



ORIGINAL

Prevention of Inflammatory Complications after Atypical Tooth Removal

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ABSTRACT

Purpose: To determine the effectiveness of the “Tantum Verde®” drug for the prevention of inflammatory complications in patients after performing an extraction operation of impacted and ectopic wisdom teeth.

Materials and Methods: Seventy patients after an extraction operation of impacted and ectopic wisdom teeth were examined. We have divided the surveyed patients into two observation groups: the main group is 34 patients, who have used “Tantum Verde®” drug (Aziende Chimiche Riunite Angelini Francesco A.C.R.A.F. S.p.A., Ancona, Italy) to prevent inflammatory complications in the oral cavity for 4-5 days and a control group – 36 patients with common preventive Furacilin mouthwash (also for 4-5 days).

Results: Inflammatory infiltration of the mucous membrane of the retromolar region in the area of the postoperative wound, on the next day after the surgery, was in all patients (100%), both in the main and in the control group. In the main group, 20 patients had moderate inflammatory infiltration of the mucous membrane (58.8%), and insignificant – in 14 patients (41.2%). In the control group: moderate infiltration – in 22 patients (61.1%), and insignificant – in 14 patients (38.9%). 2-3 days after surgery, in the main group, moderate inflammatory infiltration of the retromolar region was in 13 patients (38.2%), and insignificant – in 21 patients (61.8%). In the control group: moderate infiltration – in 24 patients (in 66.7%), and insignificant – in 12 patients (in 33.3%). In 5-6 days after the surgery, in the main group an inflammatory infiltration of the mucous membrane of the retromolar region was insignificant in all patients (in 100%). In the control group: moderate infiltration persisted in 8 patients (in 22.2%), and insignificant – in 30 patients (in 77.8%).

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Conclusions: Based on our researches we can conclude that the hygienic care of the oral cavity with the “Tantum Verde®” drug in patients after the removal of impacted wisdom teeth is more effective, than traditional means. It has been proven that the non-steroidal drug “Tantum Verde” has an expressed anti-inflammatory effect, and also provides a good cleaning of the postoperative wound in the retromolar region. The use of our method of hygienic treatment of the oral cavity in this contingent of patients can significantly reduce the number of postoperative inflammatory complications. The proposed method of the oral cavity care in patients after surgical treatment for the removal of impacted wisdom teeth is the most effective for preventing the development of inflammatory complications and is recommended for use both in maxillofacial hospitals and in surgical departments of dental clinics.

INTRODUCTION

Among the inflammatory complications that develop after performing an extraction operation of impacted and ectopic wisdom teeth are the following: inflammatory infiltration of the surrounding soft tissues and *dry socket*¹ (also known as *alveolar osteitis*,^{2,3} *postextraction alveolar osteitis*,⁴ and *alveolitis* in some East European countries⁵⁻⁷).

Inflammatory infiltrates of the soft tissues, surrounding jaws and alveolitis occur when the bone and mucous membrane are severely injured and subsequently infected. These inflammatory complications occur during prolonged teeth extraction operation, as well as when patients fail to observe oral hygiene rules during the post-operative period.

As we indicated earlier, two pathological processes are most common complications associated with the wisdom teeth extraction: inflammatory phenomena in the area of postoperative wound (alveolus) and pain reaction of the body.⁸⁻¹⁴ Precisely, we must therefore dedicate our research towards eliminating these two factors.

When selecting an antimicrobial medication for the hygienic oral cavity care during the post-operative period, we keep in mind that it should be oriented towards the prophylactic purpose of its use, i.e., preventing the development of inflammatory phenomena from the mucous membranes of the oral cavity. Therefore, we have chosen a non-steroidal anti-inflammatory drug (NSAID) “Tantum Verde®,” permitted for use in Ukraine (referring to the order № 1015 of 22 November 2010 of the Ministry of Health of Ukraine; registration in Ukraine № UA/3920/02/01).

