

Pressure Injuries: Surgical Management

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Welcome to the lesson on surgical management of pressure injuries. For the purposes of this lesson, surgical management refers to the use of flaps and grafts to achieve a primary closure of a full-thickness pressure injury and NOT the use of sharp instrument debridement to remove necrotic and devitalized tissue. The difference being that surgical sharp debridement is done with the purpose of debridement then allowing the injury to heal by wound contraction and granulation or healing by secondary intention. Surgical closure is the planned use of grafting or a vascularized pedicle of tissue to provide immediate wound closure with intact skin in place. The lesson on debridement methods will cover surgical debridement.

Learning objectives

- Describe pre-operative considerations and wound bed preparation
- Explain the reconstructive selection process
- Identify types of surgical closure flaps
- Describe post operative management



Some pressure injuries warrant surgical intervention, specifically Stage 3 & 4 pressure injuries, or those with full-thickness tissue loss. This is especially true of those pressure injuries not closing by conservative management or those requiring a more functional closure for concerns such as seating. These particular wounds require a referral for surgical closure consideration. Surgical intervention requires pre-operative considerations, wound preparation, and identification of the appropriate procedure. Usual considerations for flap or graft surgery is to provide a stronger, longer lasting closure option over a particularly vulnerable area. One example would be a pressure injury over an ischial tuberosity in a chair bound person. This particular location can become quite deep, even to the bone, in a short period of time. We know that scar tissue healing is at best 80% the tensile strength and flexibility of unwounded skin. If a flap or graft was used instead to close the wound, additional tensile strength is added for a more long term or more viable closure solution. With this in mind, let's move forward to describe pre-operative considerations and wound bed preparation, explain the reconstructive selection process, identify types of surgical closure flaps, and describe post operative management for these individuals

Grafts, flaps, donor sites

- Skin completely separated from donor site & transplanted to another body site
- Maintain close contact between graft & wound bed to secure blood supply
- Thicknesses of grafting
 - Split – epidermis + part of dermis
 - Full – epidermis + all of dermis



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A skin graft is a piece of skin that is completely separated from its bed (donor site) and transplanted to another body site. There must be close contact between the graft and the wound bed for the skin graft to receive its new blood supply from the wound. A split-thickness skin graft includes the epidermis and part of the dermis while a full-thickness skin graft includes the epidermis and all of the dermis. For healing to occur, the wound must be clean and have a well-perfused wound bed (Black, Black, & Delmore, 2016).

A flap involves moving a pedicle of adjacent skin and tissue with the vasculature intact and rotating that flap directly over the wound.

Pre-surgical assessment

- Pre-operative considerations
 - Can the person survive the surgery?
 - Co-morbid conditions (e.g. diabetes, neurological considerations)
 - Smoking cessation program
 - Nutritional support
 - Enhance protein calorie intake
 - Dietitian consult
 - Fecal & urinary incontinence



As with any surgical procedure, the benefits and risks of the procedure will need to be considered. Will the individual be able to survive and recover from the procedure? Will the necessary post operative management needs be met? Consideration should be given to any existing co-morbidities. For example, diabetes delays wound healing and will need to be factored into the management plan to enhance the person's ability to heal. Other factors to consider are malnutrition and perfusion. Those individuals who smoke should quit as nicotine is known to have a negative impact on tissue perfusion related to its vasoconstriction properties. Frictional damage may occur in neurological or paralysis conditions. Hence if the individual experiences spasms, the spasms would need to be controlled prior to surgery. Fecal and urinary incontinence may also require intervention. An indwelling catheter may need to be placed to prevent contamination of the surgical site. Likewise, fecal incontinence may need to be managed with a pouching system and fecal management system. In some instances, a temporary colostomy may need to be considered.

Other considerations

- Ability to be compliant
- Financial resources
- Patient social supports
- Specialty bed considerations
- Maintain clean wound bed and manage infection



Post operative management considerations include the individual's ability to be compliant and their available support system. Does the individual have the financial resources for such things as wound care dressings and physician visits? Is there a support system which will encourage self-care and encourage the individual to follow post-operative care instructions? Is this support system willing to assist with such things as dressing changes and transportation to appointments. Consideration should be given to the post hospitalization environment. In many instances, a specialty mattress or bed will be required. Is the environment, then, safe for the individual to return to or do adjustments need to be made. Pressure redistribution chair cushions will be necessary. (Black & Black, 2016; Black, Black, & Delmore, 2016; Hicks & Thomas, 2022)

Once it is determined the benefits outweigh the risks, attention should be given to wound bed preparation. Successful surgical closure requires a clean wound bed free of infection and necrotic tissue. Surgical debridement may then be required. A course of antibiotics may also need to be administered.

