CASE REPORT

The role of biodegradable temporizing matrix in the management of a patient with major burns and anorexia nervosa

Poh Tan†, Rushabh Shah‡, Tarek Hassouna, Ralph Murphy and Samantha McNally

Department of Burns and Plastic Surgery, Wythenshawe Hospital, Southmoor Road, Manchester M23 9LT, UK

†Correspondence address. Department of Burns and Plastic Surgery, Wythenshawe Hospital, Manchester, UK.
Tel: +44-7546889079; E-mail: Rushabh-shah@hotmail.co.uk

†Poh Tan and Rushabh Shah are joint first authors.

Abstract

Severe malnutrition secondary to anorexia nervosa results in deeper burns and significantly impacts wound healing, which represents a major challenge to burn management. The use of acellular dermal matrices, such as biodegradable temporizing matrix (BTM), is a valuable tool to overcome the surgical limitations. We describe a case of a 36-year-old female with a background of anorexia nervosa (body mass index of 12.3) presenting with a 30% total burns surface area (TBSA) burn. All of her burns were excised down to fascia due to the absence of subcutaneous fat. Her thin skin and depleted nutritional status significantly impacted reconstructive options. BTM was utilized to create a neodermis and provide adequate time to optimize the nutritional status before autologous skin resurfacing 3 weeks later, which yielded robust coverage with minimal donor site morbidity. Despite initial surgical and nutritional challenges, excellent outcomes were achieved in terms of wound healing, scar contractures and mobility.

INTRODUCTION

Anorexia nervosa is a severe eating disorder characterized by emaciation culminating in severe malnutrition and reduced metabolic reserve [1]. When associated with major burns, these patients are at higher risk of death due to lack of adequate physiological reserve, increased risk of sepsis and severe metabolic derangement [2, 3]. Such patients are also at risk of significantly delayed wound healing after burn injuries [4] and often have significantly reduced skin thickness, skin collagen and bone density, with minimal subcutaneous fat layers [5, 6]. This can complicate the surgical management in this cohort of patients, as the need for thin skin grafts increases the risk of subsequent wound breakdown and secondary scar contractures, while the use of standard thickness in harvesting increases the risk of donor site complications.

We utilized a fully synthetic dermal template, NovoSorb™ biodegradable temporizing matrix (BTM), to provide adequate time to optimize the nutritional requirements of the patient prior to resurfacing the neodermis with split thickness skin grafts. BTM optimized the surgical management in our patient by temporizing the wounds and reducing the risk of problematic scars and secondary contractures.

CASE REPORT

A 36-year-old woman, with a history of severe anorexia nervosa, presented to our regional burns centre with 30% flame burns over the right side of her body, including back (see Fig. 1A), right arm, neck, torso and hip (see Fig. 1B). The patient was transferred to theatre for initial debridement after undergoing immediate resuscitation. Intraoperatively, 26% of burns were of full thickness and 4% were deep dermal, with circumferential full thickness burns around the right arm. She underwent immediate escharotomy of right arm and excision of all deep burns with meshed allograft cover within the first 24 hours. Initial excision was down to fascia due to near absence of subcutaneous fat, while care was taken to preserve the right breast tissue mound.

Given the depleted nutritional status (the patient had an admission weight of 36.5 Kg and body mass index (BMI) of 12.3)
and increased risk of wound breakdown, a decision was made to temporize her wounds using a novel synthetic dermal matrix (BTM), ~5 days after the initial excision. The entire wound was resurfaced in one session with four sheets (20 × 40 cm each) of BTM, which was found to conform well over the breast curvature (see Fig. 2A and B). The wound surface was covered by a single vacuum-assisted closure (VAC) dressing and required six VAC sites; (see Fig. 4A). Eight weeks post-burn injury, the scars had started to mature with no evidence of wound breakdown or secondary scar contracture (see Fig. 4A and B).

Overall, the use of BTM provided valuable time to optimize the patient’s nutritional status in addition to producing a robust, soft tissue coverage with excellent functional and aesthetic outcomes and minimal donor site morbidity compared to skin grafting alone.

DISCUSSION

Burn injuries can cause profound physiological stress on the human body, resulting in a hypermetabolic and hyperdynamic circulatory state, and if unaddressed, can lead to severe sarcopenia, immunocompromise and delayed wound healing [7–10]. The increased metabolic state from a burn injury in a patient with already low physiological reserve, seen in anorexia nervosa, complicates the management and results in poorer outcomes [9].

The reduced dermal thickness and minimal subcutaneous fat, seen in our patient, resulted in significantly deeper burns, which have limited reconstructive options [5]. Skin grafting alone can result in significant secondary scar contractures, high risk of wound breakdown and significant donor site morbidity [5]. Therefore, a decision was made to use BTM to counter this significant surgical challenge.