Actually, we have used the medication “Tantum Verde®” – it is a drug for the topical application, which is in the form of a solution in packs of 120 ml, as an aerosol (spray) or lozenges.

The 0.15% local solution has the appearance of a green transparent liquid with a typical mint smell. 1 ml of solution contains benzydamine hydrochloride 1.5 mg; auxiliary substances: ethanol 96%, glycerine, methyl para-hydroxybenzoate (E 218), flavoring agent (mentholic), saccharin, sodium hydrocarbonate, polysorbate 20, quinoline yellow 70% (E104), patented blue V 85% (E131), and purified water.

Local spray with a dosage of 0.255 mg/dose. 1 ml of solution contains 1.5 mg benzidamine hydrochloride; auxiliary substances: ethanol 96%; glycerol; methyl parahydroxybenzoate; menthol (flavoring agent); saccharin; sodium hydrocarbonate; polysorbate 20; purified water.

The lozenges contain 3 mg benzidamine hydrochloride; auxiliary substances: isomaltose; racementolum; aspartame; citric acid monohydrate; peppermint; lemon flavor; quinoline yellow dye (E104); indigo carmine dye (E132).

The active substance benzidamine is a non-steroidal anti-inflammatory drug (NSAID), which has pronounced anti-exudative and analgesic action. Its effectiveness after local use is due to its ability to penetrate the epithelial layer and reach effective concentrations in inflamed tissues. The mechanism of action of benzidamine is related to the stabilization of cell membranes and inhibition of prostaglandin synthesis.

Antibacterial activity of the active substance is manifested by rapid penetration through the external membranes of microorganisms, with further damage of cellular structures, disruption of metabolic processes and cell lysis. Benzidamine restores the integrity of the mucous membrane epithelium, increases its resistance to pathogenic action. When used locally in the indicated concentrations, benzidamine is absorbed into the mucous membrane, but the concentration in the blood plasma is so small that it cannot cause any pharmacological effect.

Benzidamine is excreted from the body mainly with urine in the form of inactive metabolites or conjugation products.

To rinse the oral cavity we used 15 ml (1 tablespoon or a measuring cup from a vial) of the “Tantum Verde®” solution (can be diluted with 15 ml of water). Rinse 3-4 times a day did not exceed the one-time recommended dose of the drug. After rinsing the solution must be spit out (cannot be swallowed).

Local sprays were prescribed as follows: 4-8 doses every 1.5-3 hours. The lozenges – 1 pill three or four times per day. The pill must be kept in the mouth until it is fully diluted (for greater effect it is desirable to keep as long as possible).

At present, no cases of overdose of “Tantum Verde®” have been reported or observed. The contraindications for using are: hypersensitivity to the drug, pregnancy, and breastfeeding.

If a burning sensation occurs during the application of the solution, it shall be diluted with water (by 1:2) adding the water to the line on the graded cup. Contact with spray in the eyes should be avoided. It has no impact on the ability to drive the car and other activities requiring increased attention.

The aim of this research is to determine the effectiveness of the “Tantum Verde®” for the prevention of inflammatory complications in patients after performing an extraction operation of impacted (also known as retained⁴⁻⁷) and ectopic wisdom teeth.

MATERIALS AND METHODS

Seventy patients after an extraction operation of impacted and ectopic wisdom teeth were examined. We have divided the surveyed patients into two observation groups: the main group is 34 patients, who have used “Tantum Verde®” (Aziende Chimiche Riunite Angelini Francesco A.C.R.A.F. S.p.A., Ancona, Italy) to prevent inflammatory complications in the oral cavity for 4-5 days and a control group – 36 patients with common preventive Furacilin mouthwash (also for 4-5 days).

General clinical tests were conducted for all patients, which included: history taking, investigation of the nature of complaints, examination, and clinical blood tests.

