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# Post-operative wound management

## Background

Optimal management of post-operative wounds in the community is important to prevent potential complications such as surgical-site infections and wound dehiscence from developing. As such, general practitioners, who play an important part in the sub-acute management of post-operative wounds, should appreciate the physiology of wound healing and the principles of post-operative wound care.

## Objective

The objective of this article is to update general practitioners on the important aspects of post-operative wound care. This includes a review of the physiology behind wound healing, an update on wound cleansing and dressing methods, as well as a guide on how common post-operative wound complications should be managed.

## Discussion

The key elements of post-operative wound care include timely review of the wound, appropriate cleansing and dressing, as well as early recognition and active treatment of wound complications.

## Keywords

wounds and injuries; infection; general surgery; specialties; surgical

Appropriate post-operative surgical wound care is essential in preventing potential complications, such as surgical-site infections (SSIs), wound dehiscence and haematomas. General practitioners play a major part in managing patients' post-operative wounds in the community and it is important to appreciate the principles of post-operative wound management to minimise the incidence of wound complications.

## Phases of wound healing

Wound healing has classically been described to occur in three phases, regardless of the mechanism of injury. These phases are the

inflammatory, the proliferative and the remodelling phases.<sup>1-3</sup>

The inflammatory phase is the body's natural response to injury and takes place immediately after the wound is formed. The wounding triggers a localised release of inflammatory mediators that encourage vasodilation.

Increased blood flow to the region then results in an influx of phagocytic leucocytes, such as neutrophils and macrophages, which play a key part in digesting bacteria and autolysing devitalised tissue. The inflammatory phase of wound healing is responsible for the classical signs of inflammation that occur in response to an injury: erythema, heat, oedema, pain and decreased function.

The wound starts to rebuild itself in the proliferative phase. Granulation tissue, comprising collagen and extracellular matrix, fills the wound defect and angiogenesis also occurs. As the wound defect fills, the wound gradually contracts and epithelial tissue begins to form at the wound edges. Eventually, complete epithelialisation happens, with epithelial cells fully resurfacing the wound.

The final stage of wound healing is remodelling, which occurs once the wound is closed. In this phase, the wound regains its tensile strength as the collagen fibres within the wound remodel and reorganise themselves. It is also during this phase that the wound devascularises and returns to its original state of blood supply.

## Types of wound healing

There are two main types of wound healing: primary healing and secondary healing. Most surgical wounds undergo primary closure in which there is minimal tissue loss and the wound edges can be satisfactorily approximated. This allows for primary healing

in which there is rapid epithelialisation of the wound and minimal scarring.<sup>4</sup>

Secondary healing refers to the process where a full-thickness wound is intentionally left open. This may be due to the presence of infection or an inability to satisfactorily approximate the wound edges. In secondary healing the wound heals by the natural way of granulation, eventual contraction and slow epithelialisation.<sup>4-6</sup> Wounds that undergo secondary healing often result in larger scars.<sup>5,6</sup>

## Post-operative wound care

### Principles

Regardless of the mechanism of wound healing, the aims of post-operative wound care remain the same: to allow the wound to heal rapidly without complications, and with the best functional and aesthetic results.<sup>7</sup>

Wounds intended to be healed by primary healing should, in particular, have their wound edges well approximated. In the initial phases of healing, there is only minimal tensile strength in the wound as remodelling of the collagen fibres has not occurred. As such, additional support in the form of sutures, staples or tapes is required until full remodelling and epithelialisation occur.

### Keeping wounds clean

All wounds should be kept as clean as possible to prevent the development of SSIs. The National Institute for Health and Care Excellence (NICE) in the United Kingdom has made recommendations for post-operative wound management so as to reduce the rate of SSIs (*Table 1*).<sup>8</sup> These include recommendations for dressing and cleaning the wound, antibiotic treatment and debridement, and information about specialist wound-care services.

Occasionally, cleansing of a wound is required to help clear the wound of debris, such as devitalised tissue or excessive exudates, which may otherwise delay wound healing.<sup>4</sup> In these situations, gentle irrigation of the wound with either warm sterile saline or water (as per NICE recommendations) via a syringe, rather than swabbing or bathing, should be performed to minimise trauma to the wound and to maintain an optimum healing environment.<sup>9</sup> Wound cleansing is not necessary for removal of exudates

within the normal limits. It is also important to remember that wound cleansing is itself a form of interference with wound healing and if performed excessively may delay wound healing.

### Dressings

Dressings are another important component of post-operative wound management. A good dressing should maintain a moist wound environment and thus promote wound healing, be able to remove excessive exudate that might lead to maceration of the wound, provide a good barrier against bacterial or fluid contamination, and be adherent to the skin but atraumatic on removal.<sup>10</sup> As no two wounds are the same, dressing regimens have to be individualised to suit the needs of each wound. Factors to be considered when deciding on the choice of dressing include the position, size and depth of the wound, and the level of exudate. A detailed discussion of

all dressing types is beyond the scope of this paper but a table has been provided for generic advice on suitable dressing choices (*Table 2*).<sup>11-12</sup> Dressings applied during surgery have been done so in sterile conditions and should ideally be left in place for the duration, as stipulated by the surgical team. It is acceptable for the initial dressings to be prematurely removed to have the wound reviewed and, in certain situations, apply a new dressing. These situations include when the dressing is no longer serving its purpose (ie. dressing falling off, excessive exudate soaking through the dressing and resulting in a suboptimal wound healing environment) or when a wound complication is suspected.

