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ORIGINAL PAPER

Early results and initial experience of reconstructing defects with NovoSorb® Biodegradable Temporising Matrix (BTM): a UK case series

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Abstract

Background NovoSorb® BTM is a synthetic dermal substitute that allows closure and staged reconstruction of a complex wound. This study aims to share our experience of using Novosorb to treat challenging defects and establish the indications for its use.

Methods A retrospective case series review of patients treated with Novosorb at Queen Victoria Hospital NHS Foundation Trust from October 2020 to June 2022 was performed. Data collected included patient demographics, defect aetiology, wound features, surgical treatment, complications and postoperative outcomes.

Results Novosorb was used to treat 40 wounds, commonly on the foot and ankle (32%), lower limb (20%), scalp (18%) and hand (16%). Mean size of defects was 1.29% TBSA. Aetiologies were mostly skin cancer (47%) and acute burn injury (29%). Complex wound features were mostly exposed tendon or paratenon (61%) and exposed bone or periosteum (53%). Seventy-four percent treated defects required secondary skin grafting. Mean time to skin grafting was 5.2 weeks after Novosorb application. Mean graft take was 89%. Twenty-one percent defects did not undergo secondary reconstruction but showed adequate epithelialisation with Novosorb alone, 9.2 weeks after application. Complications included infection (13%) and Novosorb non-adherence (13%). Satisfactory cosmetic and functional outcomes were observed.

Conclusions Novosorb can develop a healthy vascularised tissue bed for secondary skin grafting or spontaneous epithelialisation of a complex wound. It offers a safe and reliable reconstructive option in patients with complex wounds who are unfit for more complex surgery, prefer to avoid reconstruction, have had a failed reconstruction or have a non-graftable wound bed.

Level of Evidence Level IV, therapeutic study.

Keywords Acellular dermis · NovoSorb · Surgery, Plastic · Wounds and injuries

Introduction

NovoSorb® Biodegradable Temporising Matrix (BTM) is a synthetic dermal substitute developed for the treatment of full thickness skin defects. It consists of a 2-mm-thick foam-like matrix made of polyurethane with a non-biodegradable sealing membrane on one side that can be peeled off. It is designed to cover a wound, become incorporated and eventually dissolve after creating a neodermis, allowing closure of a complex wound not immediately amenable to skin grafting [1, 2].

Novosorb typically requires a 2-stage reconstruction. At the first procedure, a thorough wound assessment and debridement is performed and the final decision to use Novosorb is made. The appropriate size is selected to cover the defect and inset with the sealing membrane on the outer surface. After some weeks, it should become integrated within the wound, as indicated by a colour change from white to red-pink with blanching on palpation of the foam-like dermal matrix. The second procedure involves delamination of the sealing membrane from the fully integrated dermal matrix to reveal a vascularised neodermis, allowing further wound assessment and skin grafting as necessary [3, 4].

This is useful in situations where a defect is not amenable to immediate skin grafting, or requires 'bridging' over exposed tendon or bare bone, or where not enough autologous skin is available for debridement and grafting in a single stage.

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Novosorb is increasingly used in the management of burn injuries, necrotising fasciitis, skin cancer and other complex wounds where the wound may benefit from a more reliable and pliable result compared to skin graft alone [2, 4–6]. However, the clinical indications and optimal application of Novosorb remain unclear.

The main benefit of using Novosorb is to transform a non-graftable wound bed into a surface amenable to skin grafting. The manufacturer states that Novosorb has additional advantages over other comparable products. Namely, its synthetic composition is not a food substrate for bacteria; it can be stored at room temperature; it can be applied with sutures or staples for ease and does not require tissue tracking like the biological matrices [1, 7, 8].

Existing literature point to its safety and efficacy with a small complication profile. For example, recent studies show that Novosorb is effectively integrated within the treated defect in 88–94% cases, and rates of non-adherence are low [5, 6]. Solanki et al. found infection occurring in up to 20% of cases, but this did not appear to affect outcomes. Still, the evidence base regarding Novosorb use is limited.

We aim to share our experience of using Novosorb to reconstruct challenging defects, to establish the rationale for Novosorb use and to explore its clinical applications.

