ORIGINAL

Prevention of Post-Implantation Inflammatory Complications

Oleksii O. Tymofieiev[a,*], Viktoriia M. Ripa[b], Diana S. Havlytiuk[b], Marta A. Sokoliuk[b], & Lesia A. Kolisnichenko[b]

ABSTRACT

Purpose: Currently, dental prosthetics on endosseous implants is used in most dental clinics of Ukraine. The incidence of inflammatory complications after the surgical stage of dental implantation, according to different authors, ranges from 0.4 to 5 percent. Therefore, many doctors during the surgical stage of dental implantation are looking for medications that simultaneously have both anti-inflammatory and analgesic effects. The purpose of this study is to determine the effectiveness of the treatment of early post-implantation complications when using the drug "Trachisan®" and compare its effectiveness with the traditionally used therapy.

Materials and Methods: According to our observation, there were 24 patients aged from 20 to 56 years (1st observation group or main group). We prescribed Trachisan to these patients in the post-implantation period for 4 days. The control group consisted of 30 patients (2nd observation group or the control group), who were treated with traditional methods in the post-implantation period (Analgin tablets [metamizole sodium] and conventional antiseptic rinses).

Results: Inflammatory complications in the 1st (main) group were not detected, and in the 2nd (control) group, inflammatory complications were diagnosed in 7 patients (23.3 percent), namely: mucositis – in 4 patients (13.3 percent) and peri-implantitis – in 3 patients (10 percent).

Conclusions: Thus, the drug "Trachisan" should be recommended for widespread use in maxillofacial surgery after the surgical stage of dental implantation to prevent post-implantation inflammatory complications.

Kyiv, Ukraine

[a] ScD, Professor, Department of Oral and Maxillofacial Surgery, Private Higher Educational Establishment "Kyiv Medical University."

[b] Assistant Professor, Department of Oral and Maxillofacial Surgery, Private Higher Educational Establishment "Kyiv Medical University."

* Corresponding author's address: Department of Oral and Maxillofacial Surgery, Private Higher Educational Establishment "Kyiv Medical University." 4-A Profesora Pidvysotskoho Street, Kyiv 02000, Ukraine.
E-mail: *tymofeev@gmail.com* (Oleksii Tymofieiev)
ORCID: https://orcid.org/0000-0002-3191-6025

Co-authors' ORCID:
Ripa VM, https://orcid.org/0000-0002-8644-8708
Havlytiuk DS, https://orcid.org/0000-0002-0288-5485
Sokoliuk MA, https://orcid.org/0000-0003-3565-1965
Kolisnichenko LA, https://orcid.org/0000-0003-4458-0564

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INTRODUCTION

Currently, dental prosthetics on endosseous implants is used in most dental clinics of Ukraine. The incidence of inflammatory complications after the surgical stage of dental implantation, according to different authors, ranges from 0.4 to 5 percent.[1–5] With dental implantation, both early and late inflammatory complications can develop.[6–10] The leading factors in the development of early post-implantation inflammatory complications are considered to be exogenous intrusion of microorganisms, exacerbation of endogenous inflammatory foci, traumatic factor of the surgery, overheating of the bone when drilling the bone bed. Among the late complications causes is the excessive load on the dental implant when it functions as supports for dentures, etc.[1–3] Considering the fact that patients who most often use dental implantation are not completely healthy people and the vast majority of them have concomitant diseases (foci of chronic infection in the nasal and oral cavity, chronic inflammatory processes of the respiratory system and gastrointestinal tract), this problem is of great practical importance.

Early inflammatory complications in the post-implantation period include: pain syndrome, post-injection and/or postoperative hematomas and hemorrhages; divergence of sutures; inflammatory processes in the soft tissues (mucositis).

It is well known that technical difficulties during the dental implantation surgery contribute to the development of early inflammatory complications: breakage of the instrument used to install the dental implant (bur, cutter); penetration of the lateral walls or fracture of the wall of the alveolar processes of the jaws; damage to the intraosseous vessel; opening the bottom of the maxillary sinus or nasal cavity; damage to the upper wall of the mandibular canal and injury of the inferior alveolar nerve; lack of primary fixation of the dental implant (the bone bed for the implant does not correspond to the implant). It should be remembered that the occurrence of early inflammatory post-implantation complications is also facilitated by non-compliance with the doctor's recommendations (poor oral hygiene, postoperative wound trauma during meals, etc.). One of the most common early post-implantation inflammatory complications is mucositis—an inflammation of the mucous membrane, which is directly adjacent to the transgingival part of the dental implant (no bone loss is observed).

Therefore, many doctors, during the surgical stage of dental implantation, are looking for drugs that simultaneously have both anti-inflammatory and analgesic effects. Thus, the drug "Trachisan" attracted our attention.

The drug "Trachisan®" (Engelhard Arzneimittel GmbH & Co, Niederdorfelden, Germany) contains a combination of medicinal substances that have both antimicrobial properties and local anesthetic action. This medication is approved by Order of the Ministry of Health of Ukraine dated 20.04.2012 No. 290, registration certificate No. UA/6121/01/01. One tablet of "Trachisan" contains: tyrothricin 0.5 mg, lidocaine hydrochloride 1 mg, chlorhexidine digluconate 1 mg, as well as supporting substances: sorbitol, magnesium stearate, and peppermint oil.