Microbiological analyses were conducted in the surveying dynamics (microflora and its antibiotic

sensitivity were determined). The material in the retromolar region was taken by the standard method (with the sterile cotton swab), and the material from the gingival pockets (for the detection of banal microflora and fungi) were taken by a Folkman spoon, on an empty stomach. The collected material was carefully applied to the sterile pane of glass (the material cannot be rubbed on the glass, as the delicate fungal elements can be damaged). The microscopy of the native slide was carried out by not painted and painted methods (according to Romanovsky-Gimza). The sowing of the material from the gum pocket was carried to the Sabouraud dextrose agar, followed by sowing on special growth media and identification of the pathogenic agent.

The evaluation of the efficiency of the use of hygienic products was determined by the following indices: the Schiller-Pisarev's test, papillary-marginal-alveolar (PMA) index, and gingivitis index.

The obtaining figures of the laboratory research were processed in a conventional variation-statistical method using the personal computer and the statistical software package “SPSS 11.0 for Windows” and “Microsoft Excel 2000.” The reliability of derived survey results was assessed by the Student's *t*-test. Differences were considered reliable at $P < 0.05$.

RESULTS AND DISCUSSION

Microbiological tests were carried out from 23 patients in the main group, and from 31 patients in the control group. Material for microbiological research was collected at two sites: in the area of the mandibular molars gum pockets and in the retromolar regions.

In all of the patients (100%) from the main and control observation groups the microorganisms have been detected in the gingival pockets and in the retromolar region.

In the main observation group, *Staphylococcus aureus* was sown from the periodontal pockets in 87.0% (in 20 patients), *Staphylococcus epidermidis* – in 34.8% (in 8 patients) and *Streptococcus haemolyticus* – in 39.1% (in 9 patients). In 3 out of 23 examined patients of the main group (13.0%), the causative agent of *C. albicans* and *C. tropicalis* were found in the periodontal pocket. Of the 23 examined patients in the main group, 14 patients (60.9%) were seeded with monocultures, and in 9 patients (39.1%) – associations of microorganisms (several microbes).

In the retromolar region, in 23 patients of the main observation group, *S. aureus* was found in 95.7% (in 22 patients), *S. epidermidis* – in 26.1% (in 6 patients), and *S. haemolyticus* – in 34.8% (in 8 patients). No fungal flora was found. Of the 23 examined, monocultures of microorganisms were found in 10 patients (in 43.5%), and in associations (for several microbes) in 13 patients (in 56.5%).

In the control group, in the periodontal pockets, *S. aureus* was found in 96.8% (in 30 patients), *S. epidermidis* – in 38.7% (in 12 patients), and *S. haemolyticus* – in 41.9% (in 13 patients). In 7 out of 31 patients in the control group (in 22.6%), the causative agent of *C. albicans* and *C. tropicalis* were found in the periodontal pockets pocket before the surgery. Of the 31 patients of the control group, in 20 patients (in 64.5%) microflora was detected in the form of monoculture, and in 11 patients (35.5%) – in the form of associations (several microbes).

In the retromolar region, in 29 of 31 patients in the control group of observation, *S. aureus* was found in 93.6%, *S. epidermidis* – in 41.9% (in 13 patients) and *S. haemolyticus* – in 48.4% (in 15 patients). The fungal pathogen was not found in the retromolar region. Monocultures of microorganisms were found in 18 of 31 patients (in 58.1%), and in the form of associations (several microbes each) – in 13 patients (in 41.9%).

If we compare the species composition of the detected microflora depending on the examined group (main or control), it was practically the same, i.e., it did not differ significantly between the examined groups.

Monocultures of staphylococci showed sensitivity to aminoglycoside drugs and, to a lesser extent, to semi-synthetic penicillin's and anti-staphylococcal reserve antibiotics. Hemolytic streptococci showed sensitivity to most of the studied antibiotics, which did not depend on their associative relationships.

After 4-5 days, microbiological examinations were repeated in the same patients of the main and control groups.

In the main group, *S. aureus* was sown from the tooth-gingival pockets in 8.7% (in 2 of 23 examined patients), *S. epidermidis* – in 8.7% (in 2 patients), and *S. haemolyticus* was not detected. We did not find any fungal microflora after rinsing the oral cavity with “Tantum Verde®” during repeated examination of patients. Microorganisms were found only as monocultures.