Material and methods

A retrospective case series review of patients with full-thickness skin defects treated with Novosorb at Queen Victoria Hospital NHS Foundation Trust was performed from October 2020 to June 2022. Data including patient demographics, defect aetiology, wound features, surgical treatment, complications and postoperative outcomes were collected from the medical records and clinical photography. Formal ethical and regulatory approvals were not required for this study in accordance with applicable standards. Patient consent was obtained for the use of clinical photographs.

Novosorb was used as instructed in the product literature, in accordance to local hospital protocols. Betadine and chlorhexidine was used for surgical site preparation, and a single dose of antibiotics was given on induction. The treated defects underwent an initial debridement using a standard surgical knife or Watson knife to remove all non-viable tissue and allow comprehensive wound assessment, ensuring no evidence of active infection and suitability for application of Novosorb. In the first-stage procedure, Novosorb was trimmed to size and inset to the defect using circumferential and 'quilting' staples or sutures, covered with an antimicrobial barrier dressing and secured using a crepe bandage or Hypafix to provide gentle compression and encourage Novosorb adherence. Initial postoperative dressings involved either Jelonet, Inadine or Mepitel, and betadine-soaked gauze, saline-soaked gauze or topical negative pressure depending on wound size, aetiology and clinician preference.

In defects overlying a joint, immobilisation of the joint was ensured for 1 postoperative week. Where clinically indicated, patients were managed on an outpatient basis with weekly dressing changes and reassessment of Novosorb, until it appeared fully integrated within the defect.

The second stage involved the removal of staples or sutures and delamination of the Novosorb sealing membrane. In cases requiring skin grafting, this was performed in the operating theatre, but in some cases not requiring skin grafting, this was performed in the outpatient setting. In cases requiring reconstruction, the neodermis was refreshed using light debridement or dermabrasion techniques allowing further wound assessment prior to definitive reconstruction by split-thickness skin grafting, in most cases. Split-skin graft harvest was performed between 8–12/1000″ using a Dermatome or Watson knife, hand fenestrated or meshed with a 1:1.5 expansion ratio, trimmed to size and fixed to the defect using histacryl glue or sutures. Graft site dressings were either Telfa or Jelonet, Kerlix or gauze, Gamgee or wool and crepe bandage. The skin graft review was performed at 5 to 7 days postoperatively.

Where complications occurred, these were grouped into the categories of Novosorb non-adherence, non-revascularisation, infection and other. Novosorb non-adherence was defined by any area of Novosorb that had lifted off the wound bed and remained unattached at 2 weeks after application and was managed by trimming off redundant material. Non-revascularisation was defined as well-adhered Novosorb that has not undergone any change in appearance by 6 weeks after application. Infection included a change in appearance of Novosorb to yellowish-grey in colour, evidence of purulent discharge deep to the sealing membrane and systemic symptoms of infection associated with new pain and erythema around the defect, and was managed by evacuation of exudative discharge by making a small aperture in the sealing membrane, washout, daily wound care and empirical antibiotic therapy.

Results

Novosorb was used in the treatment of 38 patients with 40 wounds in total, as shown in Table 1. Patients had a mean age of 60 years with a 2.1:1 male to female ratio. Figure 1 shows the aetiology of treated defects. These include skin cancer (47%), acute burn injury (29%), scar revision (8%), infection (8%) and trauma (8%). Figure 2 shows the anatomical location of treated defects. These include scalp (18%), face (3%), back (3%), upper limb excluding the hand (5%), hand (16%), abdomen (3%), pelvis or perineum (1%), lower limb excluding the foot (20%) and foot and ankle (32%)

