This thesis has shown that a large majority of the post-bariatric patients will develop excess skin after bariatric surgery. This excess skin can significantly influence patient well-being by causing medical, physical and psychological problems. Body contouring surgery (BCS) is the only available treatment for excess skin. It improves body image, health-related quality of life (HRQoL) and weight loss maintenance. However, decision making regarding reimbursement of BCS in the Netherlands is based on a guideline that is not objective and does not consider all complaints caused by excess skin. This leads to unfair reimbursement: some patients with mild complaints will be reimbursed, while others with significant complaints will not. This valorization addendum will focus on improving the reimbursement pathway for post-bariatric BCS in the Netherlands.

RELEVANCE

In the Netherlands, more than 10,000 patients a year undergo bariatric surgery. This thesis demonstrated that 63 - 80% of these patients will develop excess skin and desire BCS. Thus, in the Netherlands, there are around 6,000 ‘new’ post-bariatric patients a year who desire BCS. We showed that because of the excess skin patients experience medical issues like intertrigo (68%); functional complaints (78%) such as hindrance in daily activities; and psychological issues (59%) such as depressive feelings and shame. These complaints were reflected in the lower HRQoL in patients with a desire for BCS compared to patients without a desire for BCS. Patients who desired BCS also had a more negative body image and reported more depressive symptoms. Moreover, we showed a relationship between body image, weight loss and depressive symptoms: a higher weight loss resulted in less depressive symptoms, medicated by more positive feelings of attractiveness and higher body-area satisfaction. In addition, other studies have shown that post-bariatric patients who have undergone BCS have an improved functional status, HRQoL and body image. More importantly, these patients had better long-term weight loss maintenance compared to patients who did not have BCS. The latter is especially important, since weight regain is an issue that is getting more and more attention in the post-bariatric population. It is estimated that about 20-30% of the population will develop significant weight regain. Although the cause of weight regain is considered to be multifactorial, a negative body image is generally not included as a cause. However, this thesis showed that body image is an importance construct for all post-bariatric patients. Even in the population who did not want BCS, a more negative body image...
was related to depressive symptoms. This is comparable to the obese (pre-bariatric) population\textsuperscript{15,16}. And in the patients who desired BCS, there was a close relationship between body weight, negative affect and body image. This might be the reason why patients who undergo BCS have better weight loss maintenance.

Weight regain has a negative effect on comorbidities and HRQoL\textsuperscript{10-12}. In part of the patients who develop weight regain, a secondary or tertiary bariatric procedure will be performed\textsuperscript{8,17-19}. The re-emerging of comorbidities as well as the secondary or tertiary surgeries have a significant impact on healthcare costs\textsuperscript{19}.

Thus, excess skin is a serious problem in post-bariatric patients. And the only available treatment, BCS, seems to prolong and improve the results of bariatric surgery by (further) improvement of patient well-being and weight loss maintenance. This can lead to lower healthcare costs. Therefore, BCS should be considered a part of post-bariatric care and efforts should be made to reimburse BCS accordingly. With this valorization addendum, we propose the first steps to improve the reimbursement system for post-bariatric body contouring surgery in the Netherlands.

**CURRENT CRITERIA FOR REIMBURSEMENT**

The current criteria for reimbursement are partly based on Dutch law. This law states that plastic surgery should not be reimbursed unless there is:

- a congenital deformity: deformity which has been present since birth, or
- a grave disfigurement caused by accident, disease or medical treatment (mutation), or
- a serious impairment of bodily function in daily life\textsuperscript{20}.

For post-bariatric patients there are additional criteria to qualify for reimbursement: the patient has a) undergone the bariatric procedure more than 18 months before, b) a stable weight for more than 12 months and c) a body mass index (BMI) below 35 kg/m\textsuperscript{2}.

Each post-bariatric patient who desires BCS can ask her/his general practitioner or bariatric surgeon for a referral to the plastic surgeon. The plastic surgeon then decides whether the patient qualifies according to the above criteria and sends all necessary information to the insurance company (through a standardized system). The insurance company reviews the information and sometimes requests additional information such as photographs. Based on this information, the insurance company then decides whether a patient qualifies for reimbursement. This decision overrules the decision of the plastic surgeon. For example, if the plastic surgeon concludes there is a serious impairment of bodily function, but the insurance company does not agree, the patient will not get reimbursed.
**Mutilation**

In the post-bariatric population, mutilation is defined as an excess skin grade 3 according to the Pittsburgh Rating Scale (PRS) \(^{20,21}\). The PRS consists of a grading scale for excess skin on ten anatomically defined areas, ranging from 0 (indicating normal) to 3 (indicating the most severe deformity). For each of the scores there is also an explanation available, for example excess skin grade 3 for the breasts is explained as: severe lateral roll and/or severe volume loss with loose skin. Grade 3 on the PRS scale does not always mean the most excess skin: grade 2 excess skin on the abdomen is defined as overhanging pannus and grade 3 as multiple rolls or epigastric fullness. An abdominal panniculus can be more serious than multiple rolls, however grade 3 needs more extensive surgery and is thus (in that way) a more severe deformity.

