What's new for the clinician – summaries of recently published papers (June 2025)

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1. Clinical and radiographic evaluation of melatonin and chitosan loaded nanoparticles in the treatment of periodontal intra-bony defects: A Randomized controlled clinical trial

Periodontitis is a chronic inflammatory disease characterized by destruction of tooth-supporting tissues. Untreated periodontal diseases may result in formation of intra-bony defects and eventual tooth loss. Adjunctive antimicrobial agents are crucial for patients with persistent periodontal deterioration despite regular mechanical treatments. The delivery method and dosage form have a beneficial effect on the therapy's overall clinical result.[1]

Local drug delivery (LDD) in periodontal diseases aims to enhance the therapeutic profile of the drug and reduce side effects. The therapeutic goal of LDDs is met by directly injecting antimicrobial agents into the periodontal pocket and subgingival sites. This results in active release of the medication in a controlled, sustained manner to fight the microbial attack while minimizing the unfavourable effects.[1] LDDs can be administered as irrigating systems, fibers, gels, strips, films, microparticles, and nanoparticles.[1]

Melatonin is a hormone secreted by the pineal gland, retina, bone marrow, and immune system and as shown to exhibit anti-inflammatory properties and enhance bone formation. It has been demonstrated that melatonin promotes bone repair around titanium dental implants and has shown potential in repairing bony defects. Applying topical melatonin to the ostectomy site after implant placement has been demonstrated to enhance bone mass, density, and bone-to-implant contact, especially in the early stages of healing[1].

Chitosan, a biopolymer derived from chitin (commonly found in the shells of crustaceans), has also emerged as a promising material in periodontics due to its unique biological and physicochemical properties. **Key Properties of Chitosan Relevant to Periodontics include antibacterial, anti-inflammatory and antifungal effects; wound healing and regeneration; Biocompatibility and Biodegradability. Its application for in periodontal therapy include use in:-**

- Local Drug Delivery: Chitosan-based systems (microspheres, nanofilms, and hydrogels) are used for targeted, sustained release of antibiotics and anti-inflammatory drugs directly into periodontal pockets, enhancing treatment efficacy and minimizing systemic side effects
- Scaffolds for Tissue Engineering: Chitosan serves as a scaffold material for guided tissue regeneration, supporting the growth and differentiation of osteoblasts and mesenchymal stem cells, which are essential for bone and periodontal ligament repair
- Oral Hygiene Products: Chitosan is incorporated into mouthwashes, varnishes, and nanogels for its anti-plaque and antimicrobial properties, helping to control biofilm formation and maintain periodontal health.
- Barrier Membranes: Chitosan films and membranes are used in periodontal surgeries to guide tissue regeneration and prevent epithelial downgrowth, improving clinical outcomes

In recent years, the use of loaded nanoparticles (LNPs) has gained attention from clinicians and researchers in periodontal regenerative surgery due to its effective drug delivery to targeted sites of infection and ability to enhance tissue regeneration. In periodontal therapy, traditional local drug delivery (LDD) systems usually face some challenges including rapid breakdown in oral environment which reduce the amount of drug available at target site, resulting in less effectiveness, low solubility, limited in vivo stability, inefficient absorption, and difficulties in achieving prolonged and targeted delivery to site of action. In addition, LDD doesn't reach effective concentration in the periodontal pocket. Consequently, researchers have introduced nanosized drug delivery systems like (LNPs) which protect the drug from breakdown rapidly and enhancing stability and deep penetration into pockets. Additionally, LNP enable controlled, sustained release of the drugs in periodontal treatments with polymeric nanoparticles through enhancing the ability of penetration of the junctional epithelium and slow release of the drug and over a long time. Recent advances in nanotechnology have introduced new types of nanoparticles such as liposomes, metallic nanoparticles and polymeric meicelles.[1]

Al-Agooz et al (2025)[1] from Egypt reported on a randomized controlled clinical trial that sought to evaluate the clinical and radiographic outcomes of utilizing melatonin loaded nanoparticles (LNP)-based delivery system for the treatment of periodontal intra-bony defects.

