11** Combination of PIP-joint closure with a homodigital flap and open palm technique



**Fig. 28.8** Rotating the second flap to the ulnar-dorsal defect

average age was 62 years, the youngest patient had an age of 35 years, the oldest one was 85 years old. No patient had diabetes mellitus type I, 6 patients had diabetes type II. The patients had no other remarkable diseases.



**Fig. 28.12** A dorsolateral skin flap is cut on the fourth finger



**Fig. 28.13** Rotating this flap to the first phalanx of the fifth finger

Details of the preoperative status of the patients, including Tubiana staging and the operative procedure performed is shown in Table 28.2.

## 28.4 Results

In all cases with preoperative PIP-joint contracture of less than 60°, full joint extension could be achieved intraoperatively. However, in these cases, universally, a flexion contracture reappeared after 6 months of up to 15° (Fig. 28.16), which further aggravated after 2 years until up to 30° (Figs. 28.17 and 18).

In cases with a preoperative PIP-joint contracture of over 60°, an extension deficit of between 10 and 30° remained, despite an open arthrolysis. In these cases, the reappearing flexion contracture after 6 months was



**Figs. 28.14 and 28.15** The final result of both fingers

**Table 28.2** Patients and kind of surgeries

<i>Forty patients</i>	
- 25 × finger V	
- 10 × finger IV	
- 5 × fingers I–III	
<i>Preop. contracture PIP</i>	<i>Operation</i>
- 15 × 45–60°	30 × primal operation
- 10 × 60–90°	10 × relapse operation
- 15 × more than 90°	
<i>Stage according to Tubiana</i>	<i>Type of flap plastique</i>
- 25 × Stage 2	35 × homodigital
- 10 × Stage 3	5 × heterodigital
- 5 × Stage 4	15 × open athrolysis

up to 40°, and worsened after 2 years up to 60°. The residual amount of flexion contracture of the fifth finger and relapse surgeries was 50% higher than for all the other fingers or for first-time surgeries. In 40% of cases, the sensitivity disturbance, as a result of the surgery which was tested with the monofilament test, continuously improved up to 2 years postoperatively,



**Fig. 28.16** Short-term postoperative result: contracture of 10°

whereas the transposed sliding flaps remained insensate as expected.

In the donor site, we ultimately did not have any aesthetic or functional problems, whereas in the beginning the skin graft was somewhat bulky.

Twenty-five patients (63%) complained of slight to moderate coldness sensitivity even up to 2 years after surgery. A summary of the results is shown in Table 28.3.

#### 28.4.1 Complications

In four patients, wound healing disorders occurred (Fig. 28.19). These healed without further surgical revision. We had one homodigital flap loss. In three cases, the full-thickness skin graft that was used to close the donor defect was lost partially or completely, which was allowed to heal secondarily.

Two revisional surgeries had to be carried out about 1 year later. In the first case, an arthrodesis of the PIP-joint was carried out because of severe recurring contracture of the joint, in a further case a finger amputation was done because the patient had a severe sensitivity to coldness and wished this option due to the danger of losing his job.

### 28.5 Discussion

Correction of MP joint contracture in Dupuytren's Disease is rarely a problem. It can almost always be released and skin shortage can be managed by simple Z-plasties or the open palm technique. Management of PIP-joint contracture however, remains a controversial



**Figs. 28.17 and 28.18** Recurrence of PIP-joint contracture after 2 years: 40°

**Table 28.3** Summary of results

	Intraop deficit of extension	Flexion contraction after 6 months	Flexion contraction after 2 years
Preop contracture PIP 45–60° (n = 15)	Full extension possible	10–15°	15–30°
Preop contracture PIP 60–90° (n = 10)	10–20° (despite athrolysis)	20–30°	30–45°
Preop contracture PIP >90° (n = 15)	20–30° (despite athrolysis)	30–40°	40–60°

point in literature. The outcome of PIP-joint release is uncertain (Belusa et al. 1997) and there seems to be a general agreement that there is no clear benefit of joint release as addition to fasciectomy (Weinzweig et al. 1996). In our opinion one of the most important

**Fig. 28.19** Delayed wound healing



procedures is to combine joint release by skin closure without any tension.

In a former control group of 30 patients (Tubiana 2/3 with severe PIP-involvement), which was treated by conventional Bruner zigzag incisions or z-plasties, the flexion contracture of PIP-joint 2 years later was 30–45° if preoperative contracture had been less than 60°. It was 50–70° if the preoperative contracture had been more than 60°.

By using our technique of homodigital or heterodigital flap plasty, these figures could be reduced by 20–30%: In cases with preoperative flexion contracture of less than 60°, a flexion contracture reappeared after 2 years until up to 30°. In cases with a preoperative PIP-joint contraction of over 60°, the reappearing flexion contracture after 2 years was up to 60°.

The coverage of palmar defects at the PIP-joint with cross finger flaps makes less sense to us. A much longer immobilization period than we strive for is necessary and a second surgery is needed to divide the pedicle of the flap and sometimes a third operation to make final corrections. The alternative for this treatment is dermofasciectomy and full-thickness skin grafting (Hueston 1984). The results of this technique have shown similar results of 30° residual contracture of the PIP-joint of little finger as we have found in our technique. (Gonzalez 1990). The advantage of flaps in comparison to skin grafts is the better healing over

flexor tendon sheet, especially once opened and the provision of better padding. We do not think that the coverage of the palmar defect with a full thickened skin graft is a good alternative because of the often insufficient blood circulation of the defect. Therefore, full-thickness skin grafting is from our viewpoint unsafe.

## 28.6 Conclusion

The primary planning of a homo- or heterodigital flap plasty for contraction of the PIP-joint over 30° clearly increases the short- and medium-term result, because the rate of recurrence of a flexion contracture is 20–30% less than when using other skin incisions.

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