S. aureus was found in the retromolar region in 2 of the 23 examined in the main group (8.7%), *S. epidermidis* and *S. haemolyticus* were not detected by us. The microflora was identified as a monoculture.

In the control group of observation (after 4-5 days), after rinsing the mouth with traditional antiseptics, *S. aureus* was found in the tooth-gingival pocket in 45.2% (in 14 of 31 subjects), *S. epidermidis* in 16.1% (in 5 people) and *S. haemolyticus* – in 22.6% (in 7 people). In 6 out of 31 examined control group (19.4%), the causative agent of *Candida: albicans* and *tropicalis* was re-detected in the dentogingival pocket. Microorganisms were identified both as monocultures and in associative relationships with other microbes.

At discharge, in the retromolar region of 31 patients in the control group of observation, *S. aureus* was inoculated in 22.6% (7 people), *S. epidermidis* – in 12.9% (in 4 patients), and *S. haemolyticus* – in 19.4% (6 patients). Microorganisms were identified both as monocultures and in associations with other microbes.

Hygienic indices were studied in the patients of the main and control groups of observation.

The Schiller-Pisarev's test (Svrakov iodine number) in patients with retention and dystopia of teeth in the main and control groups before the surgery was as follows: 2.2 ± 0.5 points (main group) and 2.0 ± 0.7 points (control group). On the next day after surgery, in the main group, this number was 3.9 ± 0.7 points, which indicated the presence of a moderate inflammatory process of the mucous membrane of the alveolar process, and in the control group – 3.8 ± 0.8 points. On days 2-3 after the surgery, the Svrakov iodine number in the main group was 2.6 ± 0.7 points (moderate inflammatory process in the mucous membrane of the alveolar process of the jaw), and in the control group – 4.3 ± 0.5 points (moderate inflammatory process). On days 6-7, in these patients of the main group, the Svrakov iodine number was 1.7 ± 0.6 points (moderate inflammatory process), and in the control group – 3.6 ± 0.5 points (moderate inflammatory process). The Schiller-Pisarev's test in patients after the removing of an impacted tooth during suture removal (6-7 days after surgery) in the main group was significantly lower than in the control group ($P < 0.001$), which indicates a high anti-inflammatory efficacy of “Tantum Verde®”.

The PMA index before the removing of the impacted and ectopic tooth in the main group was 23.1

$\pm 1.2\%$, and in the control group – $23.4 \pm 1.1\%$ (the assessment criterion of the PMA index was the mild severity of gingivitis). On the next day after surgery, the PMA index in the main observation group was $29.6 \pm 1.4\%$ (moderate severity of gingivitis), in the control group – $28.5 \pm 1.9\%$ (moderate severity of gingivitis). On days 2-3 after surgery, the PMA index in the main group of patients was $24.3 \pm 1.3\%$ (mild severity of gingivitis), in the control group – $29.9 \pm 2.3\%$ (moderate severity of gingivitis). On days 6-7 after surgery, the PMA index in the main group was $20.9 \pm 0.9\%$ (mild severity of gingivitis), in the control group – $28.3 \pm 2.4\%$ (the assessment criterion of the PMA index was the average severity of gingivitis). The PMA index in these patients 6-7 days after the surgery in the main group was significantly lower than in those examined in the control group ($P < 0.001$), which indicated the high efficacy of the Tantum Verde drug.

The gingival index (IG) in patients with impacted and ectopic teeth before surgery was 0.8 ± 0.1 points, in the control group – 0.8 ± 0.1 points, which indicated the presence of a mild degree of gingivitis. On the next day after the surgery, the GI in patients of the main group was 1.2 ± 0.1 points, in the control group – 1.3 ± 0.1 points (average degree of gingivitis). On 2-3 days after surgery, in patients in the main group, the GI was 0.9 ± 0.1 points (mild gingivitis), in the control group – 1.4 ± 0.1 points (average gingivitis). On 6-7 days after surgery, the gingival index in the main observation group was 0.3 ± 0.1 points (mild gingivitis), in the control group – 1.2 ± 0.2 points (average gingivitis). The GI in patients in the main group 6-7 days after the surgery was significantly lower than in those in the control group ($P < 0.001$), which indicated the high efficacy of the Tantum Verde.

