

# Improving facial appearance

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## English summary

### **Chapter 1: Introduction**

This chapter aims to introduce the reader to the consequences of scarring and to highlight the importance of scar therapy in plastic surgery. The formation of scars is discussed, and insight is provided about the wound healing cascade. The chapter also focuses on the influence of different cultures on the perception of scars and their (functional, symptomatic, and cosmetic) consequences as well as the psychological impact of scars on patients. The different types of scars are then addressed, and the current surgical and non-surgical options are discussed for the treatment of problematic scars. In addition, a specific way of treating facial scars with a pressure mask is discussed. Finally, the aims of this thesis are formulated.

### **Chapter 2: Better understanding of the maturation time of hypertrophic scars**

This chapter aims to provide more insight into the least understood phase of the wound healing cascade: the remodeling or maturation phase. In the current literature, estimates of the duration of this phase are wide-ranging and unclear. During this active phase, scar remodeling is still possible, and scars are susceptible to appropriate therapy. In the retrospective study in **Chapter 2**, in which 361 patients with hypertrophic scars were followed, it was shown that the maturation of hypertrophic scars takes significantly longer than stated in the literature. Older patients (>55 years) form mature scars at a significantly faster pace than do younger patients (<35 years): 22.53 months versus 35.76 months, respectively. Pressure therapy (23.20 months) provides the fastest maturation of hypertrophic scars when compared to combination therapy (30.59 months), silicones (35.10 months), intralesional therapy (46.42 months), and other therapies (41.31 months). This is the first clinical study to investigate the course of hypertrophic scars in a large group of patients. Prospective studies examining the natural course of standardized scars are important for the further unraveling of the wound healing cascade.

### **Chapter 3: Aesthetic results after facial skin cancer surgery**

**Chapter 3** focuses on patients' perceived effects of surgical removal of facial skin cancer. Surgical removal of skin cancer needs to be as radical as possible. A consequence of this is that large defects can occur. Particularly in the face, this can have disastrous consequences for the anatomical proportions of the face. In **Chapter 3**, we examined the influence of the surgical removal of facial skin cancer on patients' perceived facial appearance using FACE-Q questionnaires. This study showed that patients are significantly more satisfied with the result of the facial reconstruction three months after surgery compared to one month after. Satisfaction with patients' facial appearance in general, and in social situations is not significantly affected by the removal of facial skin cancer in the period between baseline, one month, and three months after surgery. It appears that skin cancer surgery for larger lesions (>10 mm in diameter) leads to a significant improvement in satisfaction with the result between one and three months after surgery. The influence on patients' perceived facial

appearance regarding the facial location where skin cancer occurred was also investigated. Removal of skin cancer on the nose appears to have the greatest effect on the appreciation of the face when compared to the other anatomical locations in this study (frontal/temporal, eyelids, and nasolabial). However, this difference was not statistically significant. Studies with larger patient populations and studies with a longer follow-up duration should reveal more about the possible aesthetic consequences of the surgical removal of skin cancer from different facial sites.

#### **Chapter 4: Systematic review of the clinical effects of pressure masks**

Facial scars are known for their potential disastrous consequences for patients' quality of life. The therapy for extensive facial scars is pressure therapy—a physically and mentally challenging therapy. However, the evidence of the clinical effects of this therapy, measured with validated instruments, is limited. **Chapter 4** summarizes the current literature on the clinical effects of transparent rigid pressure masks by means of a systematic review. Only three articles that address small patient groups were included. It was, therefore, challenging to make a robust statement about the clinical effects of pressure masks on facial scars. However, two of the three studies described a significant improvement in terms of decreased in thickness, improved hardness, and improved POSAS scores for hypertrophic facial scars after treatment with a pressure mask.