Methodology

The current study was designed as a triple-blind randomized controlled clinical trial including eligible participants with at least one intrabony defect that was diagnosed clinically and radiographically. The researchers included healthy participants with at least one maxillary or mandibular intrabony defect which had three walled or combined defects without involving the furcation and were between the ages of 25 and 55 years old. The study included both single-rooted and multi-rooted teeth with intrabony defects. Participants were excluded if they had a history of known systemic diseases that affect the periodontal treatment, allergies, or use of chemotherapeutic agents; received antibiotics or periodontal therapy within the previous three months preceding our study; patients with furcation involvement, smokers or tobacco chewers; taking systemic drugs that affect metabolic bone

diseases, had poor oral hygiene; or if they were pregnant females.

Before starting the study, the participants were randomly allocated into either one of the three groups by a co-investigator who was blinded to the study procedures and assessment of the study's outcomes. To ensure blinding, the topical gels were prepacked and labelled with unique codes by a separate investigator while the codes were not disclosed to the participants, the principal investigator who conducted the clinical procedures, nor the statistician analysing the de-identified data.

The study groups were categorized as follows: Group 1 (Melatonin LNP group) which included 23 Patients treated with melatonin LNPs gel as an adjunct to scaling and root planing(SRP); group 2 (placebo group) included 24 patients who were treated with placebo gel as an adjunct to SRP; group 3 (chitosan LNPs) which included 20 patients treated with chitosan LNPs gel as an adjunct to SRP.

The primary outcomes included the radiographic measurements of the bone defects to evaluate the bone fill and bone volume using cone beam computed tomography (CBCT). They were measured at the baseline as well as after 6 months from the start of the study.

The radiographic measurements included bone defect height, alveolar crest level, bone defect depth, and the buccolingual (BL) and mesiodistal (MD) width of bone defects. Imaging was performed using the SCANORA® 3D CBCT system.

Measurement of the bone defect height was made from the CEJ to the base of the defect (BD). The depth of the bone defect was measured from the BD to the alveolar crest (AC). The level of the alveolar crest was measured from cementoenamel junction (CEJ) to AC. The defect's BL width in the axial plane was measured as the horizontal distance between the buccal and lingual alveolar crest's most coronal points. The AC point was measured as the junction point of a line drawn perpendicularly from the AC to the root surface. The depth of the intraosseous defect was defined as the distance between AC point and the base of the defect (AC-BD). The MD width of the intraosseous defect was defined as the distance between the AC point and the AC.

The secondary outcomes included clinical parameters such as CAL, periodontal probing depth (PPD), plaque index (PI), and gingival index (GI). The PPD was measured from the free gingival margin to the pocket base while CAL was measured from CEJ to the base of the pocket with a UNC #15 periodontal probe. The GI comprised examination of all teeth surfaces, including the buccal, mesial, lingual, and distal surfaces. The score ranges from 0 to 3. The GI of an individual was obtained by summing the values determined for each tooth and calculating the averages. The PI determines the thickness of plaque along the gingival margin using a periodontal probe. Air was employed to dry the teeth for plaque visualization, which was not pigmented or stained.

Before the start of the study, the participants were motivated by discussing the benefits of plaque control measures and the necessity of periodontal treatment. Detailed periodontal examinations and full mouth periodontal charts were obtained for the eligible participants of this study. CBCT radiographs were obtained at the predetermined sites of CAL.

Following a proper examination and diagnosis, all patients underwent a comprehensive SRP. Ultrasonic tips and Gracey curettes were used to meticulously eliminate calculus, subgingival, and supragingival plaque and the participants were instructed to apply the oral hygiene measures.

After the completion of SRP, the local drug was delivered by a single operator to all patients. The melatonin LNPs gel was injected in the periodontal pocket of patients of the first group, placebo gel was injected in the second group and chitosan LNPs gel was used for the third group using a syringe equipped with Endo-Eze® irrigation tips. The injection was performed until the pocket was filled. For each group, the gel was applied once a week for 4 weeks.

