

Graft loss: Review of a single burn center's experience and proposal of a graft loss grading scale



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ABSTRACT

Background: There exists neither a consensus definition of burn "graft loss" nor a scale with which to grade severity. We introduced an institutional scale in 2014 for quality improvement.

Materials and methods: We reviewed all burned patients with graft loss on departmental Morbidity and Mortality reports between July 2014 and July 2016. Graft loss grades were assigned during the course of clinical care per institutional scale. Chronic nonhealing wounds and nonburn wounds were excluded. Data abstracted included demographics, medical history, injury details, surgical procedures, graft loss, and lengths of stay (LOS). Photos of affected areas were graded by two blinded surgeons, and a linear weighted κ was calculated to assess interrater agreement.

Results: Graft loss was noted in 50 patients, with 43 remaining after exclusions. Mean age was 50.1 y. The majority were male (58.1%) and African American (41.9%). Smoking (30.2%) and diabetes (27.9%) were prevalent. Total body surface area involvement ranged from 0.5% to 51.0% (11.8 \pm 12.3%). Grade I graft loss was documented on one patient (2.3%), Grade II in 15 (34.9%), Grade III in 12 (27.9%), and Grade IV in 15 (34.9%). Reoperation was performed in 20 (46.5%). Hospital LOS was longer than predicted in 38 patients (88.4%). Seven had significant morbidity, including two amputations. Moderate agreement was reached between blinded surgeons ($\kappa = 0.44$, P = 0.004).

Conclusions: Graft loss is a major source of morbidity in burn patients. In this cohort, reoperation was common and hospital LOS was extended. Use of a grading scale improves dialog among providers and enables improved understanding of risk factors.

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Introduction

In the past several decades, a great deal of research has been dedicated to elucidating factors which contribute to the failure of an autograft after thermal injury. The presence of infection, inadequately excised tissue, shear forces, and loss of apposition between graft and wound bed due to hematoma or seroma formation have been well-established as risk factors.¹⁻⁵ The impact of smoking, malnutrition, diabetic vasculopathy, and hypoxemia are also well-appreciated detriments to wound healing.^{6.7}

Despite growing understanding of the pathophysiology involved, there exists no consensus definition of burn graft loss. Furthermore, there exists no widely accepted scale with which to grade graft loss severity. The current overall failure rate of burn grafts nationally is therefore not known.^{8,9}

With an emphasis on the need for quality improvement, our institution introduced a graft loss grading scale in 2014 (Table 1). The scale separates graft loss into Grades I through IV, with I being the least severe and IV being the most severe. Grades are based on the percentage of the total grafted area which has been lost, the type of management warranted (topical therapy versus operative intervention) and the clinician's overall sense of the contributing etiologies (unifactorial versus multifactorial).

The purpose of this study was to examine our institutional experience of graft loss through the lens of the newly implemented grading scale. Secondarily, we aimed to assess the accuracy and usability of the grading scale and to determine its utility both in clinical care and as a quality improvement metric. We hypothesized that we would observe a correlation between higher grades and longer hospital stays as well as increased overall morbidity.

Table 1 – Institutional graft loss grading scale.	
Grade	Description
Ι	Aesthetic
	No additional surgery necessary
II	<50% loss, grafted areas
	Additional topical wound care needed
	±LOS
	Unifactorial cause
	No additional surgery necessary
III	<50% loss, grafted areas
	Additional topical wound care needed
	$\pm LOS$
	Unifactorial cause
	Additional surgery needed
IV	>50% loss, grafted areas
	\pm Antibiotics
	Multifactorial cause
	Additional surgery necessary

Materials and methods

After institutional review board approval, a historic prospective cohort study was performed for all burned patients with graft loss following an autografting procedure documented on departmental Morbidity and Mortality (M&M) reports between July 2014 and July 2016. Patients with duplicate entries, wounds not secondary to burns, and chronic nonhealing wounds were excluded. An approved waiver of informed consent was obtained from the institutional review board before the initiation of all research activities.

Data abstracted from the medical record included demographics, medical history, details of injury, surgical procedures, graft loss, and hospital and intensive care unit (ICU) lengths of stay (LOS). Observed hospital LOS was compared with predicted hospital LOS (based on the assumption of 1 d per each total body surface area [TBSA] percentage point).¹⁰⁻¹²

Graft loss grades were assigned based on the institutional scale during the course of clinical care by the attending surgeon (Table 1). In situations where the graft loss grade recorded on M&M documentation was discordant with the grade documented in the medical record, the grade assigned at the later point in time was used for analysis. This determination was made in an attempt to appreciate wound evolution over time and the associated changes in care plans, given that the grading scale was designed to be a dynamic tool.

To address the secondary aim of evaluating the grading scale's usability and reliability, medical records were searched for photodocumentation of the affected body region taken on the day of initial graft loss diagnosis. Photographs examined were taken by clinical staff during standard Burn Center care procedures and were not taken for research purposes. Photos were subsequently cropped to isolate areas affected by graft loss and were presented to two independent blinded surgeons without patient identifying information. The blinded assessors were instructed to assign a percentage of graft loss and to use the institutional scale to assign patient grades, incorporating their assessment as to whether or not they felt the graft loss warranted reoperation. They were additionally asked to reflect on their experience using the grading scale.

Statistical analysis

Patient characteristics were described using frequencies and percentages for categorical variables, and means and standard deviations for continuous variables. For categorical variables, group comparisons were performed using Chi-square tests. The normality of continuous variables was assessed using the Shapiro–Wilk test. Fisher's exact test and one-way analysis of variance with post-hoc Bonferroni correction were used for normally distributed continuous variables, whereas the Mann–Whitney U and Kruskal–Wallis tests were used for nonnormally distributed continuous variables.

To assess interrater agreement, a linear weighted κ was calculated. The magnitude of the resultant κ statistic was interpreted by commonly accepted guidelines set for by Landis and Koch.^{13}

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