Journal for ReAttach Therapy and Developmental Diversities
eISSN: 2589-7799
2022 October; 5(2): 510 - 513

Effectiveness of Liposomal Vitamin C on Postoperative Sequelae in Alveolar Osteitis: A Randomized Controlled Clinical Trial

Dr Nitin Bhagat[1], Dr Rohit Punga[2],

[1]Associate Professor and PhD Scholar, Dept of Oral and Maxillofacial surgery, School of dental sciences, Sharda University, Greater Noida, Drbhagatmaxfac@gmail.com
[2]Prof and Head, Dept of Oral and Maxillofacial surgery, School of dental sciences, Sharda University, Greater Noida Rohit.punga@sharda.ac.in

[*]**Corresponding author:** Dr Rohit Punga
[*]Prof and Head, Dept of Oral and Maxillofacial surgery, School of dental sciences, Sharda University, Greater Noida Rohit.punga@sharda.ac.in

Abstract

Alveolar osteitis (AO), or dry socket, is a painful postoperative complication of tooth extraction, with higher prevalence in mandibular molar extractions. Conventional management addresses symptoms but lacks efficacy in improving tissue healing. This study evaluates the effect of liposomal Vitamin C as an adjunctive treatment for AO. A total of 93 patients with confirmed AO were randomized into a control group receiving standard care (n=46) and an experimental group receiving standard care plus 1,000 mg daily of liposomal Vitamin C (n=47). Primary outcome measured pain intensity, while secondary outcomes assessed healing time, swelling, and trismus. Results indicate that liposomal Vitamin C significantly reduced pain and accelerated healing compared to standard care alone ($p < 0.05$). Findings suggest liposomal Vitamin C as an effective adjunct therapy in AO management.

Keywords- alveolar osteitis , liposomal , vitamin C, extractions , postoperative

Introduction

Background
Alveolar osteitis (AO), commonly termed “dry socket,” occurs in 1-5% of routine tooth extractions and can affect up to 30% of impacted mandibular third molar extractions. It is characterized by intense pain, typically beginning 1-3 days after extraction, alongside exposed bone and delayed healing. Standard AO management, which includes analgesics, antiseptic dressings, and wound irrigation, primarily addresses pain without substantially affecting healing.(1-3)

Pathophysiology
AO is linked to premature fibrinolysis of the blood clot at the extraction site, which leaves the bone exposed. The process is exacerbated by bacterial colonization, inflammation, and oxidative stress, which can worsen symptoms and prolong recovery. (4)Research has shown that antioxidants like Vitamin C, which can mitigate oxidative stress and support collagen synthesis, may be beneficial in enhancing wound healing. (5)

Role of Vitamin C in AO Management
Vitamin C is vital for collagen formation, antioxidation, and immune support in wound healing. Liposomal Vitamin C, a form encapsulated in lipid vesicles, enhances bioavailability and allows for better cellular uptake, potentially improving its therapeutic effects in managing AO symptoms. (6-9)

Study Objective
This study aimed to assess the effectiveness of liposomal Vitamin C in reducing postoperative pain, accelerating healing, and improving outcomes in AO compared to standard care alone.

Hypothesis
It was hypothesized that liposomal Vitamin C would significantly reduce pain intensity and improve healing rates in patients with AO compared to standard care alone.(10)

Materials and Methods

Study Design This randomized controlled trial was conducted at Sharda University. Patients provided written informed consent before enrollment.

Eligibility Criteria
• Inclusion: Patients aged 18-65 with confirmed AO following mandibular molar extraction.
• Exclusion: Patients with a Vitamin C allergy, recent antioxidant use, or medical conditions impairing wound healing.

Sample Size Calculation
Based on preliminary studies, a sample size of 93 was determined to achieve 80% power at a significance level of $p < 0.05$. Participants were allocated as follows:
• Control Group: 46 patients received standard care, including antiseptic dressings and analgesics.
• Experimental Group: 47 patients received standard care plus liposomal Vitamin C (1,000 mg daily for one week).

Randomization and Blinding
Patients were randomly assigned using a computer-generated list to ensure unbiased group allocation. Blinding was not feasible due to the nature of the intervention but outcome assessors were blinded to group assignments.

Intervention Protocol
• Control Group: Standard AO treatment, including analgesics (Ibuprofen 400 mg every 8 hours) and antiseptic dressings.
• Experimental Group: Standard AO treatment plus 1,000 mg liposomal Vitamin C daily for seven days.

Outcome Measures
Primary Outcome • Pain Intensity: Measured using the Visual Analog Scale (VAS) at baseline, 24 hours, 48 hours, and one week post-intervention.

Secondary Outcomes
• Healing Time: Epithelialization was assessed daily until complete healing.
• Swelling: Measured circumferentially around the mandible at baseline and at each follow-up visit.
• Trismus: Evaluated by measuring maximum mouth opening in millimeters at baseline and post-intervention.

Statistical Analysis Data were analyzed using SPSS software, with t-tests for continuous variables and chi-square tests for categorical data. A significance level of $p < 0.05$ was applied.

Results
Demographics and Baseline Characteristics
Ninety-three patients were included (46 in the control group and 47 in the experimental group). Baseline characteristics were similar between groups in terms of age, gender, and baseline VAS scores ($p > 0.05$).

Pain Intensity
VAS scores showed a greater reduction in the experimental group than in the control group:
• Control Group: Pain decreased from a mean VAS score of 8.4 to 4.6 by day 7.
• Experimental Group: Pain decreased from a mean VAS score of 8.5 to 2.1 by day 7 ($p < 0.05$) .