The gel was applied carefully without traumatizing the periodontal tissues. A periodontal pack was used to secure the area for two days following the installation of the LDD system. For one week, the participants were instructed to avoid brushing the area of gel application, using interdental aids, or chewing sticky or hard foods. Patients were instructed for periodic recall monthly for reassurance of oral hygiene measurements then they were recalled at 3 months and 6 months postoperatively.

The clinical and radiographic outcomes were evaluated at baseline and follow-up intervals. The outcomes were evaluated by two independent blind investigators and the inter-examiner calibration was evaluated. In case of disagreement between the primary investigators, a third blind investigator was consulted to solve the disagreement between them.

RESULTS

After screening the potentially eligible patients (70 patients), 3 of them were excluded. Thus, the trial included 67 patients with intrabony defects, 8 males and 59 females. The following clinical indices were evaluated for each patient: PI, GI, PPD, and CAL at baseline, 3 months, and 6 months, whereas radiographic parameters were evaluated at baseline and 6 months. The radiographic parameters included the height, depth, AC level, BL width, and MD width of the intrabony defects. No adverse reactions were reported during the study or side effects were observed during or after treatment with LNPs, and the gel was well tolerated by patients. There were non-statistically significant differences in age and gender among the studied groups.

Evaluation of the PI among the three studies groups showed that PI significantly differed between groups: melatonin LNPs & placebo and melatonin LNPs & chitosan LNPs. However, there were no significant differences between groups placebo & chitosan LNPs at all the study's evaluation times. In contrast, the assessment GI among the three study groups revealed insignificant differences at all points of time($P > 0.05$). Significant differences in PPD were detected between groups melatonin LNPs &placebo ($p < 0.001$) and melatonin LNPs & chitosan LNPs ($p = 0.005$) at baseline while After 3 months, the difference persisted between Melatonin LNPs and Placebo ($p < 0.001$) and between Melatonin LNPs and Chitosan LNPs ($p = 0.027$).In addition, no differences in PPD were noticed between the groups placebo & chitosan LNPs across all measured time points, baseline, 3 months, and 6 months. Evaluation of CAL revealed significant differences between the 3 studies groups at baseline, 3 months, and 6 months.

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The reduction in PPD and CAL after 6 months showed substantial variation among the three groups studied. Melatonin LNPs group exhibited the greatest reduction followed by chitosan LNPs group, while placebo group showing the least reduction. These differences were statistically significant ($p < 0.05$), with all pairwise comparisons showing strong significance for CAL and PPD reductions. Over the study periods, all the study groups demonstrated significant improvements in all the clinical outcomes with significant differences between baseline & 3 months, baseline & 6 months, and 3 months & 6 months ($p < 0.001$).

Evaluation of the height of intrabony defect showed that there were significant changes in the reduction of the height after 6 months between all the study groups while melatonin LNPs group demonstrated the highest significant reduction after 6 months (2.10 ± 0.34, $P < 0.001$) with a smaller but significant change in chitosan LNPs group (0.56 ± 0.09, $P < 0.001$). However, the Placebo group showed minimal insignificant change in the height of the intrabony defect (0.05 ± 0.19, $p = 0.153$).

Regarding the defect depth at 6 months, statistically significant differences between melatonin LNPs and placebo group as well as melatonin LNPs and chitosan LNPs group were observed. However, there was no statistically significant difference between placebo and chitosan LNP group. In addition, the melatonin group demonstrated the highest significant reduction in defect depth after 6 months ($P < 0.001$). However, Placebo and Chitosan LNPs groups showed insignificant changes in the depth of the intrabony defect ($P > 0.05$).

