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## Radio-wave cystotomy and osteoplasty as a method of treatment of jaw radicular cysts combined with periodontitis

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### Abstract

Treatment of patients with radicular cysts of the jaws is one of the most urgent problems in dental surgery since half of the surgeries during outpatient reception hours are accounted for by cystectomy and cystotomy. Relapses may occur in case of the traditional method of cystectomy. The use of modern radio- wave technologies in combination with osteoplasty can contribute to the problem solving. The objective of our research was to increase the effectiveness of treatment of patients with jaw radicular cysts combined with periodontitis by using transcanal radio-wave cystotomy and jaw osteoplasty.

60 patients with radicular cysts of the jaws at the age of 20 to 45 were examined and treated. The patients were divided into two groups. Control group I consisted of 30 patients who underwent treatment according to traditional method: surgery with resection of the root end and simultaneous granuloma removal. Group II included 30 patients who underwent minimally invasive method of radicular cysts treatment with the help of HFSE-350M/120B Nadiya-2 high-frequency radio-wave apparatus of domestic production in combination with gingival pockets osteoplasty.

The application of transcanal radio-wave cystotomy allows providing almost bloodless surgical area, minimizing postoperative pain, accelerating wound healing and reducing the duration of patients' treatment. The obtained results of the clinical research indicated the benefits of our method use in the treatment of jaw radicular cysts.

**Keywords:** Radio-wave cystotomy, radicular cyst, cystectomy

### Introduction

The main task of surgical treatment of jaw radicular cysts is to preserve the teeth located in the cyst area and restore their function [1, 2]. According to some authors [2-4], cystectomy with single-step resection of root end of the causative tooth remains the main method of surgical treatment. Surgical treatment is conducted in case of finding the root end in the cyst cavity not more than 1/3 of its length. Deeper location of the root in the cyst cavity together with gingival pockets makes such teeth nonfunctional and leads to their early loss. Moreover, bone cavities appear after radicular cysts removal. They reduce the strength of the jawbones and can cause functional and aesthetic disturbances [2, 4, 5].

Improvement of the methods of odontogenic cysts and jaw paradontitis treatment occupies an important place in surgical section of the dentistry due to the following circumstances: the pathology is rather common in dental practice; postponed or untimely patient's visit to a doctor may lead to the premature loss of teeth, mastication dysfunction, jaws dysfunction, emergence of pathologic fracture risk due to bone tissue resorption [1, 5, 6]. Empyema of odontogenic cysts often occurs and may be complicated by the development of maxillitis, jaw osteomyelitis, abscesses and phlegmons which are dangerous for a patient's life [3, 5, 7]. The lack of reliable information on the effectiveness of various methods of surgical intervention complicates the development of clear indications for the application of certain methods of surgical treatment of jaw odontogenic cysts and retards the development of new effective treatment methods [8].

The greatest number of radicular cysts is detected in patients at the age of 20 to 45 [8]. This is due to the fact that teeth are most often affected by cariosity complicated by inflammatory changes in periapical tissues at this age [2, 4].

Therefore, an effective treatment of radicular cysts with the achievement of high clinical results has an economic and social aspect [8]. One of the treatment methods is radiosurgery. It is a modern noninvasive method of physical influence on soft tissues during surgical interventions based on the effect of electric current conversion into radio waves of certain

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ranges [1, 4]. Nowadays, radiosurgery has become a universal technique for doctors in dermatological, urological and gynecological practice [3, 4]. Radiosurgery is an effective method of many diseases treatment the use of which significantly reduces surgery duration. A cut, incision, coagulation or fulguration may be performed by setting the required wavelength and power [4, 5]. The area of coagulation necrosis reduces by more than 4 times in case of radio-wave surgery application in comparison with a laser scalpel and by more than 10 times in case of electrosurgical diathermy coagulator use [3, 5].

The application of modern radio-wave technologies may promote the problem solving.

The objective of the research was to increase the effectiveness of treatment of patients with jaw radicular cysts and periodontitis by using transcranial radio-wave cystotomy and gingival pockets osteoplasty.

### Materials and methods

60 patients with radicular cysts of the jaws at the age of 20 to 45 were examined and treated. All patients with jaw radicular cysts were divided into two groups depending on the treatment method. The groups were randomized according to age and sex. The research excluded patients with somatic diseases at the decompensation stage, malignant neoplasms, decompensated forms of diabetes mellitus, infectious diseases.

All patients underwent outpatient treatment at the Center of Dentistry at the University Clinic of Ivano-Frankivsk National Medical University (IFNMU). The examined patients included 26 (43.33%) men and 34 (56.67%) women. The patients were divided by age as follows: 10 people at the age of 20-29 (16.67%); 27 patients at the age of 30-39 (45%); 23 individuals at the age of 40-45 (38.34%).

Radicular cyst and jaw periodontitis were diagnosed based on the results of clinical examination methods, namely the destruction of tooth hard tissues, tooth loosening, percussion, palpation, and additional examination methods such as spot-film radiography and cone-beam computed tomography.

All patients underwent endodontic preparation for surgery in the preoperative period. It consisted in root canals opening, apical opening expansion, canals mechanical treatment, root canal filling with guttapercha point (Standardized Gutta-Percha Cones VDW, "Adseal" Meta Biomed) by lateral condensation method.