Table 1 Patients treated with Novosorb BTM

Age (years)	Aetiology of defect	Site of defect	Wound features	Size of defect (%TBSA)	Grafted (yes/no)	Complications
46	Acute burn injury	Right foot dorsum	Exposed tendon	0.25	Yes	None
66	Skin cancer	Right medial canthus/ nose	Exposed bone	0.5	Yes	None
69	Acute burn injury	Left hand dorsum	Exposed bone and tendon	0.5	Yes	None
85	Skin cancer	Right cheek	Failed skin graft	0.25	No	Infection and non-adherence
83	Skin cancer	Scalp	Exposed bone	0.5	No	None
52	Scar revision	Left leg	Exposed bone and tendon	2	Yes	None
40	Scar revision	Left hand	Exposed tendon	0.5	Yes	None
74	Skin cancer	Right foot	Exposed tendon	0.25	No	None
88	Skin cancer	Scalp	Exposed bone	0.5	Yes	None
77	Skin cancer	Left leg	Exposed bone and tendon	0.5	Yes	Haematoma
44	Acute burn injury	Right foot Left foot	Exposed tendon Exposed tendon	1 1	Yes Yes	Infection None
5	Acute burn injury	Right ankle	Exposed tendon	0.25	No	None
60	Skin cancer	Left foot	Pressure area	0.25	No	None
84	Skin cancer	Scalp	Exposed bone	0.5	Yes	None
31	Acute burn injury	Right lower leg	Exposed bone and tendon, failed skin graft	1	Yes	None
83	Skin cancer	Scalp	Exposed bone	0.25	Yes	None
24	Acute burn injury	Left ankle Left foot	Exposed tendon Exposed tendon	0.25 0.25	Yes Yes	None None
58	Acute burn injury	Abdomen	Overlying umbilicus	2.5	Yes	None
49	Acute burn injury	Chest, back	Failed skin graft	8	Yes	Non-adherence
34	Infection	Left thigh, groin, perineum	Exposed tendon	4.5	Yes	None
91	Skin cancer	Right lower leg	Exposed bone and tendon	4	Yes	None
18	Trauma	Left index finger	Exposed bone and tendon	0.1	No	Infection, osteomyelitis
36	Acute burn injury/ Trauma	Right lower leg	Exposed bone	4	Yes	None
41	Scar revision	Right lower leg	Exposed tendon	1	Yes	None
75	Skin cancer	Left foot	Exposed tendon	0.75	Yes	None
77	Skin cancer	Right lower leg, ankle	Exposed bone and tendon	2	Yes	Infection and delayed healing
84	Skin cancer	Right foot	Exposed bone and tendon	0.5	Yes	None
84	Acute burn injury	Left leg	Exposed bone and tendon	5	No	Infection and non-adherence
54	Acute burn injury	Left arm	Delayed wound healing	0.75	No	Non-adherence
89	Skin cancer	Scalp	Exposed bone	0.25	No	None
64	Acute burn injury	Right forearm	Exposed bone and tendon, failed skin graft	2.5	Yes	None
69	Skin cancer	Right little finger	Exposed bone and tendon	0.2	No	None

Table 1 (continued)

Age (years)	Aetiology of defect	Site of defect	Wound features	Size of defect (%TBSA)	Grafted (yes/no)	Complications
54	Skin cancer	Left foot	Exposed tendon	0.25	Yes	None
88	Skin cancer	Scalp	Exposed bone	0.5	Yes	None
86	Skin cancer	Right foot	Pressure area	0.25	Yes	Non-adherence
50	Infection	Right hand	Exposed tendon	0.5	Yes	None
16	Trauma	Right foot	Exposed bone and tendon	1	Yes	Fluid collection
48	Infection	Left index finger	Exposed tendon	0.1	Yes	None