The change in the level of Alveolar crest (AC) was evaluated at baseline and after 6 months. There was a significant change in the level of AC in the melatonin LNPs group at 6 months, with slight changes in the placebo and chitosan LNPs groups. The most pronounced change from baseline was in melatonin LNPs group ($P < 0.001$) with insignificant changes in placebo and chitosan LNPs group ($P > 0.05$).

Evaluation of the BL and MD width of intrabony defect showed that there were significant changes in both measurements after 6 months between the three groups ($P < 0.001$). Melatonin LNPs demonstrated the highest significant reduction after 6 months ($P < 0.001$), with a smaller but significant change in chitosan LNPs group. However, the Placebo group showed minimal insignificant changes in the BL and MD width of intrabony defect.

CONCLUSION

This trial showed that melatonin and chitosan LNPs can act as novel and effective adjunctive local drug therapies in the management of periodontal intrabony defects. Significant improvements in the clinical and radiographic outcomes when melatonin and chitosan LNPs were combined with non-surgical periodontal therapy.

Implications for practice

This trial showed that, in addition to its immunomodulatory, anti-inflammatory, and antioxidant properties, melatonin could enhance bone formation and so could potentially eliminate the need for surgical interventions in the management of periodontal diseases.

REFERENCE

1. Al-Agooz A, Ata F, Saleh W, Elmeadawy S. Clinical and radiographic evaluation of melatonin and chitosan loaded nanoparticles in the treatment of periodontal intrabony defects: A Randomized controlled clinical trial. Clinical Oral Investigations. 2025 May 2;29(5):280.

2. Combined block anaesthesia of inferior alveolar nerve, lingual nerve and buccal nerve guided by 3D printed indicator: a randomized controlled trial

In the extraction of mandibular third molars, local anaesthesia is often the first choice of dentists, including nerve block anaesthesia and local infiltration anaesthesia, of which inferior alveolar nerve block anaesthesia is the most commonly used. At present, there are three mainstream anaesthesia methods for extracting mandibular third molars, namely Halstead technique (HT), Gown-Gates technique (GGT) and Vazirani-Akinosi technique (VAT) (See Table 1)

He & Zhang (2024)[1] designed an indicator to perform combined anaesthesia of the inferior alveolar nerve, lingual nerve, and buccal nerve under the guidance of a 3D printed indicator (IGT). This RCT sought to compare the anaesthesia effects, onset time, and safety of IGT and the Halstead Technique (HT) in the extraction of mandibular third molars.

Materials and methods

A Total of 210 adults who required a mandibular third molar extraction were enrolled in this trial. For inclusion, participants had to:- (1) be between 18–50 years old (2) h have no history of anaesthesia or drug-related allergies. (3) be not taking painkillers, alcohol, or other drugs or foods that may affect the experimental results before surgery. (4) have no contraindications for tooth extraction. (5) have no experience of extracting mandibular impacted third molars. (6) be cooperative. Participants were excluded if they were suffering from systemic diseases or had clinical signs of infection or inflammation.

The 210 patients were divided into two groups, with 105 patients in the IGT group and 105 patients in the HT group. The specific method was as follows: Patients were sorted and assigned visit numbers based on their order of arrival. Those with odd-numbered visit numbers were categorized into the IGT group, whereas those with even-numbered visit numbers were categorized into the HT group. The patient did not know which group they were assigned to. Among them, there were 47 males and 58 females in IGT group, aged 18-49, with an average of 27.90 ± 7.50; 56 cases with a tooth extraction position of 38; 49 cases with a tooth extraction position of 48.

Based on the Pell & Gregory classification system (AI = 4, AII = 49, AIII = 18, BI = 1, BII = 10, BIII = 17, CIII = 6). HT group, consisted of 45 males and 60 females, aged 18–50, with an average of 29.09 ± 7.42; 54 cases with a tooth extraction position of 38; 51 cases with a tooth extraction position of 48. Based on the Pell & Gregory classification system (AI = 4, AII = 56, AIII = 22, BI = 1, BII = 6, BIII = 14, CIII = 2). There was no statistically significant difference in general data between the two groups of patients ($P > 0.05$).