The PRS was developed by Song et al. to provide a systematic approach for selection of the appropriate body contouring procedure for post-bariatric patients \(^{21}\). The PRS provides a good overview of the deformities seen in the post-bariatric population and was validated by the developers. It was, however, not designed as a method to evaluate whether patients should be reimbursed for BCS. Therefore, van der Beek et al. tested the PRS in Netherlands. A total of 13 observers, plastic surgeons, nurses and students, rated photographs of 10 areas of 25 patients \(^{22}\). The results showed a moderate interobserver validity, meaning that the PRS is not an objective scale to rate the amount of overhanging skin. In daily practice this results in differences in rating of excess skin by plastic surgeons and insurance companies. Thus, some patients will be considered a grade 2 by the insurance company; while the plastic surgeon rates the overhanging skin as grade 3. But, there will also be patients who will get reimbursement while the plastic surgeon does not rate the overhanging skin as grade 3. This makes the current system used to define mutilation unreliable and subjective.

**Impairment of bodily function**

A serious impairment of bodily function in daily life is defined as a significant restriction of movement and/or a chronic skin condition that cannot be treated with conservative measures \(^{20}\). Only for the abdominal overhanging skin there is an objective measurement of a significant restriction of movement: the abdominal skin surplus should cover at least 25% of the length of the femur.

However, this “objective” measurement was never tested in a post-bariatric population. It is unknown if this cut-off point correlates with complaints of the patient and if this measurement is reliable. And although we showed that overhanging skin on the abdomen is most prevalent, patients also complain of excess skin on breast, flanks, arms and legs. For these areas, there are not objective criteria to define restriction of movement. The guideline does provide examples, like when walking is restricted by
the excess skin on the legs. How this should be measured or assessed is not clear.

Regarding chronic skin conditions, only intertrigo is included as a skin condition that can warrant reimbursement. The intertrigo has to be present for at least 6 months and hygienic measures and topical treatment as stated by the national guideline should have failed to adequately treat the intertrigo. According to this national guideline, intertrigo is defined as redness and maceration (saturated with moisture) of skinfolds, with or without infection. However, we showed that in addition to intertrigo, patients also experienced other skin conditions like dermatitis, ulceration and hidradenitis. Moreover, some patients have multiple skin conditions because of the excess skin. This should all be part of the criteria for reimbursement.

In conclusion, the current criteria used for decision making regarding reimbursement of BCS are subjective and therefore, unreliable. In addition, physical and medical complaints are not adequately included. This leads to a daily practice in which patients who do not necessarily need BCS are reimbursed, while patients who do need BCS are not. With the plan below, we want to propose the first step to develop a guideline with complete and objective criteria for reimbursement.

THE PLAN

Healthcare in the Netherlands is organized in a way that spending more on body contouring procedures means spending less on another part of healthcare. Therefore, we need to improve the way the current budget for BCS is spent, by treating the patients that will benefit most from BCS, have the lowest complication rates and, more importantly, select these patients in an objective manner. The first step is to improve that current system with respect to the inclusion of a complete overview of complaints of excess skin and the improvement of the definition of mutilation.

The plan will involve three parties: the healthcare providers, the patients and the payers (health insurance companies and Healthinstitute of the Netherlands (Zorginstituut Nederland). The Healthinstitute of the Netherlands is a governmental organization that has been giving the task to guard quality, affordability and accessibility of healthcare in the Netherlands. This institute also advises the government on reimbursement of healthcare.

Complete overview of complaints

Several chapters in this thesis have shown that excess skin significantly impacts several aspects of patients’ well-being. However, not all these aspects are captured in the current criteria for reimbursement. In the last chapter of the thesis we tested a modified version of a screening tool for reimbursement of BCS developed by the British
Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS). This tool gives a complete picture of the patient and how excess skin influences the patients’ well-being based on a combination of weight loss results, complaints of excess skin and smoking behavior. It assesses medical complaints (intertrigo, dermatitis, infection, ulceration, lymphedema and hidradenitis), psychological complaints (fear, depression, sleep disturbance, stress) and physical complaints (in daily routine, at work and during physical activity). Moreover, impact on patient well-being was assessed with the BODY-Q, a questionnaire specifically designed to measure HRQoL in the (post-) bariatric population.