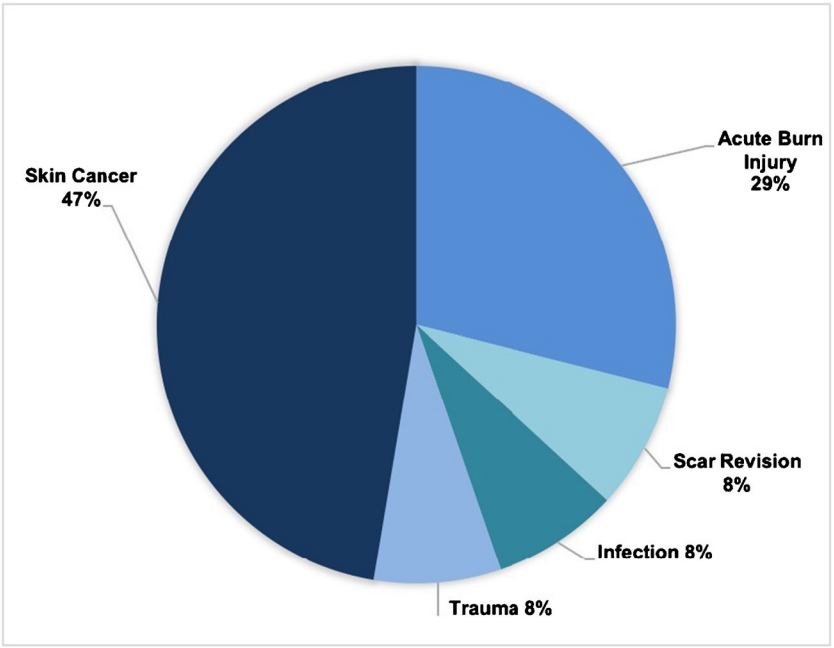

Fig. 1 Aetiology of defects treated with Novosorb BTM

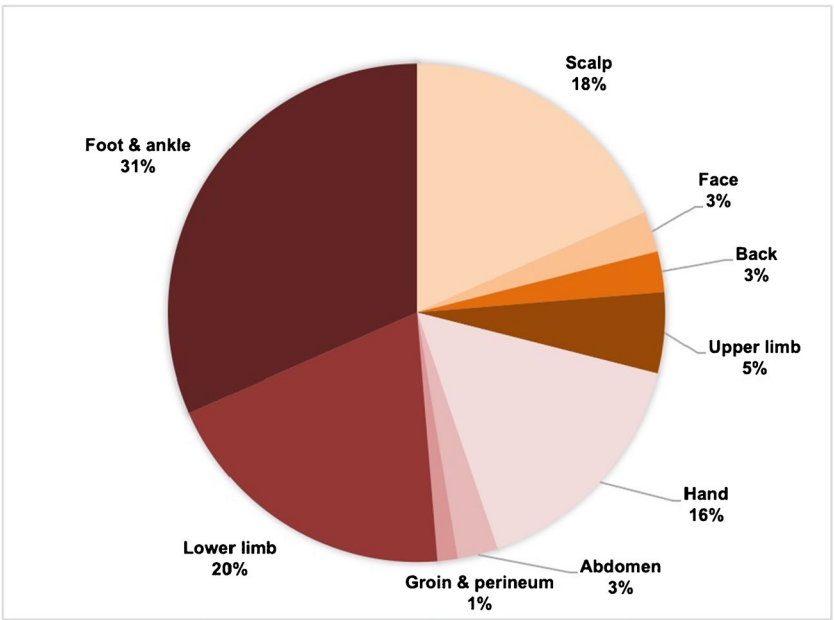

Fig. 2 Anatomical location of defects treated with Novosorb BTM

defects. The mean size of treated defects was 1.29% total body surface area (TBSA), ranging from 0.1 to 8% TBSA. Figure 3 shows the distribution of these.

The relevant features of treated defects were exposed tendon or paratenon (61%), exposed bone or periosteum (53%), pressure areas (5%) and other (5%). Thirty-two percent defects involved both exposed bone and exposed tendon, and 11% defects had already been treated unsuccessfully with a failed graft. Indications for using Novosorb to temporise a defect were patient unfit for more complex reconstructive surgery, patient preference to avoid needing reconstruction, failed reconstruction and non-graftable wound bed.

A timeline of Novosorb use is shown in Fig. 4. Overall, delamination of Novosorb was performed 4.8 weeks after application. Early delamination was required in three cases, two of which experienced complications and one that was successfully grafted. Seventy-four percent of defects treated with Novosorb required skin grafting, as shown in Fig. 5. Mean time to skin grafting was 5.2 weeks after Novosorb application. Mean graft take was 89% at 1–2 weeks after skin grafting, including 3 cases of complete graft loss due to complications. Mean graft take was 66.4% in skin cancer defects and 73.8% in acute burn injury defects. Mean follow-up time was 3.4 months. Overgranulation of the treated defect was observed in 30% of all cases. Visual characteristics of all treated defects were improved, and the concavity of the original wound was found to have reduced, as shown in Fig. 6. No impairment of range of motion or function of the treated area was reported.

