The issues surrounding the continued use of saline soaked gauze dressings

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Abstract

Saline soaked dressings are often used on wounds healing by secondary intention within the acute care sector. Nurses need to act as patient advocates with other healthcare providers and use evidence-based practice from reliable research findings to guide practice towards care that is effective, feasible, appropriate and meaningful for the patient. As such, the levels of research-based evidence into the efficacy of saline soaked gauze dressings are discussed. This article identifies many potential issues with the use of these dressings such as patient discomfort, prolonged inflammation, localised hypothermia, infection risk and increased costs.

Introduction

On surgical wards within acute care hospitals, many patients with an open wound healing by secondary intention are subjected to three times daily saline soaked gauze dressings. This paper aims to highlight that these dressings may have detrimental effects on wound healing and patient comfort, and argues that their use should therefore be limited.

Evidence-based practice is the use of the most reliable research findings to guide practitioners towards the provision of care that is effective, feasible, appropriate and meaningful for the patient [1-4]. Research is judged as the most reliable (Level I) if it is a randomised control trial with a large enough sample size to enable practitioners to generalise results within an identified population, and if it shows sound tools for collecting data, minimal bias and an accurate reporting of results [3]. Level I evidence also incorporates a systematic review of such trials as these provide a comparison of results and critique the reliability of findings [3]. Controlled studies, wherein participants have not been randomly assigned to treatments, provide weaker evidence as the results can not be generalised; these are consequently graded Level II evidence [3]. Level III evidence incorporates comparative descriptive case studies and Level IV evidence includes expert opinions that have not necessarily been verified by scientific studies [3].

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Within the scope of wound care research, most of the current evidence available is based within the Level III and IV categories [3]. Although most of the research that has been undertaken comparing saline soaked gauze to modern dressings for the treatment of open wounds are descriptive case studies or small trials, they identify many of the same issues [4-7], thus improving their generalisability. These issues include saline soaked gauze dressings prolonging inflammation, causing immense pain for the patient, impeding healing due to localised hypothermia, increasing the risk of wound infection and not being cost effective; these are discussed in more detail below. It is pertinent to note the bias of evidence hierarchies towards quantitative research as many nursing research articles seek to uncover subjective meaning in order to provide holistic care to patients [8]. Therefore, quality of life issues impacting on the acceptability of the dressing to the patient are usually addressed in qualitative research, which falls outside the scope of Level 1 evidence [8]. However, this does not reduce the validity of the patient's lived experience in relation to dressing acceptability.

Potential issues

Prolonged inflammation

Wound dehiscence is the opening of an incision due to lack of tensile strength in the wound [9, 10]. This lack of strength at the incision site can be attributed to delayed granulation in patients for whom wound healing is inhibited by physical, perioperative and lifestyle factors [9, 10]. Risk factors for delayed surgical wound healing include perioperative hypothermia, oedema, malnutrition, diabetes mellitus, renal failure, jaundice, obesity, smoking, immunosuppressant therapy,

anaemia, wound contamination and any other causes of compromised blood flow to the area [9, 10, 11].

Also present in many open surgical wounds healing by secondary intention is slough, a yellow devitalised tissue that must be removed as it retards healing [9, 10]. Slough requires debridement and one form of mechanical debridement is saline soaked wet to dry gauze [6, 9, 10, 12-15]. These dressings are a non-selective form of debridement, therefore whilst they adhere to the devitalised tissue once dried, they may also injure surrounding granulation tissue when removed, thus returning the wound to the earlier inflammatory stage of healing [4, 6, 9, 10, 12, 13, 15-17].

Although inflammation is a necessary part of the healing process, prolonged inflammation can impede healing. Acute inflammation enables the surgical site to be cleared of foreign material through ingestion by neutrophils, monocytes and macrophages [9]. However, prolonged inflammation is problematic due to the reduced blood flow and increased capillary permeability that occurs to facilitate movement of plasma nutrients, oxygen and phagocytes to the site of injury. The localised oedema resulting from inflammation can cause poor tissue perfusion, pain and paresthesia if prolonged.

