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Wound Cleansing: Water or Saline?

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Clinical Question: Do rates of infection and healing differ depending on whether tap water or normal sterile saline is used to cleanse acute and chronic wounds?

Data Sources: Studies were identified by electronic searches of the following databases: Cochrane Wounds Group Specialized Register (June 2004), MEDLINE (1966–2004), CINAHL (1982–2004), Nursing Collection (1995–2000), Health STAR (1975–2000), EMBASE (1980–2004), and the Cochrane Controlled Trials Register (Issue 2, 2004). Additional searches were conducted with reference lists of included studies. Contact with investigators, company representatives, and content experts was initiated to identify additional eligible studies. The search terms included *water, saline, solution* or *solutions, tap and water, cleansing, irrigation, wound* or *wounds,* and *healing.*

Study Selection: Studies in any language were eligible for inclusion if they were randomized or quasirandomized controlled trials of human subjects that compared the use of water (tap, cooled, boiled, or distilled) with normal sterile saline or any other solution specifically for wound cleansing in subjects of all ages with any wound in any setting. Wound cleansing was defined as ''the use of fluids to remove loosely adherent debris and necrotic tissue from the wound surface.''

Data Extraction: The characteristics of the subjects, interventions, follow-up, outcomes, and findings were extracted from each study by 2 authors and verified by the third. The primary outcome measure was objective and/or subjective wound infection. Secondary measures were proportion of healed wounds, rate of healing, pain and discomfort, and patient and staff satisfaction. All studies were graded independently by 2 authors and verified by a third author to determine methodologic quality. Where appropriate, the data were pooled and analyzed with a fixed-effects model. RevMan software (version 4.2; Cochrane Centre, Oxford, UK) was used for statistical analysis.

Main Results: Specific search criteria identified 24 studies for review, of which 9 met inclusion and exclusion criteria. Baseline data for each treatment group were provided in 6 studies. Details of randomization procedures were not fully explained in 2 studies, and the procedures in 6 were subject to selection bias. The sample sizes ranged between 35 and 770 patients, and patient ages ranged between 2 and 95 years. Surgical wounds were involved in 4 studies, lacerations in 3, and open fractures and chronic wounds in 1 each. Eight studies were conducted in hospital emergency departments and wards and 1 in the community. The medical or nursing staff performed the cleansing in 5 studies and the subjects themselves in 4, using irrigation and showering techniques. Primary and secondary outcome variables were recorded between 1 and 6 weeks postinjury. Wound infection was subjectively measured (redness, purulent discharge, pain, or smell) in all 9 studies, and 1 used blinded outcome assessment (cleansing solution used was unknown to assessors). Among patients with surgical wounds in 3 studies, no significant difference was noted in infection rates between cleansing (bathing or showering with and without shower gel) with tap water and no cleansing (relative risks [RR] = 1.06, 95% confidence interval [CI] = 0.07–16.50). In 1 study, tap water reduced the relative risk of infection by 45% compared with normal sterile saline for cleansing (irrigation) of acute soft tissue wounds that were sutured (RR = 0.55, 95% CI = 0.31–0.97). Two studies revealed that in children with acute wounds, cleansing (irrigation) with tap water or normal sterile saline demonstrated no significant differences in infection rates (RR = 1.07, 95% CI = 0.43–2.64). In another study, cleansing (irrigation) of nonsutured chronic wounds with tap water or normal sterile saline showed no significant differences in the rate of infection (RR = 0.16, 95% CI = 0.01–2.96). Water was also compared with isotonic saline for cleansing (irrigation) of open fractures. The author reported no significant difference in wound infection rates between distilled water and cooled, boiled water (RR = 1.69, 95% CI = 0.68–4.22), distilled water and isotonic saline (RR = 0.49, 95% CI = 0.19–1.26), or cooled, boiled water and isotonic saline (RR = 0.83, 95% CI = 0.37–1.87). Additionally, no significant differences in the rate of infection were found when the distilled and cooled, boiled water results were pooled and compared with isotonic saline (RR = 0.65, 95% CI = 0.31–1.37). Among patients with postoperative wounds, 1 group found no significant differences in the infection and healing rates after cleansing (washing) with tap water or procaine spirit. An analysis of secondary outcomes revealed no significant differences in wound healing rates between cleansing (bathing or showering with and without shower gel) of surgical wounds with tap water and no cleansing (RR = 1.26, 95% CI = 0.18–8.66), nonsutured chronic wounds with tap water and normal sterile saline (irrigation) (RR = 0.57, 95% CI = 0.30–1.07), and postoperative wounds with tap water and procaine spirit (washing; neither RR nor CI was reported). Patients felt better when allowed to shower their wounds and preferred showering to irrigating their wounds from a bottle. Tap water ($1.16) was also shown in 1 study to be cost-effective compared with normal sterile saline ($1.43). Two groups reported that the quality of tap water met the national health requirements of the country in which the data were collected and that bacteria counts were low.