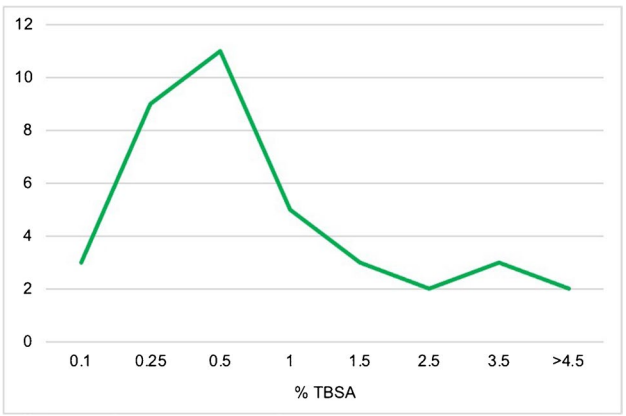

Fig. 3 Size of defects treated with Novosorb

Overall, complications were recorded in 18% cases including infection (13%) and Novosorb non-adherence (13%). Complications occurred in complex cases including 36% cases of acute burn injury, 17% cases of skin cancer, 1 trauma case and half of the cases already treated with a failed graft. In all of these, Novosorb had been used as few other reconstructive options were available or considered appropriate.

Of five cases of infection, two progressed to secondary skin grafting with one resulting in partial graft take and the other in graft loss. Two cases were ungraftable, one of which resulted in osteomyelitis and amputation of a digit, and the other involved a severely unwell patient who deteriorated and passed away. One patient declined any further procedure and was treated without skin grafting.

Of five cases of non-adherence, two healed by secondary intention, two resulted in graft loss and the other was also complicated by infection in a severely unwell patient who did not recover. Apparent causes of non-adherence were postoperative haematoma, patient non-compliance, infection and suspected mechanical stress from weight-bearing on a foot wound.

Twenty-six percent defects did not undergo any secondary reconstruction. Reasons for Novosorb treatment alone without skin grafting included illness severity precluding further surgery, inadvertent delamination and patient preference for non-operative management. These defects related to skin cancer (6), acute burn injury (3) and trauma (1).