Another issue is the increase in the patient's temperature due to pyrogens released by leukocytes, macrophages and tumour necrosis factor and prostaglandins acting on the internal thermostat in the hypothalamus. Although a slight rise in temperature is effective at minimising bacterial invasion, the protraction of the febrile state can lead to insensible water loss through diaphoresis and subsequent dehydration [9], further reducing their healing ability [10]. Hypothetically, it would also seem reasonable to propose that re-injury to the capillary buds of granulation tissue would reignite the clotting cascade and consequently prolong inflammation and delay wound healing. However, in a systematic review of dressings and treatments for surgical wounds healing by secondary intention, Vermeulen *et al.* [7] found that there was little statistical significance between healing rates of gauze versus foam or alginates due to insufficient sample sizes.

Increased pain for the patient

Pain is closely related to inflammation as it is triggered by inflammatory mediators prostaglandin and bradykinin [9]. Most researchers concur that wet to dry saline soaked gauze dressings are painful, especially on removal, due to their adherence to the wound bed [4-6, 10, 13-15, 17, 18]. However, much of the evidence available regarding the amount of pain experienced by patients receiving saline soaked dressings is expert opinion and case study comparison which, according to Rycroft-Malone *et al.* [19], may be biased and subjective, and therefore lacking in credibility.

A non-experimental controlled trial involving 5850 patients with various wound aetiologies reported that 88% of the chronic wound participants and 95% of the acute wound participants had decreased pain when treated with the non-adherent dressings compared to wet, dry or paraffin gauze [20]. According to Schneider, Whitehead & Elliot [8], such trials have the benefit of a large number of participants, which assists with the generalisability of results; however, the validity of results may be affected by the lack of randomisation. Bias is also a potential threat to validity when researchers are not blinded to the products used and funding is provided by the manufacturer [21], as evident in this trial.

In a literature review by Bethell [4], it is concerning to read that surveys of medical and nursing staff have shown that many accept pain on dressing removal to be unavoidable, especially given that non-adherent dressings may cause less pain. Several studies have demonstrated the potential to reduce pain by applying dressings that promote moist wound healing, maintain normothermia and protect granulation tissue [7, 10]. Wound experts concur that saline soaked gauze dressings cause pain as they dehydrate the wound, adhere to healthy tissue, cause exposure to the air several times per day, sting when applied and cause nerve endings to be exposed to cold saline [10, 13, 14, 18, 22]. Vermeulen *et al.* [7] reported that current randomised controlled trials comparing calcium alginate and hydrocolloid dressings to gauze demonstrated decreased pain when calcium alginate or hydrocolloid dressings were used on open surgical wounds, yet further research is needed to validate these results as the studies did not use comparable tools for measurement or adequate sample sizes.

Therefore, although the evidence to support the amount of pain patients receiving saline soaked dressings experience may not meet the criteria for Level 1 evidence, the validity of the individual's reporting of pain can not be questioned as pain is a subjective experience [23].

Localised hypothermia

Wound healing may also be impeded by saline soaked gauze dressings as they cause localised hypothermia. This occurs as the saline soaked into the gauze cools the wound, causing localised vasoconstriction; this, in theory, would result in decreased leukocyte mobility and efficiency of phagocytes and increased haemoglobin affinity for oxygen, thus reducing waste removal by phagocytes and the delivery of oxygen to the tissue [10, 14]. Several authors agree that gauze does not provide adequate thermal insulation, thus resulting in water evaporation and further heat loss from

the wound [10, 14, 18]. The maintenance of normothermia and a moist healing environment is essential to effective healing in order to ensure efficient mitosis of new cells [10]. However, despite these theories, current evidence comparing modern dressings to saline soaked gauze in open surgical wounds shows minimal difference between healing times [5-7].

