Sp71: Do Vacuum assisted closure devices have a role in the treatment of spinal infections post debridement?

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Response/Recommendation: Based on available data, we are unable to recommend the routine use of Vacuum assisted closure devices in the treatment of spinal infections post debridement and its usage must be restricted on case based decision by the treating surgeon.

Level of Evidence: Limited

Delegate Vote:

Rationale:

A systematic review was conducted to study the role of vacuum assisted closure devices post debridement of spinal infections. PubMed, Web of Science, Clinicaltrials.org and Scopus were searched from inception till December 01, 2024, for original articles reporting the use of vacuum assisted closure devices post debridement of spinal infections. We included studies which compared vacuum assisted closure devices combined with other techniques of wound management versus other techniques of wound management alone. We excluded non-English language publications, case reports, review articles, registry-based studies, and studies on tubercular spondylodiscitis. We excluded studies that did not compare vacuum assisted closure devices to other techniques of wound management post debridement of spinal infections. Initial database screening resulted in 496 articles of which 198 duplicates were removed after title and abstract screening. We shortlisted 49 articles for full-text screening from the 298 articles and included 5 articles (1-5) in the review that met the inclusion criteria. All the studies were retrospective in nature and provided level IV evidence. All the included articles analysed compared the use of vacuum assisted closure devices to other techniques of wound management post debridement of deep surgical wound infections in adult patients. Clinical outcomes studied included the number of procedures required, retention of implants at end of treatment, recurrence of infection, duration of hospitalization and cost of treatment. These studies are shown in table 1.

The incidence of surgical site infections (SSI) after spinal surgery ranges from 0.4 to 20% depending on surgical complexity (6). SSIs in Spinal Surgery have been found to be associated with increased morbidity and mortality as well as poorer patient outcomes. While superficial SSIs may respond to conservative treatment with antibiotics, deep SSIs often require additional surgical debridement and possible implant removal and revision. In recent years, negative pressure wound therapy (NPWT) with vacuum assisted closure (VAC) devices have demonstrated promise in the management and prevention of surgical site infection in spinal surgery. VAC devices improve local blood flow, promote granulation tissue formation and promote wound healing by creating a microenvironment favourable for wound healing (7).

While there have been numerous case series describing the use of VAC in treating spinal infections post debridement, there is limited evidence comparing VAC to other methods of treatment. Wang et al (1) compared 19 patients who underwent NPWT with VAC, and 15 who underwent standard debridement followed by placement of a surgical drain, patients

treated with VAC were found to have a significantly reduced incidence of recurrence of infection and implant removal as well a significantly reduced duration of admission. In a similar study by Li et al (2) conducted in patients with deep infection post cervical spine surgery, VAC patients were found to have significantly reduced number of procedures and duration of hospital stays with no significant difference in recurrence of infection or need for implant removals. Cost comparison was not performed in both these studies

In two studies, Continuous irrigation suction systems (CISS) were compared to VAC in the treatment of spinal SSIs. Yuan et al (3) found that there was no significant difference in number of procedures or need for implant removal between both methods of treatment, however there was a significantly longer duration of stay (36 vs 29 days) and cost of surgery in the VAC group. Zeng et al (4) found that CISS patients had significantly fewer number of reoperations and lower cost of treatment, while there was no difference in need for implant removal or duration of hospital stay between both groups. Shi et al (5) found that the addition of a superficial VAC dressing in addition to CISS significantly reduced the number of reoperations and hospital stay, but did not significantly reduce the need for implant removal and significantly increased the cost of treatment. The above studies noted that while CISS had reduced cost of treatment, VAC had potential advantages in portability and ease of nursing.

Based on a Forrest plot comparing VAC vs standard surgical debridement and placement of surgical drains, VAC treatment was associated with a significant reduced duration of stay (mean difference: -10.8 days; 95%CI -15.7 to -5.8) (1,2). There was no other significant difference in clinical outcomes, including recurrence and implant removal, between VAC and CISS or VAC and standard surgical debridement and placement of drains (1-5).