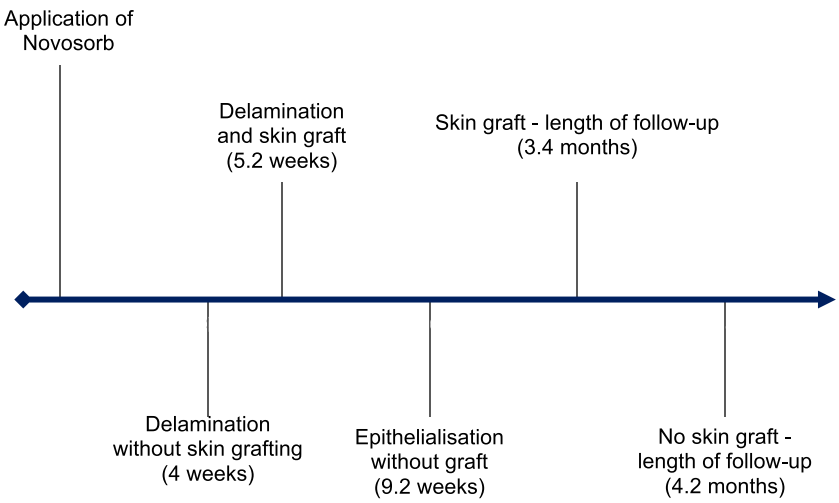

Fig. 4 Timeline of Novosorb use

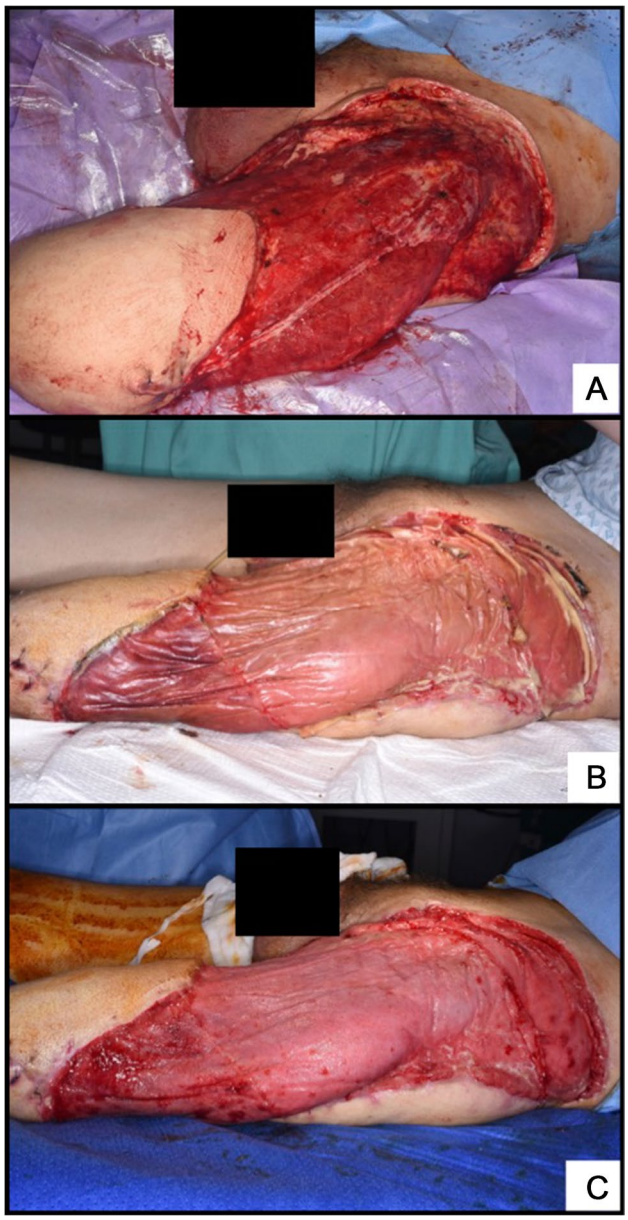

Fig. 5 Typical appearance of defect treated with Novosorb. **A** Wound prepared for application of Novosorb. **B** Novosorb integrated within the wound ready for delamination. **C** Wound neodermis after Novosorb delaminated from wound

They included 3 defects of the face and scalp, 3 defects of the foot and ankle, 2 defects of the hand, a lower limb defect and an upper limb defect. The mean size of these was 0.78% TBSA. Defects treated without secondary reconstruction were delaminated at 4 weeks after Novosorb application.

Mean follow-up time of defects treated without secondary reconstruction was 4.2 months. Overgranulation was observed in 30% of these defects. Two of these did not reach follow-up (one defect of the hand resulted in infection, osteomyelitis and amputation, and another involved a severely unwell patient who deteriorated and passed away). The remainder showed adequate epithelialisation with Novosorb alone, with a mean time to epithelialisation of 9.2 weeks after application.

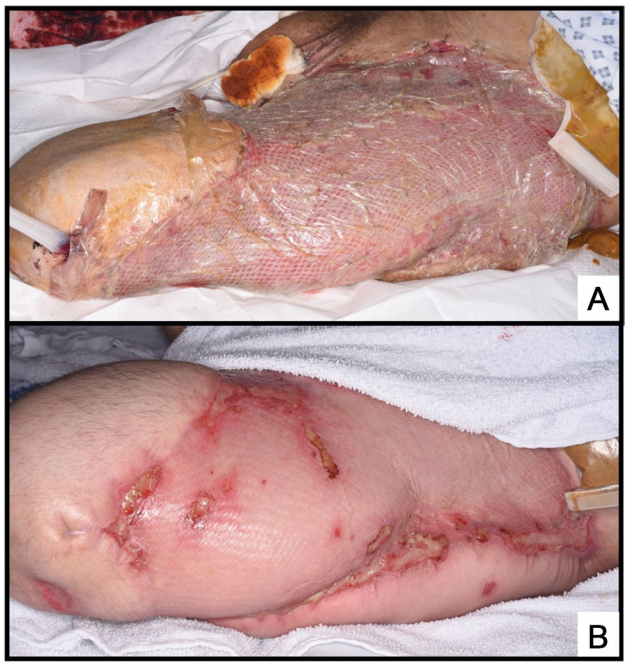

Fig. 6 Typical appearance of defect treated with Novosorb and subsequent skin grafting: **A** at time of skin grafting and **B** at 6-month follow-up

Discussion

This series demonstrates that Novosorb is an effective treatment option for defects not amenable to immediate reconstruction. Reconstruction may not be possible in these cases due to complex wound features or other patient factors, including comorbidity, clinical condition and patient preference. Defects treated with Novosorb followed by secondary skin grafting showed an overall mean graft take of 89% at 1–2 weeks after skin grafting. Satisfactory cosmetic outcomes were recorded by assessing the visual characteristics of grafted wounds, and no impairment of functional outcomes was observed.

Furthermore, 21% of all defects treated with Novosorb showed epithelialisation with Novosorb alone without need for skin grafting. Epithelialisation had occurred around 5 weeks after delamination of the fully integrated matrix. Notably, the sizes of all defects successfully treated without skin grafting were less than 0.75% TBSA.