The soft tissues on the side of the surgery, the next day after, were infiltrated in all patients (100%), both in the main and in the control group. In the main group, moderate inflammatory infiltration of the soft tissues was in 18 patients (52.9%), and insignificant in 16 patients (47.1%). In the control group: moderate infiltration – in 18 patients (50.0%), and insignificant – in 18 patients (50.0%). 2-3 days after the surgery, in the main observation group, moderate inflammatory infiltration of the soft tissues was in 11 patients (32.4%), and insignificant in 23 patients (67.6%).

In the control group: moderate infiltration – in 21

patients (58.3%), and insignificant – in 15 patients (41.7%). In 5-6 days after the surgery in the main group, inflammatory infiltration of the soft tissues was insignificant in all patients (in 100%). In the control group: moderate infiltration was preserved in 6 patients (16.7%), and insignificant – in 30 patients (83.3%).

Inflammatory infiltration of the mucous membrane of the retromolar region in the area of the postoperative wound, on the next day after the surgery, was in all patients (100%), both in the main and in the control group. In the main group, 20 patients had moderate inflammatory infiltration of the mucous membrane (58.8%), and insignificant – in 14 patients (41.2%). In the control group: moderate infiltration – in 22 patients (61.1%), and insignificant – in 14 patients (38.9%). 2-3 days after surgery, in the main group, moderate inflammatory infiltration of the retromolar region was in 13 patients (38.2%), and insignificant – in 21 patients (61.8%).

In the control group: moderate infiltration – in 24 patients (in 66.7%), and insignificant – in 12 patients (in 33.3%). In 5-6 days after the surgery in the main group, inflammatory infiltration of the mucous membrane of the retromolar region was insignificant in all patients (in 100%). In the control group: moderate infiltration persisted in 8 patients (in 22.2%), and insignificant – in 30 patients (in 77.8%).

Thus, on the basis of the examinations carried out, the anti-inflammatory effect of the “Tantum Verde” drug is significantly superior to that when using traditional methods of treatment.

CONCLUSIONS

Based on our researches we can conclude that the hygienic care of the oral cavity with the “Tantum Verde®” drug in patients after the removal of impacted wisdom teeth is more effective than traditional means. It has been proven that the non-steroidal drug “Tantum Verde” has an expressed anti-inflammatory effect, and also provides a good cleaning of the postoperative wound in the retromolar region. The use of our proposed method of hygienic treatment of the oral cavity in this contingent of patients can significantly reduce the number of postoperative inflammatory complications.

The proposed method of the oral cavity care in patients after surgical treatment for the removal

of impacted wisdom teeth is the most effective for preventing the development of inflammatory complications and is recommended for use both in maxillofacial hospitals and in surgical departments of dental clinics.

AUTHOR CONTRIBUTION

Conceptualization: Tymofieiev OO, Sokoliuk MA. Data and interpretation acquisition: Tymofieiev OO, Sokoliuk MA, Ripa VM, Havlytiuk DS, Kolisnichenko LA. Drafting of the manuscript: Sokoliuk MA, Ripa VM. Critical revision of the manuscript: Tymofieiev OO. Approval of the final version of the manuscript: all authors.