#### **Chapter 5: The fabrication technique of a specialized facial pressure mask**

At the MUMC+, pressure masks are often used to reduce the thickness of the skin after facial flap surgery and to improve hypertrophic facial scars and irregularities. **Chapter 5** explains the fabrication technique of such a custom-made mask. Sequentially, the fabrication process includes the fabrication of a negative mold, a positive mold, the production of the Uvex® outside of the mask, the addition of the silicone inner layer, and the finishing of the mask. Soft tissue is manually shifted during the formation of the negative mold. When forming the positive mold, it is important that irregularities are removed from the mold. The finishing of the mask consists of attaching anchors for the Velcro® in order to apply pressure to the face. For the shifting and steering of soft tissue, a hand-made mask like the one described above is superior to 3D-printed masks based on face scanning. In addition, manual adjustments can be made more easily during therapy. However, the manufacturing of such a mask is accompanied by a steep learning curve.

#### **Chapter 6: The clinical effects of a specialized facial pressure mask**

The number of studies assessing the clinical effects of transparent pressure masks (as described in **Chapter 4**) is small. **Chapter 6** describes the clinical effectiveness of a facial pressure mask for patients with aesthetically unsatisfactory results after facial flap surgery. These patients had symptoms of noticeable hypertrophic scars and thickened, bulging

reconstruction sites after facial flap surgery to cover a defect usually caused by (the removal of) skin cancer. Twenty-one patients were included in a retrospective study over an average treatment duration of 46 weeks. Significant improvements in POSAS scores and, in particular, in the Patient Scale of the POSAS were observed in this study. Although facial flap surgery usually provides acceptable results, and although face mask therapy is only suitable for a relatively small number of (motivated) patients, it is a promising result in our study that patients following pressure mask therapy show clinically significant improvements.

### **Chapter 7: Quality of life after therapy with a specialized facial pressure mask**

At the MUMC+, patients undergoing pressure mask therapy are advised to wear the mask for 12 hours per day. Sometimes therapy is necessary for longer than a year. Many patients experience wearing a full-face mask as a hideous and socially disruptive experience. In addition, prolonged positive facial pressure can be experienced as unpleasant. Moreover, pressure mask therapy is often long-term treatment. In **Chapter 7**, 87 patients who completed face mask therapy within the past five years were asked about satisfaction with their facial appearance in general and in social situations. They were also questioned about satisfaction with the choice of pressure mask therapy and satisfaction with the end result after treatment. The results reveal that a longer daily duration of therapy (8 to 12 hours per day versus 4 to 8 hours per day) leads to greater satisfaction with the end result from the patients' perspective. Patients' satisfaction with their facial appearance in general and in social situations appears to be stable over a follow-up period of almost five years. This study supports the choice of pressure mask therapy for the treatment of problematic facial scars.

### **Chapter 8: A new treatment for hypertrophic and keloid scars**

Hypertrophic and, in particular, keloid scars are known for their negative effect on patients' quality of life. Keloids also have a recurrent nature, often with the presence of itching and pain. Intralesional injections with steroids (of which triamcinolone acetonide is the most studied steroid drug) are part of the standard treatment of thickened and elevated hypertrophic scars and keloids. With triamcinolone, varying results have been achieved, and side effects regularly occur. The addition of verapamil, a calcium antagonist that also has positive effects on scar tissue and thereby has a more favorable side effect profile, is discussed in **Chapter 8**. Intralesional injections of 1:1 triamcinolone and verapamil appear to result in significant and long-lasting improvements in hypertrophic and keloidal scars. This was measured by means of POSAS scores, with a maximum follow-up period of 729 days. A prospective comparative study of the clinical effects of verapamil and triamcinolone alone, as well as the combination of these drugs, should provide even more robust evidence of the effectiveness of these intralesional injections for hypertrophic scars and keloids.

**Chapter 9: General discussion**

In this chapter, the main findings from this thesis are discussed. Also, its relationship with the current literature on scarring, the aesthetic results after facial skin cancer, pressure mask therapy, and intralesional injection therapy is reviewed and situated.