

## Case Report

# Case Report 'Layer of Hope': Managing Large Surface Wounds on Frontal Bare Bone in a Challenging Patient

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### Abstract

This was a case of an elderly gentleman with large bleeding basal cell carcinoma occupying almost three quarter of the forehead managed with adjunct usage of Integra acellular dermal regeneration template after lesion's wide local excision despite challenged with patient's newly diagnosed bicytopenia to rule out haematological malignancy. Standard management of tissue reconstruction with purely living tissue (split skin grafting) has higher risk of graft rejection due to bare bone as wound bed. This limits the neo-graft ability to achieve optimal potential of imbibition and inosculation. Thus, dermal matrix usage makes split skin grafting difficult wound bed has higher chance of surviving and hence shortens healing time and reduces hospital stay.

**Keywords:** Basal cell carcinoma; bicytopenia; dermal regeneration matrix; delayed skin grafting; wide local excision

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### Introduction

Large wounds of the forehead especially to the bare frontal bone, remains a reconstructive challenge, especially in patients with co-morbidities and advanced age. Gold standard management of tissue coverage includes full thickness split skin grafting, local flaps, or free flaps. However in high risk patient, prolonged operative time and prolonged hospital stays imposed potential risk of pneumonia, cardiorespiratory event, or even pulmonary embolism which collectively leads to higher mortality.

Autograft with skin after wide local excision of large skin cancer can be technically difficult especially in area like face. Elderly patient has limited regenerative reserve and is added with existing underlying disease, the healing rate may be suboptimal with higher rate of native skin graft failure. Although regional flaps may be ventured, it may lead to longer operative time and challenging technique which may contribute to graft failure, thus, simple skin grafting may be a wise option

with faster and lower technical difficulty. However, direct grafting onto bare bone is not a standard practice due to poor graft survival due to the poor wound bed capability to support growth at cellular level.

Therefore, enhancement of vital matrix needed for optimum neo-graft uptake prior to final grafting would be a beneficial stepping stone. That is - dermal regeneration templates. Layer of dermal matrix can be regard as a bridge to facilitate and locally enhance the dermal growth (1). Patient comorbidities as this case influence the approach added by the expected degree of post excision tissue loss on bare area of skull. Hence, acellular dermal matrix was chosen to promote wound bed prior to split skin grafting

### Case Report

82 years old semi dependent on activity of daily living Chinese gentleman with underlying diabetes mellitus and hypertension, presented with left sided frontal swelling for 10 years, increasing in size for the past 2

years, associated with intermittent bleeding for the past 2 months with itching (Figure 1). Clinical examination shows irregular border of 8x8 cm bleeding lesion with excavating base of 0.5 cm depth with exposed frontal bone at the centre base of wound. There was extension more to the left glabellar involving the superomedial part of left eyelid.



FIGURE 1: Initial presentation

Patient was noted to be anaemic with haemoglobin level of 9 upon admission together with thrombocytopenia (65 x 10<sup>9</sup>/L). Haematological consult was seek and patient is diagnosed as pancytopenia secondary to possible myeloid leukemia thence planned for bone marrow biopsy. In ward, haemostatic dressing with surgicell and tranexamic acid dressing. Confirmatory diagnosis was unable to be made as family member was not keen for bone marrow biopsy. Basal cell carcinoma of forehead skin was diagnosed from the wedge biopsy.

Imaging by CT head and neck showed skin thickening with ulceration at mid forehead (5cm w x 4.4cm with 0.6cm thickness) and no bony erosion or lymphadenopathy was seen. After initial haematological resuscitation and haemostatic controlled with local dressing, patient was later discharged with elective date for wide local excision determined.

However, he was readmitted 2 days later due to persistent bleeding from the wound bed. Emergency wide local toilet excision with 1cm margin was done on the next day (27/12/21). Intraoperatively noted the left medial glabellar part of the frontal bone was thinned out and involved (Figure 2). However, in view of patient risk, further excision of the anterior table



FIGURE 2: Post Wide Local Excision

was not done. Subsequently an integra dermal extracellular matrix was applied in the same setting (Figure 3) with coverage of silver impregnated carbon layered 'acticoat'. Post operatively, the patient was observed in ward for continuous nutrition optimisation and close monitoring of the graft. This was important as he was latter had 2 episodes of bleeding of the matrix layer. Evacuation of haematoma was done through pre-existing fenestration of the matrix and local haemostatic such as surgicell and topical tranexamic acid dressing was done.



FIGURE 3: Integra application

Patient was then discharged 3 days after surgery and was seen in the clinic a week after, whereby the wound bed growth of granulation tissue was seen optimal for skin grafting. He was subjected to partial thickness split skin grafting as second stage surgery 2 weeks later. Intraoperative assessment of the wound bed

showed the previous dermal matrix uptake was good with up to 90% granulation tissue coverage (Figure 4). He was discharged post op day 2 and seen in the clinic on regular follow up and wound well healed with minimal scarring (Figure 5).