We showed that patients with less weight loss, higher BMI and more complaints had higher screening tool scores. And more importantly, we showed that the screening tool scores correlated with the BODY-Q scores. Patients who had higher scoring on the screening tool had lower HRQoL. Based on the results of the study, we proposed three additional modifications to the modified BAPRAS screening tool. Patients with an unstable weight, a recent pregnancy or planning to have children in the near future cannot be referred. And all patients with a recent life-event, a history of psychological issues and/or addiction, should be evaluated by the psychologist (of the bariatric team) in order to decide whether these issues can be seen as a contra-indication for BCS. With these additional modifications, we created the Dutch Reboc Tool.

Definition of mutilation

Currently, when a plastic surgeon or insurance company rates the amount of excess skin, the photograph of the patient is not systematically compared to the photograph of the PRS. This makes grading more dependent on the subjective interpretation of the plastic surgeon / insurance company and limits reliability. Currently, our study group is working on an improved version of the PRS: the PRS Rainbow Scale. This Rainbow Scale of the PRS is based on a study in patients with upper eyelid ptosis, which showed that estimation of the ptosis of the upper eyelid improved when the photograph of the patient was compared to pictures with eyelid ptosis with increasing severity.

In the PRS Rainbow Scale the photograph of the patient is presented in the center of the PRS photographs (see figure 1). The first version of this system was recently tested and showed that validity was better when using the PRS Rainbow Scale compared to the normal PRS (results not published yet).
PILOT STUDY

The Dutch Reboc Tool and PRS Rainbow Scale have not been tested in a post-bariatric population that consults the plastic surgeon. Moreover, medical and physical complaints were assessed via a questionnaire and the true extent of these problems in the studied population are unknown.

The next step would be to conduct a pilot study using the Dutch ReBoc Tool (with the BODY-Q) and the PRS Rainbow Scale in patients who consult the plastic surgeon. In this study, the current criteria and the new system should both be evaluated in all patients. Thereby we can compare which patients are reimbursed with the current system and which patients would be reimbursed with the new system. Medical and physical complaints can also be objectified.

Scoring with the Dutch Reboc Tool should be parallel to assessment of the current definitions of impairment of bodily function. For example, in the Dutch Reboc Tool patients will be asked if they have physical complaints of excess skin. The amount of excess skin should also be measured. The current criteria can be used for the abdomen. Additionally, Biorserud et. al developed an objective system for measurement of excess skin that can be used for other body parts. We have already shown that the outcome of the Dutch Reboc Tool highly correlated with BODY-Q scores. In the pilot, we can review whether the measurements of overhanging skin also correlate with the BODY-Q.
This pilot should be conducted in 2-3 plastic surgical clinics that work closely with a bariatric team. This ensures all information regarding bariatric surgery and weight loss is available. To improve future implementation, the pilot should be developed in collaboration with the Health institute of the Netherlands and insurance companies.

COMMUNICATION

An important part of improving care for the post-bariatric patients (with excess skin) is education. This thesis showed that there is a large part of the post-bariatric patients who desire BCS and never consult a plastic surgeon. These patients assume that they will not get reimbursement and/or are not aware of the current guidelines. It also seems that most healthcare providers involved in the care for bariatric patients are unaware of the current guidelines and do not routinely assess excess skin. Plastic surgeons should work together with bariatric teams to start with education of the bariatric teams and patients. In addition, general practitioners of the bariatric patients should also be educated. A good start would be a folder with general information about the current rules for reimbursement by the Dutch Society of Plastic and Reconstructive Surgery. In this folder, the general qualifications for reimbursement can be outlined, along with the current definitions for mutilation and impairment of bodily dysfunction. These folders should be readily available in bariatric clinics throughout the country.

FUTURE RESEARCH

As discussed above, it is not possible to increase spending on body contouring surgery and optimal patient selection for BCS is key. Ideally patients who will benefit most and have the lowest complications rated should be selected. Benefits in terms of healthcare costs should be included in this model. Although body contouring procedures are considered to be costly, it is unknown how many post-bariatric patients undergo BCS and what the costs of BCS in the Netherlands are. A future study should assess how many patients in the Netherlands currently undergo BCS, how often these patients will develop complications and what the costs of these procedures are. These costs can subsequently be compared to healthcare costs for post-bariatric patients who do not undergo BCS. This will allow assessment of the influence of BCS on long-term healthcare costs. More in-depth analysis will also show which patients will benefit the most.

In addition, Dutch law states the psychological complaints can never be a reason for reimbursement of plastic surgery. However, in evaluation of healthcare treatments HRQoL is currently considered one of the most important outcome parameters. Future research should also focus on if and how HRQoL should be part of reimbursement criteria.
Valorisation Addendum

References