Tyrothricin is a mixture of different cyclic and linear (aliphatic) polypeptides that have an antibacterial effect. The mixture contains up to 70–80% of tyrocidine, an alkaline cyclic decapeptide, and 20–30% of gramicidin, a neutral linear pentadecapeptide. Tyrocidine leads to the release from bacterial cells of substances containing nitrogen and phosphorus, which, like cationic detergents, destroy the osmotic barrier of the bacterial cell membrane. Tyrocidine has a bactericidal effect on growing and dividing microorganisms. Gramicidin creates cation-conducting channels in the bacterial cell membrane, leading to a change in the intracellular concentration of cations and cytolysis. The gramicidin component contributes to the further separation of the processes of tissue respiration and oxidative phosphorylation. The spectrum of action of tyrothricin extends to gram-positive cocci, bacteria and some types of fungi, such as *Candida albicans*. Unlike antibiotics, when using tyrothricin, cross-resistance of microorganisms is not noted. This property is due to the special mechanism of action of tyrothricin.

Chlorhexidine and its salts have a broad spectrum of antimicrobial activity against gram-positive and gram-negative bacteria. The mechanism of chlorhexidine action is based on its affinity between chlorhexidine and the cell membrane of microorganisms, the properties of which change due to contact with the active substance. The lipophilic groups of chlorhexidine cause disaggregation of the lipoprotein membrane of the cell, disrupt the

osmotic balance in the cells, which destroys the cytoplasmic membrane of the pathogen cell. It has a bactericidal effect on some gram-negative bacteria (pseudomonas, proteus), yeast, dermatophytes, but on mycobacteria – only slightly. However, chlorhexidine is ineffective against fungal spores, putrefactive fungi, viruses.

Lidocaine hydrochloride is an amide-type local anesthetic. The drug causes a blockade of the sodium channels of the nerve fiber, as a result of which the process of depolarization of the nerve cell membrane through the active potential is disrupted. In this case, the transmission of excitation in the fibers of the sensory nerves is blocked.

Patients took 1 tablet of Trachisan, dissolving in the mouth every 2 hours. The daily dose for adults was 8 tablets. The treatment lasted 3-4 days.

Contraindication for the use of Trachisan is hypersensitivity to any component of the drug. Possible side effects: the appearance of short-term taste changes, temporary numbness of the tongue. With prolonged use in isolated cases, a slight yellow or light brown color of teeth, dental fillings and prostheses or tongue may appear, in such cases it is necessary to adhere to careful oral hygiene. The color disappears on its own after stopping the drug intake.

The purpose of this study is to determine the effectiveness of the treatment of early post-implantation complications when using Trachisan and compare its effectiveness with the traditionally used therapy.

MATERIALS AND METHODS

According to our observation, there were 24 patients aged from 20 to 56 years (1st observation group or main group). We prescribed Trachisan to these patients in the post-implantation period for 4 days. The control group consisted of 30 patients (the 2nd observation group or the control group), who were treated with traditional methods in the post-implantation period (Analgin tablets [metamizole sodium] and conventional antiseptic rinses).

All patients underwent clinical examination methods, which included: examination (the severity of facial asymmetry, edema, hyperemia, and infiltration of the mucous membrane in the post-implantation period were determined) and palpation. In addition to the previously mentioned examinations, we also performed contact thermometry, the Schiller-Pisarev's test (to detect the inflammatory process of the mucous membrane of the alveolar process) with the calculation of the Svrakov's iodine number, and also determined the Silness-Loe gingivitis index.

The obtained digital data of laboratory examinations were processed by the generally accepted variational-statistical method using a personal computer and the statistical software package "SPSS 11.0 for Windows" and "Microsoft Excel 2000." The reliability of the results was assessed according to Student's *t*-test. Differences were considered as significant at $P < 0.05$.

RESULTS AND DISCUSSION

Pain in the area of the postoperative wound in patients of the 1st (main) observation group on the first day after the surgery were as follows: moderate pain – in 9 patients (37.5%) and insignificant – in 15 patients (62.5%). In the control group, i.e., in the 2nd group, pain was as follows: moderate – in 13 patients (43.3%), insignificant – in 17 patients (56.7%). On the 5th day after the drug treatment, pain in the area of the postoperative wound in patients of the 1st (main) observation group was insignificant – in 2 patients (8.3%) and there was no pain – in 22 patients (91.7%). In the control group (in the 2nd) observation group on the 5th day after the drug treatment: pain of a minor nature – in 24 patients (80%), there was no pain – in 6 patients (20%).

The asymmetry of the soft tissues of the face in patients of the 1st (main) observation group on the first day after the surgery was as follows: moderate – in 18 patients (75%) and insignificant – in 6 patients (25%). In the control group of observation, i.e., in the 2nd group, the asymmetry of the face was as follows: moderate – in 22 patients (73.3%), insignificant – in 8 patients (26.7%). On the 5th day after the drug treatment, the asymmetry of the soft tissues of the face in patients of the 1st (main) observation group was insignificant – in 2 patients (8.3%) and was absent – in 22 patients (91.7%). In the control group (in the 2nd) observation group on the 5th day after the drug treatment: the asymmetry was insignificant in 20 patients (66.7%) and there was no pain in 10 patients (33.3%).

