

G32: What is the optimal irrigation solution for the patients undergoing major orthopedic procedures?

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Response/Recommendation: In total hip and knee arthroplasty and spine surgery, there is substantial evidence supporting the use of dilute povidone-iodine over saline as an irrigation solution to reduce infection rates.

Strength of recommendation: Moderate

Delegate Vote:

Rationale:

A total of 1,285 studies were identified from PubMed and Embase databases using relevant MeSH terms and keywords, and were screened in duplicate through the title and abstract stages. A total of 24 comparative studies with a total sample size of 114,076 patients were included (1–24). The studies included 5 randomized controlled trials (RCTs), 1 pilot RCT, 1 prospective cohort, and 17 retrospective cohort studies. A majority of studies focused on primary (12 studies) or revision (2 studies) total joint arthroplasty (TJA), with 9 further studies on spine surgery and one study on open fractures.

Povidone-Iodine (PVP-I)

Povidone-iodine (PVP-I), either in isolation or as part of broader protocols (e.g. in addition to topical vancomycin or hydrogen peroxide), was the intervention evaluated in the vast majority of studies (20/24 studies). Of these, 14 studies across spine and TJA found significant reductions in infection rates with the use of PVP-I. There was a wide range of administration and dilution protocols. While the most commonly cited protocol included 0.3% dilute PVP-I left in the wound for 3 minutes, this was not universal across studies. Six of these studies demonstrated significant reductions in infection rates with the use of dilute PVP-I compared to standard of care (saline) (1,5,13,17,22,25). One study did not find a significant difference in the initial analysis, but did detect a significant reduction in infection rates for hip resurfacing cases, and for total hip and knee arthroplasty cases after propensity matching (18). Only one study, which evaluated revision TJA only, did not find a significant difference when comparing povidone-iodine to saline (4).

Four studies, which combined PVP-I with intrawound vancomycin (dubbed the “VIP” protocol by some studies), also found significant reductions in infection rate (7,9,14,21), while one study using the VIP protocol did not find a significant difference (24).

One study which combined PVP-I with dilute hydrogen peroxide found a significant reduction in infection rates in spine surgery (11). One study of TJA patients, found a significant reduction in infection rates with the use of PVP-I lavage as part of a protocol that also included intravenous vancomycin and nasal mupirocin (termed “triple prophylaxis by the authors) (16). Finally, a study of “triple wash”, or sequential irrigation with dilute PVP-I, followed by dilute peroxide and normal saline was found to significantly reduce the superficial and deep infection rates in total knee arthroplasty patients.

Chlorhexidine

Two retrospective cohort studies evaluated the use of chlorhexidine lavage in TJA patients. One study found a significant reduction in infection rates (1.1% versus 2.2%) with the use of chlorhexidine-cetrimide lavage (23). In contrast, one study found no significant difference between chlorhexidine and saline in TJA infection rates (19).

Hydrogen Peroxide

One retrospective cohort study reported a significant reduction in infection rates with the use of dilute hydrogen peroxide compared to saline in spine surgery patients (8).

Soap

The multinational RCT FLOW Trial evaluated saline and soap in open fracture patients, and demonstrated a significantly higher risk of infection with the use of soap compared to saline (2).

Adverse Events

One study demonstrated that intra-wound use of dilute PVP-I led to sustained increases in systemic iodine levels as measured through urine output. However, this did not have an impact on thyroid function (12). Chlorhexidine is known to have cytotoxic potential and concerns have been raised about its prolonged use as a direct intrawound irrigation agent (26).

With regards to PVP-I specifically, concerns about the sterility of the fluid itself, and its packaging, have been raised. In the 20 included studies on PVP-I, 8 specified whether or not the PVP-I used was sterile (sterile in 7, non-sterile in 1), but 12 did not specify. There have been older (>10 years ago) published reports raising concern about non-sterile and contaminated PVP-I (27–29). There are no studies directly comparing sterile vs. non-sterile PVP-I, and sterile PVP-I is not readily available in all settings, but if and when available, should be the preferred choice over non-sterile PVP-I.

Conclusion

While the majority of studies seem to support some form of povidone-iodine as a beneficial irrigation solution to reduce infection rates. Numerous national guidelines including the Center for Disease Control (30), the International Consensus Meeting (2018) , and a recent update from SHEA/IDSA/APIC(31) all recommend the use of sterile dilute PVP-I. We are aware of two large RCTs that will attempt to definitively establish the optimal irrigation solution and local antibiotic powder protocol in TJA.

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