Surgical management of pressure injury

- Procedure selection
- Reconstructive ladder
- Grafts and flaps
 - Split & full-thickness grafts
 - Flaps include the blood supply



Once the wound bed is prepared and the individual is determined to be a surgical candidate, consideration is given to the type of closure to be performed. A reconstructive ladder is often used to assist in this decision making process. The ladder progresses from least complex procedures to more complex ones. The procedures identified include: secondary healing, linear closure, skin graft, skin flap, muscle flap, skin-muscle flap, bone-tendon-nerve flap, skin-muscle-bone flap, and skin-muscle free flap.

Procedure selection is dependent upon the goal of treatment and the individual's decision. Both skin coverage and soft tissue coverage may be achieved through surgical management. Skin grafts provide superficial coverage and, therefore, are utilized more on donor sites. Rarely then, are skin grafts utilized as a surgical option for pressure injuries. Skin grafts have been utilized in burn management as well as on venous ulcers. There are basically two types of skin grafts: split-thickness and full thickness. Split-thickness skin grafts may be applied in a manner conducive to allow wound exudate to drain and to allow contouring to the skin. Black & Black, 2016; Black, Black, & Delmore, 2016; Hicks & Thomas, 2022)

Flaps include their own blood supply. Skin as well as underlying structures are also transferred with flaps. Underlying structures may include subcutaneous tissue, muscle. Flaps then fill dead space as well as pad defects allowing for pressure

resistance once healed. Additionally, a physiological barrier to infection is achieved when the flap includes muscle.

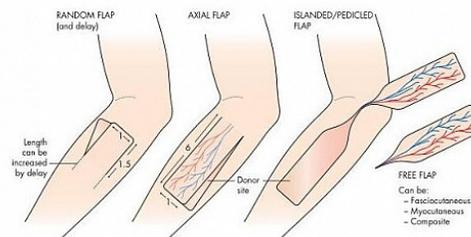
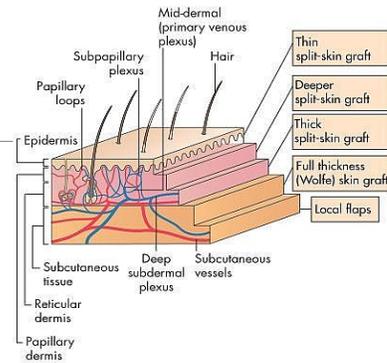
Surgical Flaps

■ Categories

- Local flaps
- Free flaps

■ Classifications of local flaps

- Anatomical structures
- Removal method
- Perfusion maintained



Flaps may be categorized as local or free flaps. Local flaps may be classified by the anatomical structures involved, the method utilized to move the flap, and the method of retaining perfusion. Each of these classifications may be further classified. Classifications of anatomical structure flaps include skin flaps, fasciocutaneous, or myocutaneous or musculocutaneous flaps. Like skin grafts, skin flaps are often not utilized for pressure injuries related to their limited blood supply and padding. Fasciocutaneous flaps, on the other hand, do provide padding as well as superficial coverage. Optimal coverage is provided by the musculocutaneous flap and, as a result, are most often the flap of choice for pressure injuries and full thickness wounds. Advancement flap, rotation flap, and transposition flaps are sub classifications of removal methods. Classifications of methods of retaining perfusion include the random flap and the axial flap. Black & Black, 2016; Black, Black, & Delmore, 2016)

The most complex method of wound closure is the free flap. It is considered after all other options have been exhausted. Free flaps are muscle flaps containing veins and arteries. These vessels are disconnected at the donor site and reconnected at the recipient site.

P.I. Surgical Management: Post-op Care

- Graft & flap mobility and vascularization
- Local care
- Long term care
 - Pruritus, dermatitis, folliculitis
 - Life time protection
- Complications
 - Infection, hematoma, suture line separation, flap necrosis, recurring pressure injury
- Referrals



Post-operative management impacts the success and survival rate of grafts and flaps. Revascularization of a graft is dependent upon the graft's immobility with inadequate immobilization resulting in skin graft failure. Revascularization may be impeded by edema in the wound bed. Measures, therefore, should be taken to control or reduce such. One such measure is site elevation. Another possible measure is negative pressure wound therapy. It is believed negative pressure wound therapy both aids in edema control and promotion of graft adherence. Infection is another possible complication. Graft sites require life long protection and moisturizing related to sweat and oil glands not being transferred with the graft. Dryness, pruritus, dermatitis, and folliculitis are all common complaints. Donor sites also require care. These sites require protection as the healing process occurs. Wound dressings of transparent films and ointment impregnated dressings (Xerofoam, Vaseline gauze, etc) are typically used.

