cant benefit in reducing SSI risk in patients with primarily closed surgical incisions when compared to conventional normal saline wound irrigation [6–9]. In one RCT focusing on primary instrumented lumbosacral posterolateral fusion performed by the same surgeon, SSI was significantly lower in those who underwent 0.35% povidone-iodine irrigation compared with normal saline irrigation (0% [0/120] vs. 4.8% [6/124], p = 0.029), with no significant difference in fusion rate, wound healing, improvement of pain score, function score and ambulatory capacity [6].

In another RCT focusing on spinal surgery, SSI was significantly lower in those who underwent 0.35% povidone-iodine irrigation compared with normal saline irrigation (0% [0/208] vs. 3.4% [7/206], p = 0.0072) [7]. In one observational study comparing before and after the application of combination of 0.3% betadine irrigation with intra-wound vancomycin (VCM) powder (1 gm), the incidence of SSI significantly decreased after intervention (1.3% [15/1173] vs. 2.4% [30/1,252], p = 0.042) with a protective effect in multivariate analysis (OR 0.23, 95% CI: 0.06-0.86; p = 0.0287) [8]. In another observational study involving 950 spinal surgeries comparing before and after application of povidone-iodine and hydrogen peroxide solution irrigation, those irrigated with povidone-iodine and hydrogen peroxide solution were less likely to develop SSI compared with pre-intervention period (0% [0/490] vs. 1.5% [7/460]) [9].

No RCT or observational study has compared chlorhexidine or antibiotic solution irrigation to normal saline irrigation to prevent SSI in spinal surgery.

5: Optimal irrigation for infected spinal surgery

No RCT or observational study has compared incisional wound irrigation with no irrigation in infected spinal surgery.

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QUESTION 4: Is negative pressure wound therapy (NPWT) effective in the treatment of wounds that are left to heal by secondary intention?

RECOMMENDATION: There is no evidence that NPWT is superior to conventional standard dressing changes in the treatment of wounds that are left to heal by secondary intention.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 60%, Disagree: 20%, Abstain: 20% (Super Majority, Weak Consensus)

RATIONALE

Animal studies have shown that sub-atmospheric pressure improves the local wound environment through both direct and indirect effects. Sub-atmospheric pressure accelerates healing and reduces the time to wound closure and the incidence of wound infections [1,2]. NPWT removes interstitial fluid and improves lymphatic drainage and microvascular blood flow. It increases oxygen and nutrient delivery in the wound, facilitates removal of metabolic byproducts, increases granulation tissue formation and ultimately accelerates wound healing. Moreover, by isolating the wound from the surrounding environment, NPWT may reduce the colonization of the wound by bacteria and avoid superinfections, particularly in areas with high skin contamination rates such as the perineal and lower back spine area.

Predominantly observational studies, but also small trials (low quality of evidence), have suggested that rates of surgical site infection (SSI) may be lower if NPWT is used instead of conventional wound dressings [3]. In a meta-analysis of six randomized control trials including a systematic review, it was observed that the risk of SSI was reduced when NPWT was used (odds ratio 0.56, 95% CI 0.32 to 0.96) in both clean and clean-contaminated procedures. However, results were no longer significant for orthopaedic/trauma surgery [3]. In a Cochrane meta-analysis that compared NPWT with other types of wound dressing for persistently-draining wounds in skin graft patients, in orthopaedic patients undergoing arthroplasty and general/trauma surgery patients it was concluded that there is no evidence for the effectiveness of NPWT on the complete healing of wounds expected to heal by primary intention [4]. An up-to date systematic review in trauma patients concluded that, based on available observational studies, NPWT [5] was safe and showed an efficacy comparable to standard dressings [6]. The primary clinical advantages of NPWT in the trauma population are its ease of application, decreased

number of dressing changes and reduction in the complexity of subsequent reconstructive procedures [7–11].

In a 2013 systematic review of NPWT for spinal wounds, no randomized clinical trials were found that addressed the use of NPWT to treat wound healing or spine SSIs, nor as prophylactic wound treatment to prevent wound breakdown and infection [12]. The duration of NPWT therapy and the number of debridement and irrigation procedures performed before the definitive wound closure operation were variable. After this review, an additional non-comparative study [12] showed the benefits of this therapy among only 6 of 317 infections after surgery for spinal stenosis. An average of 5.1 debridement and irrigation procedures were performed before the definitive wound closure operation. Vacuum-assisted closure dressings were changed at 3-day intervals and the median duration was 15 days (range 9-24).

After the revision published in 2013, only one longitudinal cohort study addressed NWPT use as a prophylactic therapy for spinal wounds. It is a well-designed, retrospective longitudinal study, which includes 160 adult patients with thoraco-lumbar spine deformity undergoing multi-level thoraco-lumbar fusion [13]. A 50% decrease in the incidence of wound dehiscence was observed in the NPWT cohort (46 cases) compared to the non-NPWT cohort (114 patients) and the incidence of postoperative SSI was significantly lower (10.6% vs 14.9%, $p = 0.04$).

In conclusion, prophylactic use of NWPT may significantly reduce wound dehiscence and wound infection after long-segment thoraco-lumbar spine fusion. There is no further evidence addressing the superiority of NWPT therapy compared to standard dressings. NPWT is safe in cases without dural leaks, easy to apply, and it decreases the number of dressing changes and reduces the complexity of wound closure. All these factors favor its use in selected cases.

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