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Analyzing contraction of full thickness skin grafts in time: Choosing the donor site does matter

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ABSTRACT

Background: In reconstructive burn surgery full thickness skin grafts (FTSGs) are frequently preferred over split thickness skin grafts because they are known to provide superior esthetic results and less contraction. However, the contraction rate of FTSGs on the long term has never been studied.

Methods: The surface area of FTSGs of consecutive patients was measured during surgery and at their regular follow up (at approximately 1, 6,13 and 52 weeks postoperatively) by means of 3D-stereophotogrammetry. Linear regression analysis was conducted to assess the influence of age, recipient- and donor site and operation indication.

Results: 38 FTSGs in 26 patients, with a mean age of 37.4 (SD 21.9) were evaluated. A significant reduction in remaining surface area to 79.1% was observed after approximately 6 weeks ($p = 0.002$), to 85.9% after approximately 13 weeks ($p = 0.040$) and to 91.5% after approximately 52 weeks ($p = 0.033$). Grafts excised from the trunk showed significantly less contraction than grafts excised from the extremities (94.0% vs. 75.7% $p = 0.036$).

Conclusions: FTSGs showed a significant reduction in surface area, followed by a relaxation phase, but remained significantly smaller. Furthermore, the trunk should be preferred as donor site location over the extremities.

1. Introduction

Despite new developments in acute and reconstructive burn surgery, such as dermal substitution and perforator based interposition flaps [1], full thickness skin grafts (FTSGs) are regularly needed as first choice for reconstruction [2]. Usually FTSGs are preferred over split thickness skin grafts (STSGs) because they give a superior esthetic result and less contraction [2,3]. Remarkably, the extent of contraction of FTSGs in burn patients has never been objectified. Most often burn patients are treated with an FTSG to improve the range of motion. Therefore, the extra tissue that is inserted should retain its initial surface area to result in a successful

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procedure. FTSGs that are used for scar contracture release are positioned in scar tissue, which differs considerably from healthy tissue in terms of elasticity and contractile forces. The graft that is inserted in the defect is subject to these contractile forces and this could affect the contraction rate of FTSGs.

Several other factors may influence the contraction rate of FTSGs such as the age of the patient and the location where the skin is harvested [3]. It has been reported that FTSGs on the nose and peri-orbital area demonstrate more contraction than other recipient areas [4]. As differences in contraction rates according to the recipient location were found, likely differences in donorsite location may as well be present, which has only been observed in animal studies [5]. Furthermore patient characteristics like age of the patient at time of surgery have been assumed to influence the contraction rate of grafts [3,6]. Skin laxity is thought to increase with age and thereby older patients might show less contraction than younger patients [7].

Literature up to now, though providing some information on potential influencing parameters, does not suffice in a clear understanding of the contraction rate of FTSGs on the long term and its potential predictive factors. Two studies describe contraction of FTSGs in reconstructive procedures over time [4,8]. One study found a significant reduction in surface area within the first month after surgery, but no significant difference was found beyond the first month [8]. Another study stated that FTSGs undergo a significant amount of contraction; a mean remaining surface area of 62% was found [4]. As these studies use a relatively short follow up period [4] and non validated surface area measurement techniques [8], results from these studies are less applicable for interpretation in clinical practice. To measure the outcome of a treatment technique objectively, the use of reliable and valid measurement instruments is important. 3D stereophotogrammetry is one of the most recent advances in the field of surface area measurement and has been proven to reliably and validly measure surface area [9]. The aim of this study was to evaluate the surface area of FTSGs over time using a reliable and valid measurement tool and to identify potential predictive factors that influence the surface area over time.

2. Methods

2.1. *Patients*

In this clinical observational study, we analyzed a cohort of consecutive patients that received FTSGs as a reconstructive procedure between April 2011 and November 2013 at the department of plastic, reconstructive and hand surgery in the Red Cross Hospital (Beverwijk, the Netherlands). Patients were seen at their regular follow up moments as part of the medical treatment. Fig. 1 represents a flow chart. Also patients participating in other clinical studies were included. All patients of 12 years and older with scars that are treated in our clinic, undergo a standard scar evaluation protocol at follow up. This scar evaluation protocol was approved by the local medical ethical committee and includes scar surface area measurements. From all patients informed consent was obtained. The following data were collected: age of the patient, the donor site, the recipient site, the indication for operation and the presence of risk factors such as diabetes mellitus or smoking was registered for each patient. These characteristics were registered to include in the analysis as potential risk factors.

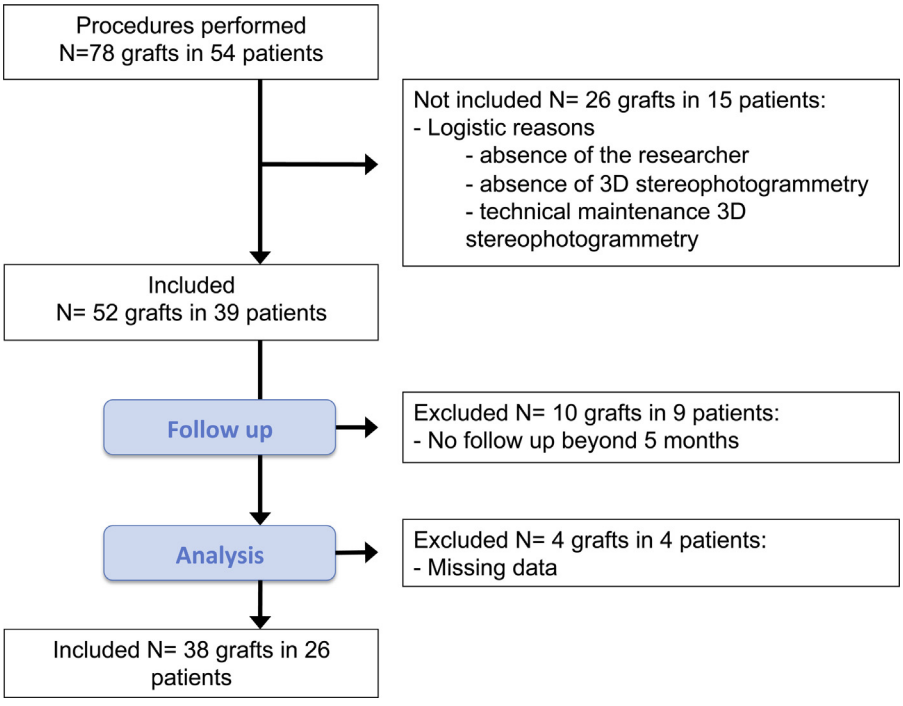

Fig. 1 – Flow chart representing the drop outs, due to lack of follow up.