There were no studies identified in this review that compared VAC therapy to other forms of treatment in primary infections of the spine. While there are case series that suggest that VAC is beneficial in the management of deep SSI in paediatric patients, we are unable to make any recommendations in paediatric patients based on the above studies (8,9). Finally, while there is evidence to suggest that VAC dressings can be safely used in patients with incised or exposed dura (10,11), we are unable to make any recommendations based on the papers included.

Based on the available literature, there is very limited evidence available to support the use of VAC devices in the treatment of deep spinal infections post debridement. Firstly, all the studies comparing VAC dressing to other methods of treatment were performed in relatively small groups of patients which may limit the applicability of these results. Secondly, the clinical outcomes studied was not homogenous in all 5 studies and number of procedures, recurrence of infection and duration of hospital stay was not reported in all 5 studies. Thirdly, these studies were also of limited methodological quality.

Conclusion:

Based on available data, we are unable to recommend the use of vacuum assisted closure devices in the treatment of spinal infections post debridement.

References:

1. Wang J, Yang Y, Xing W, Xing H, Bai Y, Chang Z. Safety and efficacy of negative pressure wound therapy in treating deep surgical site infection after lumbar surgery. Int Orthop. 2022 Nov;46(11):2629-2635. doi: 10.1007/s00264-022-05531-w.
2. Li J, Jiang D, Chang Z. Investigating the efficacy of vacuum sealing drainage versus traditional negative pressure drainage in treating deep incision infections following posterior cervical internal fixation-a retrospective cohort study. Eur J Med Res. 2024 Feb 15;29(1):125. doi: 10.1186/s40001-024-01717-7
3. Yuan W, Liu X, Zhou X, Pei L, Zhu Y. Management of Early Deep Wound Infection After Thoracolumbar Instrumentation: Continuous Irrigation Suction System versus Vacuum-Assisted Closure System. Spine (Phila Pa 1976). 2018 Sep 15;43(18):E1089-E1095.
4. Zeng J, Sun X, Sun Z, Guan J, Han C, Zhao X, Zhang P, Xie Y, Zhao J. Negative Pressure Wound Therapy Versus Closed Suction Irrigation System in the Treatment of Deep Surgical Site Infection After Lumbar Surgery. World Neurosurg. 2019 Jul;127:e389-e395.
5. Shi H, Zhu L, Chen L, Jiang ZL, Xu ZY, Wu XT. A Novel Technique for Treating Early Deep Surgical Site Infection After Posterior Lumbar Fusion with Instrumentation. World Neurosurg. 2021 Dec;156:e167-e174.
6. Pappalardo G, Schneider S, Kotsias A, Jeyaraman M, Schäfer L, Migliorini F. Negative pressure wound therapy in the management of postoperative spinal wound infections: a systematic review. Eur J Orthop Surg Traumatol. 2024 Jul;34(5):2303-2313. doi: 10.1007/s00590-024-03983-x.
7. White AJ, Gilad R, Motivala S, Fiani B, Rasouli J. Negative Pressure Wound Therapy in Spinal Surgery. Bioengineering (Basel). 2022 Oct 26;9(11):614.
8. Canavese F, Marengo L, Corradin M, Mansour M, Samba A, Andreacchio A, Rousset M, Dimeglio A. Deep postoperative spine infection treated by negative pressure therapy in patients with progressive spinal deformities. Arch Orthop Trauma Surg. 2018 Apr;138(4):463-469. doi: 10.1007/s00402-017-2860-2.
9. Canavese F, Krajbich JI. Use of vacuum assisted closure in instrumented spinal deformities for children with postoperative deep infections. Indian J Orthop. 2010 Apr;44(2):177-83. doi: 10.4103/0019-5413.62067.
10. Ridwan S, Grote A, Simon M. Safety and Efficacy of Negative Pressure Wound Therapy for Deep Spinal Wound Infections After Dural Exposure, Durotomy, or Intradural Surgery. World Neurosurg. 2020 Feb;134:e624-e630.
11. Lee R, Beder D, Street J, Boyd M, Fisher C, Dvorak M, Paquette S, Kwon B. The use of vacuum-assisted closure in spinal wound infections with or without exposed dura. Eur Spine J. 2018 Oct;27(10):2536-2542. doi: 10.1007/s00586-018-561