

Innovative Method of Filling Collagen Particles in Difficult Cavity Wounds

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Abstract

Difficult cavity wounds have undermined and tunneling morphology of their edges or a location which is difficult to access. Collagen dressing is an interactive dressing designed for wound management. Collagen particles are designed for cavity wound management. Filling the difficult cavity wound with collagen particles has some practical problems. To overcome these problems we have used an innovative method of filling collagen particles in difficult cavity wound. Innovative method of filling collagen particles is simple and effective solution of the problems faced in managing difficult cavity wounds.

Keywords: Difficult cavity wounds; Collagen particles; Wound bed preparation.

Introduction

Definition of a 'wound' is: loss of continuity of the skin or mucous membrane with associated tissue loss.¹ A wound is called as 'cavity wound' if the tissue loss is beyond the subcutaneous tissue and underlying tendons, muscle, or bone are exposed.¹ 'Difficult cavity wounds' have undermined and tunneling morphology of their edges or a location which is difficult to access.

Collagen particles are designed specifically for cavity wound management.² Filling the cavity wound with collagen particles has a practical problem of spillage and difficult packing. Also significant amount of collagen particles get lost after application of secondary dressing over the collagen filled cavity wound. To overcome these problems we have used an innovative method of putting the collagen particles in cavity wound. Through this article, we share our experience of using this innovative method in a single case.

Case report

A young man (age: 25 year) has been admitted in tertiary burn care unit of our institute with high voltage fourth degree electric burns to right upper limb. Immediately at the time of presentation patient was taken to emergency operation theatre where forearm and hand fasciotomy was performed. After few days, once the tissue demarcation appeared, the necrotic tissue was debrided and a resultant cavity wound was formed in right distal forearm of the patient. The wound was bone deep, situated on both volar and dorsal aspect of the forearm. Size of the wound was 7 cm X 4 cm X 3 cm on volar aspect and 6 cm X 5 cm X 2 cm on dorsal aspect. Distal vascular supply was intact, but tendon and nerves of forearm had to be sacrificed during debridement. After systemic assessment of patient and wound status, it was decided to do multi staged reconstruction of the defect. Early flap cover was planned to protect the exposed forearm bones. The defect was reconstructed with

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two adjacent abdominal flaps, one for dorsal side and one for volar side defect. Unfortunately during postoperative period inset of volar side abdominal flap was lost and it had to be repositioned on its donor site on postoperative day 5. However by this time the volar side wound started granulating based on 'crane principle'³. Now we had a cavity wound on volar aspect of right forearm which was difficult to access because the forearm was attached to abdomen with a flap on dorsal aspect. At that time a second flap surgery was not possible because of intact pedicle of dorsal side flap. Also it was not possible to put the negative pressure wound therapy (NPWT) due to difficulty in sealing the wound without compressing the flap pedicle. Hence it was decided to manage this cavity wound using antimicrobial impregnated collagen particles. Putting collagen particles in this cavity wound was found to be difficult. We used an innovative method of filling the collagen particles for this wound.

One dry collagen membrane (NeuSkin™; cost: INR 700 / US\$10 for 10X10cm) was taken and the required amount antimicrobial impregnated collagen particles (Collofibre-MM™; cost: INR625 / US\$9 for 10 mL) were put on that (Fig. 1). After that the collagen membrane was folded in the form of a packet (Fig. 2) and tied with absorbable suture (catgut). Now this collagen packet was inserted into the cavity wound (Figs. 3 and 4). Over the collagen filled cavity, secondary dressing was done using non adhesive foam (Biatain™ foam; cost: INR1290 / US\$18 for 20 X 20 cm) and carefully wrapped with roller gauge, avoiding compression over the flap on dorsal side. This dressing was repeated twice weekly for four weeks. Gradually the wound contracted, cavity got obliterated and epithelialized (Fig. 5). By the time dorsal side flap was delayed, divided and re-inset done; the volar side wound got healed by secondary intention (Figs. 6 and 7). Further stages of reconstruction and rehabilitation are planned now for achieving a sensate and functional hand.



Fig. 1: Putting collagen particles on a collagen membrane



Fig. 2: Preparing collagen packet



Fig. 3: Wound just before debridement. After debridement of necrotic tissue a bone deep cavity wound was formed.



Fig. 4: Filling the difficult cavity wound with collagen packet



Fig. 5: Volar side cavity wound at the time of division of dorsal side flap. Note that cavity wound has started contracting.

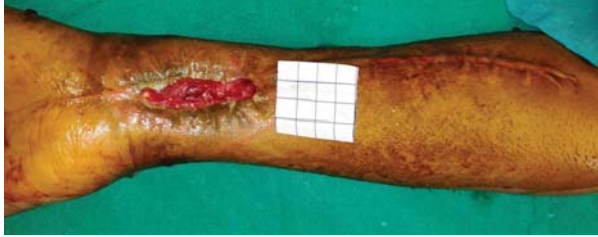


Fig. 6: Cavity obliterated after 4 weeks of collagen dressing



Fig. 7: Almost complete epithelialization after 6 weeks of collagen dressing

Discussion

Principles of wound management are summarized by acronym 'SWCR'⁴:

1. Systemic analysis of patient and wound
2. Wound bed preparation
3. Clinical decision making
4. Repair, reconstruct and rehabilitate

Like any other wound, principles of wound management remain same for cavity wound also. However approach of management differs.¹

Wound bed preparation is a critical part of wound management before proceeding to reconstruction and rehabilitation. There are four components of wound bed preparation which can be summarized by acronym 'TIMES'⁴:

1. Tissue debridement (of non viable and infected tissue)
2. Inflammation and infection control
3. Moisture balance
4. Edge of the wound- epithelial advancement
5. Surrounding tissue (control of edema, inflammation and venous stasis)

Once the tissue debridement is completed the focus of wound management shifts to other components of wound bed preparation. Role of wound dressing is to maintain the adequate moisture and provide favourable wound environment for epithelial advancement.

Simultaneously wound dressing should also control local infection and inflammation, while preventing further infection from outside the wound.⁵

Collagen dressing is an interactive dressing designed for wound management. It acts as a sacrificial substrate to deal with elevated levels of matrix metalloproteinases (MMPs).⁶ This help the endogenous native collagen to continue normal wound healing.⁶ Collagen dressings are available in various forms: sheet, foam, gel, particles etc.

Medicated collagen particles are effective tool of cavity wound management.² Some cavity wounds are difficult to access due to their location or morphology. Filling the cavity with collagen particles has some practical problems in such wounds:

1. Significant amount of particles gets spilled out of the margins of wound while filling.
2. Cavities located in antigravity direction are further difficult to fill.
3. Packing of particles in the cavity is also important to achieve contact of collagen with maximum wound surface area. Effective packing is difficult in such cavity wounds.
4. Once cavity is filled and packed with the collagen particles, it needs to be covered with secondary dressing. Significant amount of collagen gets lost in contact with the secondary dressing.

Innovative method of collagen filling proposed in this article deals with all above problems. The method is simple, effective and reproducible. It can be used for other cavity wounds like pressure sores, diabetic foot, burst abdomen etc.

Limitation of this method is that it increases cost of the dressing. This study does not compare various options of cavity wound management. Randomized control trials for validation of effectiveness of this method are required.

Conclusion

Innovative method of filling collagen particles is simple and effective solution of the problems faced in managing difficult cavity wounds.

Key message: Innovative method of filling collagen particles is simple and effective solution of the problems faced in managing difficult cavity wounds.

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