

Methacrylate Polymer Powder Dressing for a Nasal Surgical Defect

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ABSTRACT

The fusion of technology and medicine has led to the advent of advanced wound healing techniques that may be adapted to the management of surgical defects. Shortened duration of healing and ease-of-use are two potential benefits under investigation. Here we describe a 65-year-old male with a nasal alar wound that was allowed to heal with secondary intention, assisted by a novel methacrylate polymer powder dressing.

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BACKGROUND

Advances in technology have recently contributed to the development of innovative wound healing modalities that hold promise for the management of surgical defects.

CASE

A 65-year-old Caucasian man presented with a biopsy-proven nodular basal cell carcinoma on the left nasal alar. The tumor was cleared after 2 stages of Mohs Micrographic Surgery with excision down to the nasalis muscle. The resultant defect measured 12mm x 14mm in area and 5mm in depth (wound size 840mm³). Reconstructive options were discussed, including random pattern flap repair, skin graft and secondary intention healing with the aid of a novel methacrylate powder dressing. The patient preferred to proceed with secondary intention healing assisted by the methacrylate powder dressing.

After achieving hemostasis, 10mg of a sterile, biologically inert polymerized methacrylate powder dressing (Altrazeal™, Uluru Inc., TX) was poured over the wound in a uniform layer to fill and seal the entire surface. 0.1ml of sterile ionic saline was sprayed onto the powder to activate the dressing. The single dressing was left intact for 3 weeks. A post-operative follow-up visit at 3 weeks found the wound completely epithelialized and reduced in size to 9 x 10mm in area and 1mm in depth (wound size volume 90mm³). This represented a 90% reduction in wound (Figure 1). The dressing was easy to maintain, non-painful, and there were no reported adverse effects.

DISCUSSION

Polymerized methacrylate powder dressings are a novel, sophisticated dressing modality with great potential in the management of wounds following cutaneous surgery. The dressing

FIGURE 1. Patient before, during, and after. (A) Post-operative defect on the left nasal alar. (B) Single application of methacrylate polymer powder dressing on wound. (C) Wound after 3 weeks.

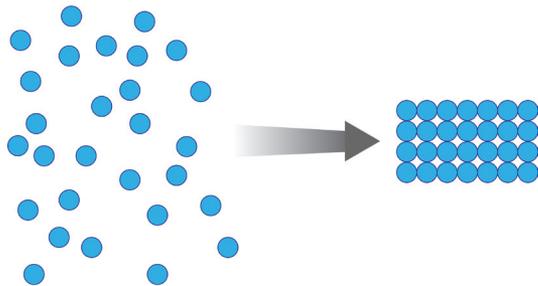


used in this case was a lyophilized, sterile powder consisting of 84.8% poly-2-hydroxyethylmethacrylate, 14.9% poly-2-hydroxypropylmethacrylate (pHPMA), and 0.3% sodium deoxycholate. These hydrophilic polymers have a covalent methacrylate backbone with a hydroxyl aliphatic side chain. When saline or wound exudate contacts the powder, the spheres hydrate and non-reversibly aggregate to form a moist, flexible dressing that conforms to the topography of the wound and seals it (Figure 2).¹

FIGURE 2. Polymerized methacrylate powder forms. (A) Methacrylate polymer powder. (B) Aggregation following application of ionic saline medium.



FIGURE 3. Mechanism of methacrylate powder. When saline is added to methacrylate polymer powder, the particles form an aggregated, organized honeycomb structure with pores 4-10nm in diameter that serves as capillary channels. The small size allows for wound moisture management but does not permit bacterial transmigration.



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Once the spheres have aggregated, they are designed to orientate in a honeycomb formation with 4-10nm openings (Figure 3) that serve as capillary channels. This porous architecture of the polymer is essential for adequate moisture management, as it allows for vapor transpiration at a rate of 12 l/m² per day. This ensures the capillary flow from the moist wound surface is distributed evenly through the dressing, which contributes to its 68% water content. Notably, this approximately 3/5 water composition is similar to the water makeup of human skin. Optimized moisture management is theorized to enhance epithelial migration, stimulate angiogenesis, retain growth factors, promote autolytic debridement, and maintain ideal voltage and oxygen gradients for wound healing. The risk of infection is not increased by the existence of these pores, as their small size does not allow for bacterial migration.¹

CONCLUSION

This case demonstrates the effectiveness of a polymerized methacrylate powder dressing to promote timely wound healing of a nasal alar defect. This low maintenance, single-application, user-friendly dressing spared the patient the inconvenience and pain associated with more conventional primary and secondary dressings. The dressing was well tolerated and resulted in a 90% reduction in wound size.

Further studies are needed to investigate the utility of this promising technology.

DISCLOSURES

The authors have no conflicts of interest to declare.

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