### Possible complications

Two common complications of surgical wounds are infections and wound dehiscence. As such, the following signs should be looked out for

**Table 1. Recommendations for preventing SSIs in the post-operative phase<sup>8</sup>**

Dressing and cleaning the wound
<ul style="list-style-type: none"> <li>• Use an aseptic, non-touch technique for changing or removing dressings</li> <li>• Aim to leave the wound untouched for up to 48 h after surgery, using sterile saline for wound cleansing during this period only if necessary</li> <li>• Advise patients that they may shower safely 48 h after surgery</li> <li>• Use tap water for wound cleansing after 48 h if the wound has separated or has been surgically opened to drain pus</li> <li>• Use an interactive dressing for surgical wounds that are healing by secondary healing</li> <li>• Refer to a tissue viability nurse (or another healthcare professional with tissue viability expertise) for advice on appropriate dressings for surgical wounds that are healing by secondary intention</li> </ul>
Antibiotic treatment
<ul style="list-style-type: none"> <li>• If a SSI is suspected (ie. cellulitis), either de novo or because of treatment failure, give the patient an antibiotic</li> <li>• Choose an antibiotic that covers the most likely causative organisms. Consider local resistance patterns and the results of microbiological tests</li> </ul>
Debridement
<ul style="list-style-type: none"> <li>• Do not use Eusol and gauze, or dextranomer or enzymatic treatments for debridement of surgical site infections</li> </ul>
Specialist wound care services
<ul style="list-style-type: none"> <li>• To improve the management of surgical wounds, use a structured approach to care and provide enhanced education</li> </ul>
Do not use the following to reduce the risk of SSIs:
<ul style="list-style-type: none"> <li>• Topical anti-microbial agents for surgical wounds that are healing by primary intention</li> <li>• Eusol and gauze, or moist cotton gauze or mercuric antiseptic solutions for surgical wounds that are healing by secondary intention</li> </ul>

**Table 2. Suitable dressings for various types of wounds<sup>11–12</sup>**

Protective dressings		Anti-microbacterial dressings		Absorbent dressings		Autolytic debridement	
Gauze	Inexpensive, easily accessible, easy to apply	Antibacterial ointments	Can be applied to areas where dressings are difficult to apply	Foam	Absorbs moderate exudate	Films	Occlusive, allows exchange of gases
Impregnated gauze	Non-adherent, preserves moisture	Iodine-based	Absorbent, not to be used in thyroid disorders	Hydrogels	Can absorb minimal wound exudate or rehydrate wound, absorption function predominant here	Hydrogels	Can absorb minimal wound exudate or rehydrate wound; rehydration function predominant here
		Silver-based	Broad spectrum with low resistance	Hydrofibres and alginates	Absorbs heavy exudate	Hydrocolloids	Occlusive, not for exudative or infected wounds

in the post-operative wound review: fever, haematoma, seroma, separation of wound edges and purulent discharge from the wound. It is important to bear in mind that inflammation of a surgical wound is part of the physiological process of healing and, in the absence of other clinical features, does not equate to a wound complication.

If wound infection is suspected, active management should be considered. In the first instance, wound swabs for culture and sensitivity should be taken. Next, empirical antibiotic therapy can be commenced on the basis of the suspected pathogen (*Table 3*).<sup>13</sup> Antibiotic therapy should be subsequently tailored once the offending pathogen and its sensitivity have been identified. Debridement of non-viable and infected tissue is another effective method of treating and preventing further extension.<sup>14</sup> Wounds with equivocal signs do not require immediate antibiotic therapy but should be closely and regularly monitored for any progression of signs.

Superficial dehiscence can be closed by secondary intention, after removal of necrotic tissue, and this can be reinforced by dressings. Debridement and primary closure are indicated in small dehiscence, whereas continuous tension devices and negative pressure dressings

**Table 3. Common pathogens associated with types of operation<sup>13</sup>**

Type of operation	Common pathogens
Abdominal surgery	Gram-negative bacilli, anaerobes, streptococci
Breast surgery	<i>S. aureus</i> , coagulase-negative staphylococci
Cardiothoracic surgery	<i>S. aureus</i> , coagulase-negative staphylococci
Head and neck surgery	<i>S. aureus</i> , coagulase-negative staphylococci
Neurosurgery	<i>S. aureus</i> , coagulase-negative staphylococci
Obstetrics and gynaecological surgery	Gram-negative bacilli, enterococci, anaerobes, group B streptococci
Orthopaedic surgery	<i>S. aureus</i> , coagulase-negative staphylococci
Vascular surgery	<i>S. aureus</i> , <i>S. epidermidis</i> , gram-negative bacilli

are appropriate for large and deep wound dehiscence.<sup>14</sup> However, appropriate specialist advice should be sought if doubt arises at any stage.

Certain patient factors may increase the risk of post-operative wound complications. These include the type of surgery and the body part involved, certain medications, immunosuppressive disorders, poorly controlled diabetes, peripheral vascular disease, tobacco smoking and malnutrition.<sup>14–16</sup> Immunosuppressive agents, such as prednisolone and methotrexate, and immunosuppressive disorders suppress the inflammatory process and delay wound healing. The initial inflammatory response is impaired in poorly controlled

diabetes whilst hyperglycaemia diminishes neutrophil and phagocyte function, which in turn slows down the wound healing process. In patients with peripheral vascular disease, oxygen delivery to the tissues is compromised. Similarly, tobacco smoking decreases oxygen delivery as a result of arterial spasm. Poor nutrition leads to slow metabolic processes, which reduce collagen synthesis. It is therefore important to ensure these factors are managed to prevent wound complications from developing.

## Conclusion

Optimal management of surgical wounds is an important part of post-operative recovery and health care professionals should monitor

the process of acute wound healing, prevent wound complications and treat appropriately if complications arise. The key elements of post-operative wound management include timely review of the wound, appropriate cleansing and dressing, and early recognition and intervention of wound complications.

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