FIGURE 4: Split Skin Grafting



FIGURE 5: Post 2 month surgery

## Discussion

Historically acellular dermal matrix was developed by team efforts of Massachusetts General Hospital, Boston Shriners Burns Centre, and Massachusetts Institute of Technology in the 1970s. The design was further enhanced in 1980 by Yannas and Burke (2). The matrix named 'Integra' later and was initially developed for extensive burn wounds management by Integra Life Sciences Company with focus on

extensive burns. Values of the matrix seen in burn due to the limited autograft ability to reduce contracture which is enhanced by dermal matrix via providing dermis scaffolding. Subsequently the clinical application expanded until regarded as an important part of plastic and reconstructive surgery modality nowadays. Reviews of case series on the usage of 'integra' as the synthetic acellular dermal regeneration template shows superiority compared to traditional split skin grafting largely due to the contribution of matrix for revascularisation contributing to enhanced neodermal formation (3).

The acellular dermal matrix template composed of a bilaminar sheet of porous cross-linked bovine tendon collagen and shark glycosaminoglycan (chondroitin-6-sulfate) which serves as a scaffolding for the growth of a neodermis with a silicone sheet to cover the template with wound and to prevent fluid egress. Several other brands are available on market can be divided into animal derived-integra, and syntethic-namely Pelnac® or NovoSorb™ Biodegradable Temporisng Matrix (BTM). Integra demonstrates the highest rate of skin graft viability and uptake after 7 days whilst Pelnac® shows the quickest induction of secondary healing in acute wounds as well as the best effectiveness in the overall supra-fascial wounds closure (4).

A well described steps of dermal regeneration was observed including imbibition, fibroblast migration, neovascularisation, remodelling and maturation. These histological phases are corresponding to natural wound healing phases similar in skin grafting 'uptake' process. The natural course of the uptake started with imbibition as early as within minutes which is enhanced with the pre-existing wound exudates and fibrin. After around day 7, fibroblast begins migration into the matrix and at the end of 2<sup>nd</sup> week, endothelial migration happens to supply the newly formed fibroblast (5).

Myofibroblast deposits native collagen by 3<sup>rd</sup> week then later the native collagen begins to dominate and makes the neodermis thicker than host natural dermis around 4th week. Subsequently through the maturation process, it becomes pliable and thinner (4). With a good wound bed neovascularisation, clinical colour change can be seen from pink becoming yellow and peach. Good uptake is secured with dermal epidermal junction formation of rete ridges once patient's split skin grafted onto neodermis which make way for adnexa and nerve ending formation.

Usage of non-living matrix template is advantageous compared to autograft as no metabolism is needed to maintain its integrity and function thus less dependent

on suboptimal neovascularisation from surrounding tissues. As seen in this case, bare bone wound base made native neovascularisation is dependent primarily on circumferential peripheral tissue which is slow and maybe inadequate depending on patients of regenerative potential.

However, despite the advantage, as others non-living prosthetics, the matrix shall be regarded as foreign body -susceptible to infection which made prolonged usage of skin commensal empiric antibiotic are required (6). Allograft usage is inferior with carries risk of bacterial infection and is short lived compared to integra application as an adjunct to completion of surgery.

Several limitations and challenges were identified in this case that can be divided into patient factor, disease factor and material factor. Patient factor includes patient age, premorbid functionality and newly diagnosed blood malignancy and clinical senile malnutrition collectively contributing to higher mortality and morbidity. Disease factors include the uneven contour of the bare bone wound bed post wide local excision which made complete surface adherence to obliterate dead space between base and graft difficult. Hence causing haematoma formation as in this case after the first stage surgery of integra application

The extensiveness of lesion to the surrounding vital sensitive structures, such as the glabellar area and bilateral medial upper eyelids made the complete 1cm clearance of margin are difficult. Surgeon had to balance the disease free interval post resection against debilitating excision involving bilateral eyelid which can impose great difficulties in term of post operation functionality and post-operative care including dressings and final grafting plan.

Material factors include usage of non-living material which lacks antibacterial properties leading to mandatory usage of antibiotic and silver-impregnated dressing. As the silicon outermost layer are for prevention of fluid egress, exudates accumulation from large wound surfaces pose a risk of bacterial accumulation and suboptimal wound bed preparation for the 'uptake' (7). Therefore, fenestration of the layer are important and in case of haematoma or fluid collection in between matrix and base, intermittent meticulous aseptic evacuation of collection must be performed accordingly.

Despite all these limitations and challenges, there is no absolute contraindication described in literatures for the dermal matrix usage shows its versatility and

flexibility of the usage on variety of cases. In the event of failure of these methods, one have to utilise traditional method of total full thickness split skin grafting which will incur longer recovery period.

Therefore, properly planned optimal intervention that is tailored to minimise potential morbidity and mortality of patient must be the primary aim, allowing patients to recover physiological and psychologically with staged procedure together with minimal exposure of general anaesthesia are beneficial as in this case. Avoidance of curative-intended extensive excision embarkment has shortened hospital stay and made patient able to return to normal daily living earlier. It can be seen in this case that perioperative morbidities averted despite above-mentioned patient factors comorbidities. Therefore, the term 'layer of hope' is accurate to depict a patient's staged journey of recovery albeit possibility of latter recurrence.

### Conclusion

It is important that dermal matrix modality is in the armamentarium of reconstructive surgeons so that high risk patients with such skin malignancy would not be regarded as terminal disease without optimal surgery as local control.

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