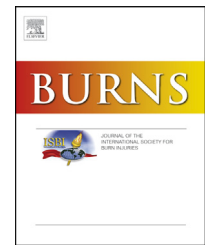


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Reconstructive surgery after burns: A 10-year follow-up study



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ABSTRACT

Background: There is minimal insight into the prevalence of reconstructive surgery after burns. The objective of this study was to analyse the prevalence, predictors, indications, techniques and medical costs of reconstructive surgery after burns.

Methods: A retrospective cohort study was conducted in the three Dutch burn centres. Patients with acute burns, admitted from January 1998 until December 2001, were included. Data on patient and injury characteristics and reconstructive surgery details were collected in a 10-year follow-up period.

Results: In 13.0% ($n = 229/1768$) of the patients with burns, reconstructive surgery was performed during the 10-year follow-up period. Mean number of reconstructive procedure per patient were 3.6 (range 1–25). Frequently reconstructed locations were hands and head/neck. The most important indication was scar contracture and the most applied technique was release plus random flaps/skin grafting. Mean medical costs of reconstructive surgery per patient over 10-years were €8342.

Conclusions: With this study we elucidated the reconstructive needs of patients after burns. The data presented can be used as reference in future studies that aim to improve scar quality of burns and decrease the need for reconstructive surgery.

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1. Background

The significant reduction in mortality in patients with burns in the past decades has resulted in a shift in attention from

mortality to improving functional outcome, including scar quality [1]. Burn scars may cause severe functional and aesthetic problems. Since the problem of burn scars is complex, different treatment options are used. Next to pressure garments, splinting, silicones, laser therapy, mas-

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sage and corticosteroids, reconstructive surgery may be necessary in problematic burn scars [2–8]. The need for reconstructive surgery is an important long term outcome indicator for patients with burn scars. In our search for an optimal scar quality, a decreased need for reconstructive surgery is one of the endpoints. Fortunately, not all patients with burns undergo reconstructive surgery. However, the question is, which patients require reconstructive surgery, and what type of reconstructive surgery is performed in burn scars?

In literature a broad overview of possible reconstructive techniques is presented. Nevertheless, epidemiologic information on prevalence, indications, locations and techniques of reconstructive surgery after burns is scarce. Only two articles were found on the epidemiology of reconstructive surgery after burns. One relatively old retrospective study, from the USA in 1991, described the prevalence of reconstructive surgery in patients who were initially admitted to a burn centre for acute burn care. In 19.9% of the patients reconstructive surgery was performed. Patients requiring reconstructive surgery were younger and had a larger burn size [9]. The most applied technique was release and grafting, and the most reconstructed locations were arms, hands and neck. A recently published article from our research group presented the prevalence and predictors of reconstructive surgery to the head and neck after burn centre admission: facial reconstructive surgery was performed in 5.3% of all facial burn patients, significant predictors were burns to the neck, fire/flame burns and number of facial surgeries in the acute phase of the wound healing process [10].

Nowadays, insight in costs of healthcare is becoming increasingly important because healthcare costs are rising and pressure on budgets too. To our knowledge, literature on the costs of reconstructive surgery after burns in high-income countries is lacking. We noted one article describing healthcare costs of reconstructive surgery after burns, in one year, in Nigeria. Mean reconstructive surgery costs per patient represented the highest cost category (35%) of the total calculated medical costs in rehabilitation phase (\$1301). Hospital stay was the second highest cost category [11].

Thus, in current research, there is limited knowledge on the prevalence, predictors, indications and costs of reconstructive surgery after burns. Insight in prevalence and predictors of reconstructive surgery is essential to improve our understanding of the reconstructive needs of burn patients [9]. In addition, the need for reconstructive surgery is an important long term outcome parameter of burn care, representing the quality of the burn scar. However, in order to measure a decline in reconstructive surgery we need a baseline. Therefore, the prevalence, high risk populations and anatomical locations for reconstructive surgery after burns should be identified. Furthermore, the costs involved in reconstructive surgery after burns must be examined, to establish which potential savings can be achieved when we will be able to decrease the need for reconstructive surgery. The objectives of this study were to analyse (1) the prevalence for reconstructive surgery after burns, (2) the predictors for reconstructive surgery, (3) the indications and techniques of these reconstructions and (4) the medical costs of reconstructive surgery after burns.

2. Methods

2.1. Study design and population

A retrospective study was conducted, including all patients with acute burns admitted to one of the Dutch burn centres (Beverwijk, Groningen, Rotterdam) from January 1998 until December 2001. Acute burns were defined as all burns before initial wound closure. Patients were excluded from the study if they died within 6 months post burn, further treatment was continued abroad after discharge or information on the need for reconstructive surgery was not available. Data were collected on gender, age, aetiology, body location burned, percentage of Total Body Surface Area (TBSA) burned, percentage of full thickness TBSA burned, number of surgeries in acute phase and the need for reconstructive surgery in a 10-year follow-up period. Reconstructive surgery was defined as all surgical procedures performed by a plastic surgeon or burn physician on burn scars, i.e. after initial wound closure. Detailed data on the reconstructions were collected, including date of surgery, location of surgery and indications and technique per location. In addition, data on healthcare consumption were collected: duration of surgical treatment, surgical personnel (including physicians) and length of hospital stay (both hospital days and day care). Data were derived from historical databases of the Dutch burn centres and patient records. This study was approved by the medical ethical board of the Maasstad Hospital (protocol 2012/16) and local hospitals.

2.2. Referral criteria and treatment protocols

Up to 1999 referral to a Dutch burn centre was advised in burns >25% TBSA in adults or deep burns >10% TBSA, and in burns >10% TBSA in children and elderly, irrespectively the depth. In addition, referral was advised in minor burns associated with another injury or pre-existent disease that may increase the risk for complications. In 1998 the course Emergency Management of Severe Burns (EMSB) was introduced, with new referral criteria: from then all children with burns over 5% and adults with burns over 10% TBSA were advised to be referred [12]. Between 1998 and 2001, the most used topical agents were silver sulphadiazine, and cerium nitrate-silver sulphadiazine. Hydrofiber dressings were introduced in 1999. Early excision was not performed regularly: only in obviously full thickness wounds excision and autografting was performed within one week post burn, in indeterminate depth wounds decision for surgery was made approximately two weeks post burns. In our burn centres, general surgeons and burn physicians were responsible for the treatment of acute burn wounds. In severe hand burns or facial burns a plastic surgeon was involved in the acute phase as well. After wound closure, silicones and custom made pressure garments were applied, depending on location and scar activity. Patients with problematic scars were referred to a plastic surgeon [13,14].

2.3. Statistical analysis

Data analysis included univariable and multivariable logistic regression (forward stepwise LR) to identify predictors of

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