Table 1: Technique Descriptors

Halstead Technique (HT)	Gow-Gates Technique (GGT)	Vazirani-Akinosi Technique (VAT)
Also known as the conventional inferior alveolar nerve block. The needle is inserted from the contralateral lower premolar area, targeting the mandibular foramen by contacting bone on the medial surface of the ramus Considered the easiest and most widely practiced technique due to clear anatomical landmarks	The needle is inserted with the patient's mouth wide open, aiming toward the neck of the condyle, just below the insertion of the lateral pterygoid muscle Targets the mandibular nerve trunk before it branches, providing a broader area of anaesthesia Considered more technically demanding, with a higher learning curve	A closed-mouth technique, useful for patients with limited mouth opening (e.g., trismus) The needle is inserted parallel to the maxillary occlusal plane, medial to the ramus, without contacting bone

Comparative Efficacy and Clinical Considerations			
Feature/Outcome	**Halstead Technique (HT)**	**Gow-Gates Technique (GGT)**	**Vazirani-Akinosi Technique (VAT)**
Onset of Anaesthesia	Fastest (approx. 3.5 min)	Slowest (approx. 5.1 min)	Intermediate (approx. 3.1 min)
Success Rate	High, but up to 50% failure in some studies	High (up to 99% in some reports)	High (95.7% success in studies)
Ease of Administration	Easiest, clear landmarks	Most difficult, requires precise technique	Easier in trismus, but fewer landmarks
Pain Perception	Low	Moderate	Low
Complications	Low trismus (5%)	Higher trismus (20%)	Minimal complications, good for limited opening
Supplementary Anaesthesia	Rarely needed	Occasionally needed	Occasionally needed
Indications	Routine cases	Wide field anaesthesia needed	Trismus or limited mouth opening

Comparative Efficacy and Clinical Considerations			
Feature/Outcome	**Halstead Technique (HT)**	**Gow-Gates Technique (GCT)**	**Vazirani-Akinosi Technique (VAT)**
Supplementary Anaesthesia	Rarely needed	Occasionally needed	Occasionally needed
Indications	Routine cases	Wide field anaesthesia needed	Trismus or limited mouth opening

Patients in IGT group received a combined block anaesthesia of inferior alveolar nerve, lingual nerve and buccal nerve guided by 3D printed indicator (See Fig 1).

HT group: Patients in HT group were received Halstead inferior alveolar nerve and lingual nerve block and buccal local infiltration anaesthesia [9] (Fig. 2).

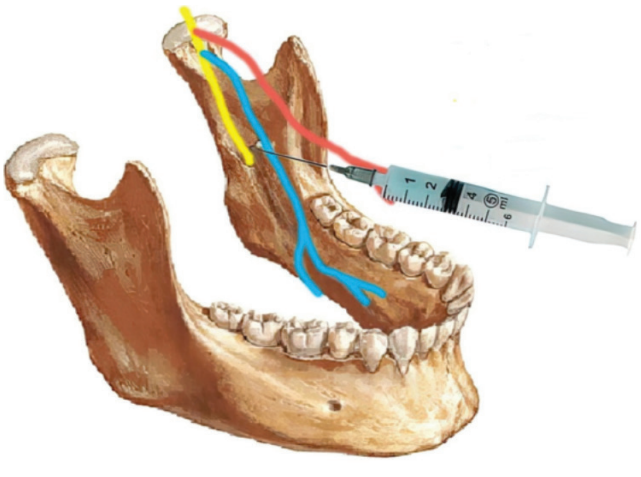

Fig 1: Combined block anaesthesia of inferior alveolar nerve, lingual nerve and buccal nerve guided by 3D printed indicator