Pressure redistribution and shear prevention are the main focus of post operative care for flaps. (Black, & Black, 2016). Interventions aimed at pressure redistribution and shear prevention include the use of specialty beds and turning sheets or comparable systems. Education should be focused on pressure ulcer development and prevention including pressure redistribution and shear prevention. Gradually, pressure and shear exposure is introduced to the affected area. Pressure redistribution chair cushions should be utilized. Potential complications associated with flaps include infection, hematoma, suture line separation, flap necrosis, and

pressure ulcer reoccurrence. Black & Black, 2016; Black, Black, & Delmore, 2016; Hicks & Thomas, 2022)

Usually, the graft is covered with a non-adherent layer followed by negative pressure wound therapy (NPWT). This therapy helps to promote close adherence between the graft and wound bed, prevents fluid accumulation under the graft, provides a moist wound environment, and protects the site from external contaminants. This dressing remains in place for three to five days postoperatively (Brindle & Creehan, 2022). If NPWT is not used, the wound is dressed with a nonadherent contact layer followed by a bulky bolster dressing or compression to help keep the graft in contact with the wound bed. The initial dressing typically stays in place for five to seven days to support graft "take". Dressing choices then include non-adherent contact layers and products that allow for moist wound healing (Black, Black, & Delmore, 2016,; Hicks & Thomas, 2022). Edema can cause failure of a skin graft, so a grafted limb requires elevation for at least 72 hours postoperatively (Black & Black, 2016).

Grafts, flaps, donor sites: Nursing care

| Flap care | Offloading | Mobility |
|---|--|---|
| <ul style="list-style-type: none">• Closed suction• Non-adherent dressing• NPWT | <ul style="list-style-type: none">• Redistribute pressure• Minimize shear• Use lift sheets | <ul style="list-style-type: none">• Gradually reintroduced• Padding for chair surface• Limit sitting time |

Postoperative care of the flap site also involves monitoring for signs and symptoms of infection or seroma. Closed suction drains are carefully monitored for drainage amount and consistency. They remain in place until drainage is minimal. The patient is placed on a specialty bed that provides pressure redistribution and minimizes shear on the flap, with the length of time on the specialty bed a minimum of 10 days, depending on flap take and surgeon. (Black, Black, & Delmore, 2016). Use of a lift sheet for turning is important to prevent shear. Mobility and exposure to pressure are gradually reintroduced; padding for the chair surface helps reduce the risk of flap ischemia. Time for sitting on the flap must be limited for the patient's lifetime (Black & Black, 2016).

The skin graft donor site, also known as the *graft harvest site*, is a partial-thickness wound, which heals by reepithelialization (Black, Black, & Delmore, 2016; Hicks & Thomas, 2016). Many wound care products that promote principles of moist wound healing can be used and include calcium alginates, transparent films, fine mesh gauze, Xeroform gauze, and silicone-based dressings (Black & Black, 2016). Pain management may be a primary concern with the patient complaining of more pain from the donor site than from the grafted area. This is particularly true if the donor site involves a split-thickness depth, where the nerve endings are left exposed.

Surgical management of pressure injury

- Pre-operative considerations and wound bed preparation
- Reconstructive selection process
- Surgical closure flap types
- Post operative management

When surgical intervention is identified as the treatment of choice for a pressure injury, careful consideration should be given to wound bed preparation. The procedure to be performed is determined using reconstructive selection process. Post-operative management is guided by the type of procedure performed and is impacted by one's ability to be compliant with all care aspects. A positive outcome can be achieved!

Summary

- A variety of surgical wound closure options are available
- Not for all individuals and not the “magic bullet”
- Success depends on several factors
 - Causative wound factors
 - Type of tissue missing
 - General physical condition of the patient
 - Nutrition
 - Pre & post-operative care
 - Lifestyle changes after surgery



There are many types of surgical closures that can be used for patients with deep pressure injuries, but it is not necessarily the right option for all patients, nor is surgical closure a magic bullet. A successful outcome very much depends on underlying cause of the wound, the tissue type that is missing, the general physical condition of the patient, including nutritional status, the pre & post-operative care provided, and the lifestyle changes made after the surgical site heals.

Reference

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This ends to lesson on surgical management of pressure injuries. For more detailed information, see the reference listed on this slide. Thank you for your attention.