Risk of wound infection

There is also a potential risk for infection with saline soaked gauze dressings. Several problems arise when utilising gauze on heavily exudating open surgical wounds. Firstly, gauze does not provide a barrier to bacteria; in fact, Lawrence [24] demonstrated that bacteria were able to penetrate 64 layers of gauze. Another issue is that gauze fibres may be left in the wound, further increasing the infection risk [10, 13, 14]. An additional cross infection risk has also been identified – once exudates dries on the gauze, bacteria may be dispersed into the air as it is removed from the wound [10, 14]. A study by Lawrence, Lilly & Kidson [25] revealed that bacteria was released by both moist and dry gauze for up to 30 minutes post removal, whereas a hydrocolloid dressing released minimal amounts of bacteria. This is of particular concern when the patient's wound is contaminated with antibiotic resistant microorganisms.

Reduced cost effectiveness

A common misconception is that saline soaked gauze dressings are inexpensive. Although saline and gauze themselves are relatively cheap when compared to modern dressings, they are labour intensive, require secondary dressings to contain exudate and usually require nursing care in the community [10]. When these and other additional costs are factored in, such as the potential for wound infection, prolonged hospital admissions, and the amount of product used, saline soaked gauze dressings seem a less feasible option.

Cohn *et al.* [6] revealed (in a pilot study comparing Aquacel to saline soaked gauze dressings on open surgical wounds) that the potentially decreased healing time and reduction in dressing changes associated with Aquacel would greatly reduce costs. Several other small comparative studies have been carried out on open surgical wounds suggesting that weekly dressings using foam, alginate or Aquacel are more cost effective as they require less nursing time and product, and facilitated early discharge from hospital [4, 14, 20]. However, the limited sample size, lack of randomisation and blinding reduces the validity of these studies [8]. As Vermeulen *et al.* [7] pointed out, the quality of life costs of a dressing also need to be addressed in valid research as the inconvenience caused to the patient through saline soaked dressings is not fully understood.

Discussion

It is evident that there may be better alternatives to saline soaked gauze dressings in the management of open wounds healing by secondary intention. This article has identified that the primary use of saline soaked gauze dressings is to debride devitalised tissue from wounds, yet these dressings may be more detrimental than useful.

Although Level 1 evidence is lacking regarding the detrimental effects of saline soaked gauze dressings on wound healing and quality of life issues, it is outside the scope of randomised controlled trials to examine individual responses to an intervention in order to determine the acceptability of that treatment to the patient [8]. Therefore, the subjective experiences of the patient, such as pain perception and personal inconvenience caused by the dressing, will not be captured by quantitative research [8]. The lack of randomised controlled trials highlighting the detrimental effects of saline soaked gauze dressings may also be related to ethical and financial issues. Ethical issues could arise as researchers may not want to perform treatment on participants that may be detrimental, yet practitioners are utilising these dressings on a regular basis.

Secondly, from a financial perspective, it is extremely costly to undertake research that has a large patient sample to ensure generalisability, strict participant exclusion criteria, double blinding to eliminate bias, standardised tools for comparison and accurate diagnostic testing [3]. It is important to consider that although a treatment may have evidence beyond a reasonable doubt to prove its effectiveness, it can still be viewed as inappropriate for practice. A treatment needs to effective, feasible and acceptable for it to be used in practice [1, 26]. Therefore, although saline soaked gauze may effectively remove devitalised tissue and seem like a cheap option, if the dressing is not viewed as appropriate by practitioners and patients, it should be discontinued.

Conclusion

The literature repeatedly discusses the potential for saline soaked gauze dressings to cause detrimental effects to the patient. As such, there is a need for practitioners to question the continued use of such dressings in their healthcare organisations in order to provide effective, feasible and acceptable wound management for their patients. Clearly, there is a research gap in the area of saline soaked gauze dressings in comparison to modern dressings and further research is needed to further understand the impact of wound dressing selection on wound healing and quality of life issues.

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