Novosorb is mainly used to transform a non-graftable wound bed into a surface amenable to skin grafting. This may be a complex wound containing exposed bone or tendon, in which case tendon function can be preserved.

However, when used without subsequent skin grafting, Novosorb negates the need for a further procedure and additional surgical wounds.

Rationale for its use can therefore be divided into patient factors and wound factors. Patient factors include patient not fit for more complex reconstructive surgery and patient preference to avoid reconstruction. Wound factors include a non-graftable wound bed and a hostile wound/failed reconstruction.

The authors noted some advantages of Novosorb. Clinicians found it easy to use, both at the point of application and delamination. Although there is an initial learning curve to overcome before gaining familiarity with Novosorb, users were increasingly able to confidently assess Novosorb integration. Despite one case of non-compliance, patients did not report problems having Novosorb in situ. As it is not animal derived, it may also have greater acceptability amongst patients.

There may be aesthetic advantages to using Novosorb. For example, the mesh pattern appears to be less visible on meshed grafts when inset onto Novosorb. Dermal replacements are also noted to increase the likelihood of a more pliable, less contracted skin graft [9, 10]. Comparative long-term outcomes of treatment with Novosorb are required to confirm this.

Furthermore, a simple cost comparison showed that Novosorb was of comparatively low cost when directly compared to similar products. Using the largest sizes of the dermal matrices available in our centre, the cost of Novosorb was calculated as £3.50/cm^2, comparatively less than Integra® at £6.56/cm^2 and Matriderm® at £5.61/cm^2.

Novosorb is most commonly used in the management of upper and lower limb defects [5, 11]. Solanki et al. report difficulty in cases where it was used on the trunk in areas more affected by movement. Similarly, Novosorb was used only once on the trunk in this series and frequently used in defects of the scalp.

Although the recommended time to delamination is 4 weeks after Novosorb application, this series found that reconstruction could be safely performed up to 8 weeks later, as delays were incurred for numerous reasons including cases of Covid-19, unrelated medical treatments and the need for additional preoperative medical optimisation. These cases did not result in any adverse outcomes. Furthermore, it is suggested that Novosorb integration is delayed when it is used to cover non-vascularised structures, such as bone or tendon. Eighty-two percent defects in this series contained exposed bone or tendon, which may have increased the length of time between application and delamination of Novosorb.

Considering that Novosorb was often used in complex cases where few other reconstructive options were available, complications were observed in this series. The main complications encountered were infection and non-adherence. Novosorb is thought to be amenable to salvage when infection occurs. However, only one such case was successfully grafted, and even this resulted in a partial graft take. None of the cases complicated by non-adherence were successfully reconstructed using Novosorb. However, Novosorb appears to revascularise well if adherent to the wound bed, as no cases of non-revascularisation occurred. Complications occurred in half of the cases treated with Novosorb after a failed skin graft, suggesting suboptimal conditions for Novosorb or inadequate surgical debridement of the wound prior to its application. Patient comorbidity was not assessed within patient demographics but also warrants further consideration here.

Although it cannot be inferred from the data, it may be that outcomes are affected by defect aetiology. Lo et al. previously reported the incidence of infection with Novosorb use in patients with acute burn injury to be 38.5% patients [12]. The graft take reported in that study was 81.9%, and scar quality was acceptable. Mean graft take for acute burn injury defects treated with Novosorb and grafted in this series was 85.4%.

All cases of complete graft loss in this series occurred in the context of skin cancer. However, the majority of defects that epithelialised without the need for reconstruction were also due to skin cancer, supporting the observation that grafting may not be necessary in all cases of Novosorb use if there is evidence of spontaneous epithelialisation [11].

Although the possibility of selection bias exists in this study, it is likely that Novosorb was used in more challenging cases with limited reconstructive options and relatively worse prognoses. Importantly, there is no conflict of interest in this study as in industry-sponsored studies, and so, the observed findings are reliable. However, the study did not involve a sufficiently large cohort to draw any major conclusions from these.

Therefore, randomised controlled trials are required to compare Novosorb to the other dermal matrices, including patient-reported outcomes and longer-term surgical outcomes such as mature scar results and possible return of sensation to the wound. A comprehensive cost analysis, incorporating the cost implications of subsequent treatments, complications and follow-up, is also required to fully assess the cost-effectiveness of Novosorb.