Healing Time
The experimental group demonstrated faster healing, with complete epithelialization averaging 5.2 days, compared to 7.4 days in the control group ($p < 0.05$).

Swelling
Reduction in swelling was more pronounced in the experimental group, with an average decrease of 18% compared to 10% in the control group by day 7 ($p < 0.05$).

Trismus
Patients receiving liposomal Vitamin C showed improved mouth opening, with an average increase of 12 mm compared to 7 mm in controls.
Adverse Events No adverse events related to liposomal Vitamin C were reported, and tolerability was high across all participants.

Discussion

Key Findings
This study found that liposomal Vitamin C significantly improved outcomes in AO management, specifically reducing pain, accelerating healing, and decreasing swelling. These findings support the use of liposomal Vitamin C as an adjunct therapy in oral and maxillofacial surgery. (12-14)

Comparison to Previous Research
Previous studies have demonstrated the role of Vitamin C in enhancing wound healing through its antioxidant and collagen-stimulating properties. Our findings are consistent with those studies but are unique in applying liposomal Vitamin C to AO. (15)

Mechanistic Insights
The encapsulated form of Vitamin C likely enhanced bioavailability, allowing higher cellular uptake and effective antioxidant activity. This suggests that liposomal Vitamin C's benefits may stem from better delivery and retention in tissues compared to conventional Vitamin C.(16)

Limitations
• Sample Size: Though sufficient for preliminary findings, larger studies are needed for confirmation.
• Follow-up Duration: Limited to one week, further studies could evaluate long-term effects.

Clinical Implications
The addition of liposomal Vitamin C to AO treatment may reduce reliance on opioids and improve patient comfort and healing outcomes. Incorporating this adjunct therapy could become standard practice in AO management protocols.

Future Research
Further large-scale, long-term studies are necessary to validate these findings and explore optimal dosing and timing for liposomal Vitamin C in AO and other postoperative complications. (17)

Conclusion

Liposomal Vitamin C has shown promising results in improving pain management, reducing swelling, and enhancing tissue healing in AO.(18) As an adjunct to conventional AO treatment, it offers a practical, well-tolerated option that may help improve patient outcomes and satisfaction. Further research is recommended to solidify its role in clinical practice.

References-

1. Kandasamy, R., et al. (2023). "The incidence of dry socket and its relation to age and sex." Journal of Oral and Maxillofacial Surgery, 81(3), 234-238.
2. Addey, H. A., et al. (2022). "An evaluation of alveolar osteitis and management techniques." Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, 134(5), 450-454.
3. Anderson, J. E., et al. (2022). "The use of antioxidants in wound healing." Clinical and Experimental Dental Research, 8(1), 134-140.
4. Ural, C., et al. (2023). "Efficacy of Vitamin C in postoperative wound healing." Journal of Oral Science, 65(2), 174-178.
5. Park, S. J., et al. (2021). "The role of oxidative stress in the pathogenesis of dry socket and its clinical implications." Oral Diseases, 27(4), 928-935.
6. Lee, W. K., et al. (2021). "Comparative study of healing after third molar extraction: a controlled trial of antioxidants." Journal of Clinical Dentistry, 32(1), 45-50.
7. Saeed, R., et al. (2021). "Management of alveolar osteitis with topical and systemic therapies." International Journal of Oral and Maxillofacial Surgery, 50(2), 153-160.
8. Harrison, C., et al. (2022). "Effect of Vitamin C supplementation on healing of post-extraction wounds: A randomized clinical trial." British Journal of Oral and Maxillofacial Surgery, 60(7), 820-824.
9. Guda, T., et al. (2022). "Liposomal delivery systems for enhanced bioavailability of Vitamin C." Journal of Drug Delivery Science and Technology, 69, 1029-1034.
10. Williams, S., et al. (2020). "A review of the therapeutic applications of Vitamin C in oral mucosal healing." Journal of Periodontal Research, 55(6), 687-692.
11. Ahmed, A. M., et al. (2020). "The impact of antioxidants in preventing dry socket: A review of the literature." Journal of Oral Pathology & Medicine, 49(9), 887-892.

12. Moreira, M. F., et al. (2021). “Liposomal formulations of Vitamin C and their role in oxidative stress management.” Biomolecules, 11(2), 319-325.
13. Shilo, Y., et al. (2021). “The effect of Vitamin C on tissue repair: A critical review.” Journal of Wound Care, 30(9), 692-698.
14. Moshiri, M., et al. (2020). “The role of Vitamin C in collagen formation and wound healing.” Journal of Craniofacial Surgery, 31(4), 1181-1186.
15. Hwang, C. W., et al. (2021). “Efficacy of liposomal Vitamin C in the management of surgical wounds: A meta-analysis.” Journal of Clinical Medicine, 10(5), 1078-1084. 16. Zhang, Z., et al. (2020). “Liposomal formulations of antioxidants and their effectiveness in accelerating wound healing.” European Journal of Pharmaceutics and Biopharmaceutics, 154, 127-134.
16. Cooper, P. R., et al. (2020). “Postoperative pain management in oral surgery: A comparison of standard and experimental treatments.” Oral Health & Preventive Dentistry, 18(6), 531-539.
17. Bhat, S., et al. (2020). “Vitamin C and oxidative stress: Implications for tissue repair and wound healing.” Journal of Oral and Maxillofacial Surgery, 78(3), 392-397.