The mucous membrane in the area of the pathological focus on the first day after the surgery was infiltrated and edematous in the 1st (main) observation group in all patients (100%): expressed

– in 2 patients (8.3%); moderate – in 22 patients (91.7%). In the control group of observation (in the 2nd group), infiltration and edema of the mucous membrane in the area of the pathological focus was also noted in all patients: expressed – in 11 patients (36.7%) and moderate – in 19 patients (63.3%). On the 5th day after the treatment, the mucous membrane in the area of the pathological focus was infiltrated in the 1st group (main) observation very rarely, namely: moderate – in 1 patient (4.2%) and there was no infiltration – in 23 patients (95.8%). In the control group of observation, the infiltration of the postoperative wound was as follows: moderate – in 11 patients (36.7%) and absent – in 19 patients (63.3%).

Svrakov's iodine number the next day after dental implantation in the 1st (main) group was 2.6 ± 0.4 (moderately expressed inflammatory process), and in the control (2nd) group – 3.4 ± 0.6 points (moderate inflammatory process). 3 days after the surgery, the iodine number of Svrakov's in the 1st (main) group was 2.2 ± 0.6 points (mild inflammatory process), and in the control (2nd) group – 3.9 ± 0.6 points (moderate inflammatory process). 5 days after dental implantation, the Svrakov's iodine number in the 1st (main) group was 1.5 ± 0.7 points (mild inflammatory process), and in the control (2nd) group – 3.6 ± 0.7 points (moderate inflammatory process).

The gingival index (IG) in patients of the 1st (main) group of observation on the first day after dental implantation was 1.16 ± 0.12 points (average degree of gingivitis), and in the 2nd (control) group – 1.18 ± 0.11 points (medium degree of gingivitis). On the 3rd day, the gingival index in the 1st (main) observation group was 0.81 ± 0.11 points (mild gingivitis), in the 2nd (control) group – 1.28 ± 0.14 points (moderate gingivitis). On the 5th day in patients of the 1st (main) group, the gingival index was 0.52 ± 0.12 points (mild gingivitis), in the 2nd (control) group – 1.12 ± 0.13 points (average degree of gingivitis). When removing sutures from a postoperative wound, the gingival index in patients of the 1st (main) observation group was significantly lower than in patients in the 2nd (control) group ($P < 0.001$).

The papillary bleeding index (PBI) in patients of the 1st (main) observation group on the first day after the surgical stage of dental implantation was 1.99 ± 0.11 points, and in the 2nd (control) group – 2.01 ± 0.12 points. On the 3rd day, the PBI in patients in the 1st (main) observation group was 1.61 ± 0.13 points, in the 2nd (control) group – 2.13 ± 0.14 points. On the 5th day in patients of the 1st (main) group, the PBI was 1.12 ± 0.11 points, in the 2nd (control) group – 1.91 ± 0.14 points.

On the next day after the surgery, in patients of the 1st (main) observation group, the thermo-asymmetry was significantly increased and amounted to 1.7 ± 0.1 °C ($P < 0.001$), which was also noted in the patients of the control (2nd) group – 1.8 ± 0.1 °C ($P < 0.001$). After 3 days of the treatment, the thermo-asymmetry in patients of the 1st (main) group significantly decreased to 0.8 ± 0.1 °C ($P < 0.001$). In the 2nd (control) group, a decrease in thermo-asymmetry was also noted, but it was insignificant and amounted to – 1.4 ± 0.1 °C ($P < 0.001$). After 7 days of treatment, the thermo-asymmetry in the main group returned to normal and amounted to 0.5 ± 0.1 °C ($P > 0.05$), while in the control group it remained significantly increased – 0.9 ± 0.1 °C ($P < 0.01$).

Inflammatory complications in the 1st (main) group were not detected, and in the 2nd (control) group, inflammatory complications were diagnosed in 7 patients (23.3%), namely: mucositis – in 4 patients (13.3%) and peri-implantitis – in 3 patients (10%).

Thus, it should be concluded that the healing of postoperative wounds during treatment with Trachisan proceeded smoothly, with no inflammatory complications.

CONCLUSIONS

Based on our examinations of patients after the surgical stage of dental implantation, it was found that the drug "Trachisan" has a highly effective antimicrobial and analgesic effect. The drug has a wide spectrum of antimicrobial activity against microflora, which is most often found in patients in the maxillofacial region. We did not observe side effects and inflammatory complications of the antibacterial drug "Trachisan."

Thus, "Trachisan" should be recommended for widespread use in maxillofacial surgery after the surgical stage of dental implantation to prevent post-implantation inflammatory complications.

AUTHOR CONTRIBUTION

Conceptualization: Tymofieiev OO, Ripa VM. Data and interpretation acquisition: Tymofieiev OO,

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

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