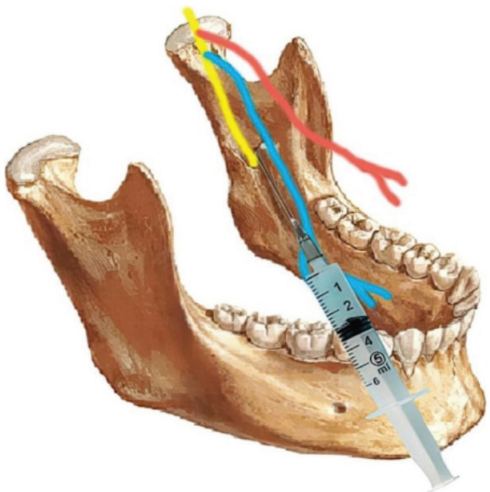

Fig 2: Halstead inferior alveolar nerve block

Anaesthetic injection and tooth extraction were performed by an experienced attending physician. The physician was proficient in the two anaesthesia injection techniques and had rich experience in tooth extraction.. After the surgery, symptomatic treatment with painkillers was given.

Evaluation indicators included:-

Anaesthesia onset time

The nurse recorded the time from the end of anaesthesia injection to the patient's indication of numbness in the lower lip, tongue, and cheeks on the surgical side as the onset time of anaesthesia. If the patient still did not experience numbness in the relevant area 10 min after the injection operation, it was considered as anaesthesia failure, and the effect was recorded as level D. In this case, it was necessary to supplement anaesthesia and complete the tooth extraction operation.

Anaesthesia effect evaluation

According to the patient's intraoperative pain perception, the level of anaesthesia effect was recorded: Level A: satisfactory anaesthesia effect, and the patient has no pain in the operating area during surgery; Level B: The anaesthesia effect is good, and the patient has tolerable pain in the operating area during surgery; Level C: The anaesthesia effect is average, and the patient has pain in the operating area during surgery and needs to supplement local infiltration anaesthesia; Level D: Anaesthesia failure.

Safety evaluation

Recorded the number of times positive aspiration, hematomas, nerve injuries (sensory abnormalities, temporary facial paralysis), and other complications (syncope, closed jaw, instrument separation, etc.) during the anaesthesia process, and kept a record.

Results

The onset time of anaesthesia in two groups of patients was 173.09 ±53.50 s in IGT group and 182.89 ±56.20 s in HT group, respectively, with no statistical difference *(P* = 0.213). The success rate of anaesthesia in IGT group was 95.2%, and the success rate of anaesthesia in HT group was 90.5%. There was no statistical difference between the two groups (*P* = 0.180). In terms of anaesthesia effect, there was no statistically significant difference between the two groups (*P* = 0.933). Among them, the A/B level ratio of anaesthesia effect in IGT group was 84.8%, and that in HT group was 81.0%. In terms of anaesthesia safety there were 2 cases of anaesthesia risk factors in IGT group, both of which were positive aspiration, and 9 cases of anaesthesia risk factors in HT group, including 7 cases of positive aspiration, 1 case of syncope, and 1 case of hyperventilation and trembling. The incidence rate of anaesthesia risk factors in IGT group was 1.9%, while in HT group, it was 8.6% *(P = 0.030).*

CONCLUSION

The Combined block anaesthesia of inferior alveolar nerve, lingual nerve and buccal nerve guided by 3D printed indicator (IGT) was found to be similar to the Halstead Technique (HT) in terms of anaesthesia success rate (*P* = 0.180), anaesthesia onset time (*P* = 0.213), and anaesthesia effect (*P* = 0.933). However, IGT was found to be significantly safer than the HT.

Implications for practice

The new method of inferior alveolar nerve block guided by a 3D printed indicator was found to be equivalent in terms of its anaesthetic effect but significantly safer than the HT. Clinicians can consider this has an alternative to the traditional HT to obtain anaesthesia

REFERENCE

1. He R, Zhang T. Combined block anaesthesia of inferior alveolar nerve, lingual nerve and buccal nerve guided by 3D printed indicator: a randomized controlled trial. Clinical Oral Investigations. 2025 May;29(5):1-5.

CPD questionnaire on page 288

The Continuing Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.