

Effects of topical hyaluronic acid injection in surgical site infection caused by *Staphylococcus aureus*

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Purpose

Surgical site infection (SSI) is a common postoperative complication, mainly caused by *Staphylococcus aureus* (*S. aureus*).¹ In some cases, antibiotics are insufficient for the treatment of *S. aureus* infection. *S. aureus* produces hyaluronidase which degrades hyaluronic acid (HA) and is one of its virulence factors in wound infection.² HA prevents bacterial proliferation and has anti-inflammatory effects to promote wound healing.³ Herein, we studied the effects of HA injection with systemic antibiotics treatment on SSI caused by *S. aureus*.

Materials and Methods

A single 2x1cm² open wound was created on each dorsum of 40 Sprague-Dawley rats. The wound bed was stitched three times with 3-0 vicryl suture inoculated with *S. aureus* (2x10⁸ CFU/ml) to induce SSI.⁴ The test group was treated with 200µg/kg of HA (n=20) and the control group received a subcutaneous injection of normal saline (n=20) in the infected wound. All groups were then treated with intraperitoneal 30mg/kg injections of cefazolin. The stitches were removed two days after the procedure. The gross pathology and bacterial count were assessed at days 2, 4, 6 and 8 post-procedure. The histologic grading and inflammatory cytokines in wound were assessed at day 8 post-procedure. Histologic grading was from 0 to 3 (0: none, 1: minimal, 2: moderate, 3: marked) based on the proportion of each finding within the entire wound.⁵

Results

The HA group showed significant reduction in the wound area (wound area of day X/wound area of Day0x100) compared to the control group (day8, 26.54±6.12% vs 50.59±5.50%, respectively; p<0.001), which is an assessment of the gross pathology. The HA group showed also significantly superior wound healing to the control group on histological analysis, including assessment of abscess, necrosis, neutrophil infiltration, edema, fibroplasias (4.2±1.2 vs 11.5±2.1, p<0.001). The HA group was significantly lower than the control group on the levels of TNF-α (324.0±134.0pg/ml vs 433.8±119.9pg/ml, respectively; p=0.01) and IL-1β (329.8±151.7pg/ml vs 481.7±204.5pg/ml, respectively; p=0.011). In addition, the HA group showed significantly lower bacterial counts compared to the control group (day8, 4.66 ±0.45logCFU/ml vs 5.35±0.37logCFU/ml, p<0.001).

Conclusion

Immediate local injection of HA in the wound can reduce the occurrence of SSI and can promote wound healing. This suggests that HA injection with antibiotics at the surgical site is effective for

preventing or treating SSI caused by *S. aureus*.

References

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