Conclusions: No differences were noted in the rates of infection and healing between the use of tap water and normal sterile saline in the cleansing of acute and chronic wounds. However, 1 group suggested that tap water was effective in reducing infection rates for cleansing of acute soft tissue wounds that were sutured. The methodologic quality of the studies should be considered in the interpretation of the findings. Additional randomized controlled trials are needed to determine the effectiveness of tap water used for wound cleansing among various populations and settings.

COMMENTARY

Proper cleansing to create a wound environment optimal for healing is perhaps the key component of acute and chronic wound management. Cleansing methods often differ among individual health care providers, institutions, and facilities and many times are based on individual experiences and personal preferences.[1,2] A variety of cleansing solutions exist, and their selection should be based on cleansing effectiveness and lack of cytotoxicity. Is tap water safe and effective when used as a cleanser to attempt to create a wound environment for optimal healing?

Many cleansing solutions have demonstrated safe and effective results, whereas others may damage and destroy cells essential to the healing process.[3] Normal sterile saline is regarded as the most appropriate and preferred cleansing solution because it is a nontoxic, isotonic solution that does not damage healing tissues.[3–5] Tap water is commonly used and is therefore of interest as a cleansing solution.[1,3] However, normal sterile saline and tap water have not been rigorously compared as wound cleansing solutions in acute and chronic wounds.[1,6]

In their review, Fernandez et al reported several clinical implications regarding the use of tap water as a wound cleanser. Their findings provide some support for the use of tap water for routine cleansing of acute and chronic wounds. The authors cautioned that the potential for harmful effects with the use of tap water cannot be excluded. Using tap water on surgical and sutured wounds did not increase infection rates, which may bring into question the standard practice of avoiding showering and irrigation during this early postoperative period. Among children, the use of tap water or normal sterile saline produced no significant differences in infection rates. These findings appear to support the cost-effectiveness and ease of use of tap water. The single group that reported a 45% reduction in the relative risk of infection with tap water used poor methods. The tap water was at body temperature and the normal sterile saline at room temperature. The researchers cautioned that the temperature differences of the solutions could have affected tissue healing and microbial growth.[1]

The studies in this review that examined the quality of tap water were conducted in countries with developed water systems. Fernandez et al suggested that tap water could be used for cleansing when produced from a supply of potable drinking water. Tap water of lesser quality than was used in the studies may produce different effects. Distilled water and cooled, boiled water were compared with saline, and no increase in the infection rates was found, suggesting that these solutions could be used in the absence of potable water. Tap water has been used for centuries as a wound cleanser without evidence of adverse effects or associated infection risk. The history of its use might suggest the safety of tap water as a wound cleanser.[7]

The Fernandez et al review points out several limitations. In 8 of the 9 studies reviewed, randomization methods were not fully explained or were subject to selection bias. Inconsistent criteria to measure the outcomes of wound infection and healing among the studies lessened the ability to replicate the comparisons. As a result, the strength of the evidence is reduced. Fernandez et al attempted follow-ups with the researchers to obtain additional data, but no responses were received. The follow-up periods in the studies reviewed, with a maximum of 6 weeks, prevented investigation of the long-term effects of water on wounds that were not healed.

Although this review of tap water as a wound cleanser by Fernandez et al suggested that potable tap water may be as safe and effective as sterile water or normal sterile saline, only limited conclusions can be drawn. Athletic trainers should base decisions on the use of tap water on the quality of the tap water, the type of wound, and the availability and cost of other solutions and equipment needed for cleansing. Future research should be conducted with true randomized controlled trials to compare cleansing and no cleansing to initially identify the effects of cleansing on infection and healing. Additional authors should examine the effectiveness of different solutions on various wounds among a variety of populations and settings to compare the cost-effectiveness and practicality of the techniques for athletic trainers.

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