Conclusions

Novosorb provides a safe and reliable reconstructive option for complex wound surgery, to develop a healthy vascularised tissue bed for secondary skin grafting or spontaneous epithelialisation of a complex wound.

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Author contribution All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Nicholas Cereceda-Monteoliva, Mariam Rela and Ana Borges. The first draft of the manuscript was written by Nicholas Cereceda-Monteoliva and revised for important intellectual content by Baljit Dheansa. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data Availability Available on request.

Declarations

Ethics approval This is an observational study. The local Research & Ethics Committee has confirmed that no ethical approval is required.

Consent to participate and for publication The authors affirm that human research participants provided informed consent for publication of the images in Figs. 5 and 6. Informed consent was obtained from all other individual participants included in the study, and any other identifiable patient data were removed.

Conflict of interest The authors declare no competing interests.

References

1. PolyNovo Biomaterials Pty Ltd (2022) Novosorb BTM—biodegradable synthetic dermal substitute. https://polynovo.com/novosorb-btm. Accessed 31 Sept 2022
2. Greenwood JE, Dearman BL (2012) Split skin graft application over an integrating, biodegradable temporizing polymer matrix: immediate and delayed. J Burn Care Res 33(1):7–19. https://doi.org/10.1097/BCR.0b013e3182372be9
3. Dearman BL, Li A, Greenwood JE (2014) Optimization of a polyurethane dermal matrix and experience with a polymer-based cultured composite skin. J Burn Care Res 35(5):437–448. https://doi.org/10.1097/BCR.0000000000000061
4. Greenwood JE, Schmitt BJ, Wagstaff MJD (2018) Experience with a synthetic bilayer Biodegradable Temporising Matrix in significant burn injury. Burns Open 2(1):17–34. https://doi.org/10.1016/j.burnso.2017.08.001
5. Solanki NS, York B, Gao Y, Baker P, Wong She RB (2020) A consecutive case series of defects reconstructed using NovoSorb® Biodegradable Temporising Matrix: Initial experience and early results. J Plast Reconstr Aesthet Surg 73(10):1845–1853. https://doi.org/10.1016/j.bjps.2020.05.067
6. Li H, Lim P, Stanley E, Lee G, Lin S, Neoh D, Liew J, Ng SK (2021) Experience with NovoSorb® Biodegradable Temporising Matrix in reconstruction of complex wounds. ANZ J Surg 91(9):1744–1750. https://doi.org/10.1111/ans.16936
7. Wagstaff MJD, Salna IM, Caplash Y, Greenwood JE (2019) Biodegradable Temporising Matrix (BTM) for the reconstruction of defects following serial debridement for necrotising fasciitis: A case series. Burns Open 3(1):12–30. https://doi.org/10.1016/j.burnso.2018.10.002
8. Kogan S, Halsey J, Agag RL (2019) Biologics in acute burn injury. Ann Plast Surg 83(1):26–33. https://doi.org/10.1097/SAP.0000000000001915
9. Halim AS, Khoo TL, Mohd Yussof SJ (2010) Biologic and synthetic skin substitutes: an overview. Indian J Plast Surg 43(Suppl):S23–S28. https://doi.org/10.4103/0970-0358.70712
10. Hughes OB, Rakosi A, Macquhae F, Herskovitz I, Fox JD, Kirsner RS (2016) A review of cellular and acellular matrix products: indications, techniques, and outcomes. Plast Reconstr Surg 138(3 Suppl):138S-147S. https://doi.org/10.1097/PRS.0000000000002643
11. Wu-Fienberg Y, Wu SS, Gatherwright J, Chepla KJ (2021) an alternative dermal template for reconstruction of complex upper extremity wounds. Plast Reconstr Surg Glob Open 9(7):e3674. https://doi.org/10.1097/GOX.0000000000003674
12. Lo CH, Brown JN, Dantzer EJG, Maitz PKM, Vandervord JG, Wagstaff MJD, Barker TM, Cleland H (2022) Wound healing and dermal regeneration in severe burn patients treated with NovoSorb® Biodegradable Temporising Matrix: a prospective clinical study. Burns 48(3):529–538. https://doi.org/10.1016/j.burns.2021.07.014