REFERENCES (14)

1. Kamal A, Omar M, Samsudin AR. Management of dry socket: new regenerative techniques emerge while old treatment prevails. *Dent Rev* **2021**;1:100035. <https://doi.org/10.1016/j.dentre.2022.100035>
2. Lone PA, Ahmed SW, Prasad V, Ahmed B. Role of turmeric in management of alveolar osteitis (dry socket): a randomised clinical study. *J Oral Biol Craniofac Res* **2018**;8(1):44–7. <https://doi.org/10.1016/j.jobcr.2017.08.005>
3. Hatab N, Yahya J, Alqulaihi S. Management of alveolar osteitis in dental practice: a literature review. *J Diagn Treat Oral Maxillofac Pathol* **2017**;1(3–4):147–55. <https://doi.org/10.23999/j.dtomp.2017.34.7>
4. Buttaravoli P, Leffler SM. Dental pain, postextraction alveolar osteitis: (dry socket). In: Buttaravoli P, Leffler SM, editors. *Minor emergencies*. 3rd edition. Philadelphia, PA, USA: Elsevier Saunders, **2012**:183–4. <https://doi.org/10.1016/B978-0-323-07909-9.00047-7>
5. Tymofieiev OO. *Manual of Maxillofacial and Dental Surgery* [Russian]. 5th edition. Kyiv: Chervona Ruta-Turs; **2012**.
6. Tymofieiev OO. *Maxillofacial surgery and surgical dentistry* [Russian]. 1st Volume. 1st edition. Kyiv, Ukraine: All-Ukrainian Specialized Publishing House “Medicine”; **2020**.
7. Tymofieiev OO. *Maxillofacial Surgery* [Ukrainian]. 3rd edition. Kyiv, Ukraine: All-Ukrainian Specialized Publishing House “Medicine”; **2021**.
8. Ramos E, Santamaría J, Santamaría G, Barbier L, Arteagoitia I. Do systemic antibiotics prevent dry socket and infection after third molar extraction? A systematic review and meta-analysis. *Oral Surg Oral Med Oral Pathol Oral Radiol* **2016**;122(4):403–25. <https://doi.org/10.1016/j.oooo.2016.04.016>
9. Khan FR, Iftikhar K, Hashmi A, Ismail M, Siddiqui SH, Siddiqui HK. Complications of extraction socket among diabetic, hypertensive and smokers in comparison to normal patients. *Adv Oral Maxillofac Surg* **2021**;2:100032. <https://doi.org/10.1016/j.adoms.2021.100032>
10. Karthik KP, Balamurugan R. Evaluation and comparison of anti-inflammatory properties of ibuprofen using two drug delivery systems after third molar surgery: using chitosan microspheres as a carrier for local drug delivery in to the third molar socket and through the oral route. *Br J Oral Maxillofac Surg* **2021**;59(2):191–6. <https://doi.org/10.1016/j.bjoms.2020.08.025>
11. Al-Shamiri HM, Al-Maweri SA, AlAhmary AW, Aljunayh MS, Aldosari AO, Alqahtani NM, Alabdulaziz JI, Al-Sharani HM. Efficacy of laser therapy for alveolar osteitis: a systematic review of the available evidence. *J Evid Based Dent Pract* **2022**;22(2):101711. <https://doi.org/10.1016/j.jebdp.2022.101711>
12. Riba-Terés N, Jorba-García A, Toledano-Serrabona J, Aguilar-Durán L, Figueiredo R, Valmaseda-Castellón E. Microbiota of alveolar osteitis after permanent tooth extractions: a systematic review. *J Stomatol Oral Maxillofac Surg* **2021**;122(2):173–81. <https://doi.org/10.1016/j.jormas.2020.08.007>
13. Canellas JVDS, Fraga SRG, Santoro MF, Netto JNS, Tinoco EMB. Intra-socket interventions to prevent alveolar osteitis after mandibular third molar surgery: a systematic review and network meta-analysis. *J Craniomaxillofac Surg* **2020**;48(9):902–13. <https://doi.org/10.1016/j.jcms.2020.06.012>
14. Zhou J, Hu B, Liu Y, Yang Z, Song J. The efficacy of intra-alveolar 0.2% chlorhexidine gel on alveolar osteitis: a meta-analysis. *Oral Dis* **2017**;23(5):598–608. <https://doi.org/10.1111/odi.12553>