BTM is a 2-mm thick, synthetic dermal matrix utilized to create a graftable wound bed with the aim of recreating the inherent thickness and pliability of skin [9]. It usually involves a two-stage procedure: implantation of the bilaminar matrix allowing for host integration and creation of neo-dermis; and subsequent delamination of the superficial silicone membrane after up to 10 weeks and application of a split thickness skin graft over the vascularised matrix [10]. Furthermore, BTM has shown strong resistance to infection when associated with contamination by tracheal aspirates or faecal contamination and did not require the removal of the matrix which integrated well [11]. BTM has been demonstrated to be reliable, versatile and a safe and consistent reconstructive option in complex wounds, including acute burns, necrotising fasciitis and free flap donor site reconstruction [11].

Alternative dermal templates such as Integra® and Matriderm® are used for acute burns management to improve functional and cosmetic results [12]. However, these other acellular dermal matrices have a couple of distinct disadvantages compared to BTM. Firstly, they are made of organic material, which in case of infection or collection necessitates urgent removal, which is not the case for the entirely artificial BTM [9]. Secondly, they are remarkably more expensive than BTM [9].

To our knowledge, this is the first ever report in literature to highlight the surgical and nutritional challenges presented in the management of major burns in an anorexic patient with severely low BMI. We describe a comprehensive management strategy utilizing BTM to temporize the burn wounds and to deliver aggressive nutritional therapy prior to skin grafting. We demonstrate that BTM restores the thickness and pliability of skin after grafting thus minimizing the high risk of wound breakdown and secondary scar contractures, particularly in our patient.
Figure 4. 8 weeks post-application of split thickness skin graft: (A) posterior view; (B) anterior view.

CONFLICT OF INTEREST STATEMENT
None declared.

FUNDING
None.

ETHICS STATEMENTS
Patient consent for publication—consent was obtained directly from the patient.

REFERENCES
1. Akimoto M, Takeda A, Nagashima K, Uehara R, Nemoto M, Uchinuma E. Medical treatment for burn patients with eating disorders: a case report. Plast Surg Int 2011;2011:1–4.
2. Resmark G, Herpertz S, Herpertz-Dahlmann B, Zeeck A. Treatment of anorexia nervosa—new evidence-based guidelines. J Clin Med 2019;8:153.
3. Tolley PD, McClellan JM, Butler D, Stewart BT, Pham TN, Sheckter CC. Burn outcomes at extremes of body mass index: underweight is as problematic as morbid obesity. J Burn Care Res 2022;43:1180–5.
4. Romanowski KS, Fuanga P, Siddiqui S, Lenchik L, Palmieri TL, Boutin RD. Computed tomography measurements of sarcopenia predict length of stay in older burn patients. J Burn Care Res 2021;42:3–8.
5. Savvas M, Studd J, Moniz C, Brincat M, Treasure J, Fogelman I. The effect of anorexia nervosa on skin thickness, skin collagen and bone density. Br J Obstet Gynaecol [Internet] 1989;96:1392–4.
6. Moskowitz L, Weiselberg E. Anorexia nervosa/atypical anorexia nervosa. Curr Probl Pediatr Adolesc Health Care [Internet] 2017;47:70–84.
7. Porter C, Tompkins RG, Finnerty CC, Sidossis LS, Suman OE, Herndon DN. The metabolic stress response to burn trauma: current understanding and therapies. Lancet [Internet] 2016;388:1417–26.
8. Hart DW, Wolf SE, Micak R, Chinkes DL, Ramzy PI, Obeng MK, et al. Persistence of muscle catabolism after severe burn. Surgery 2000;128:312–9.
9. Cheshire PA, Herson MR, Cleland H, Akbarzadeh S. Artificial dermal templates: a comparative study of NovoSorb™ biodegradable temporising matrix (BTM) and Integra(®) dermal regeneration template (DRT). Burns Incl Therm Inj 2016;42:1088–96.
10. Li H, Lim P, Stanley E, Lee G, Lin S, Neoh D, et al. Experience with NovoSorb® biodegradable temporising matrix in reconstruction of complex wounds. ANZ J Surg 2021;91:1744–50.
11. Greenwood JE, Schmitt BJ, Wagstaff MJ. Experience with a synthetic bilayer Biodegradable Temporising Matrix in significant burn injury. Burns Open 2018;2:17–34.
12. Shahrokhi S, Arno A, Jeschke MG. The use of dermal substitutes in burn surgery: acute phase. Wound Repair Regen 2014;22:14–22.