Control group I consisted of 30 patients who underwent treatment according to the traditional method: surgery with resection of the root end and simultaneous granuloma removal, and open flap debridement conduction. Group II included 30 patients who underwent minimally invasive method of radicular cysts treatment with the help of HFSE-350M/120B Nadiya-2 high-frequency radio-wave apparatus of domestic production in combination with gingival pockets osteoplasty. Before the surgery after endodontic preparation, cyst envelope coagulation was conducted with HFSE-350M/120B Nadiya-2 in "coagulation" pulse mode with a power of 60-100 W with an exposure of 1-2 seconds x 3 times followed by quarter-turn and half-turn electrode rotation around the axis. Nitinol (NiTi) thread was used as an electrode. The root canals were filled after radiological control of the electrode position in the cyst. Periodontitis was treated by open flap debridement combined with osteoplasty with a fibrous polylactic matrix. Fibrous matrix made of 100% pure polylactide granules, developed by us, was used

for osteoplasty. The matrix was obtained by the method of polymer phase separation. The matrix fibers diameter constituted from 4 microns to 10 microns.

All patients received background drug therapy in the postoperative period, namely "Azithromycin-Astrapharm" per os in a dose of 0.25 g 1 time a day for five days, "Dexalgin" in a dose of 1 tablet during 3 days in case of pain, "Linex" in a dose of 2 tablets 2-3 times a day for ten days.

Cone-beam computed tomography in the area of surgical intervention was conducted to both groups of patients at the Center of Dentistry at the University Clinic of IFNMU in order to assess the disease dynamics and evaluate the treatment efficacy.

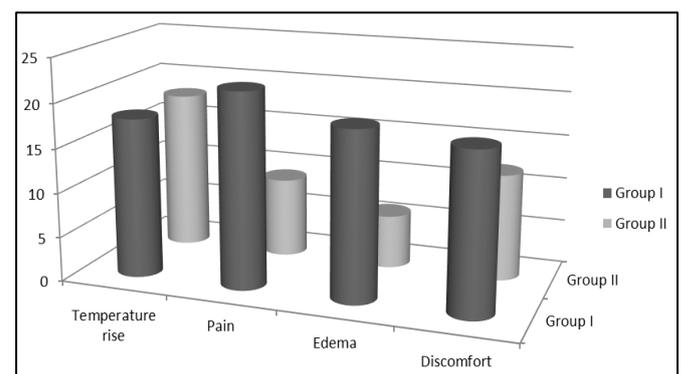
In the course of results statistical processing, all necessary calculations were performed by the method of variation statistics with the use of Statistica, namely the application package of the computer program of medical statistical calculations.

### Results and discussion

The day after our intervention all patients of Group I complained of aching pain in the area of postoperative wound, collateral edema of soft tissues was observed in 21 patients (70.0%), temperature rise to 37.0-38.30<sup>0</sup> C was noted in 18 patients (60.0%), discomfort at the intervention site was detected in 22 patients (73.33.8%), general weakness was observed in 12 patients (40.0%). Suture line disruption was not observed in Group I. Sutures were removed on the 7<sup>th</sup>-8<sup>th</sup> day after the surgery.

The postoperative period in Group II lasted without any complications. Temperature rise in the range of 36.9-37.30<sup>0</sup> C was observed in 18 patients (60.0%), aching pain was noted in 9 patients (30.0%) and discomfort was detected in 12 patients (40.0%).

On the third day, 22 patients (73.33%) of Group I complained of collateral edema of soft tissues, 15 patients (50.0%) complained of minor aching pain and discomfort in the area of surgical intervention. 3 patients (10.0%) of Group II complained of aching pain, 7 patients (23.33%) noted discomfort in the area of the operated tooth (Fig. 1).



\* – the probability of difference from Group I.

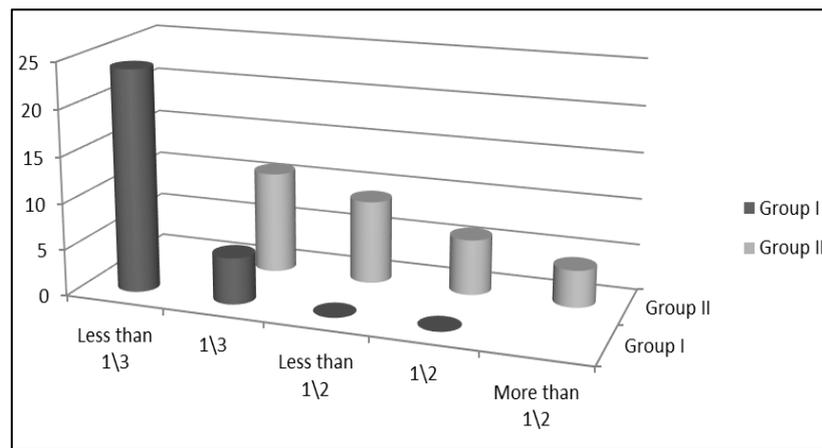
**Fig 1:** Differences in the patients' complaints in both groups on the first day after surgical intervention

In 3 months, the patients of both groups underwent radiological examination in order to control the restoration of bone structures after the manipulations. Bony tissue restoration less than 1/3 from its initial volume was observed in 24 patients (80.0%) of Group I during the study and about 1/3 in 6 patients (20.0%).

Bony tissue restoration about 1/3 was observed in 11

(36.67%) cases in Group II, less than 1/2 restoration was noted in 9 (30,0%) cases and about 1/2 restoration was observed in 6 patients (20.0%), more than 1/2 restoration was detected in 4

patients (13.33%) after postapical diathermic coagulation of cyst envelope (Fig.2).



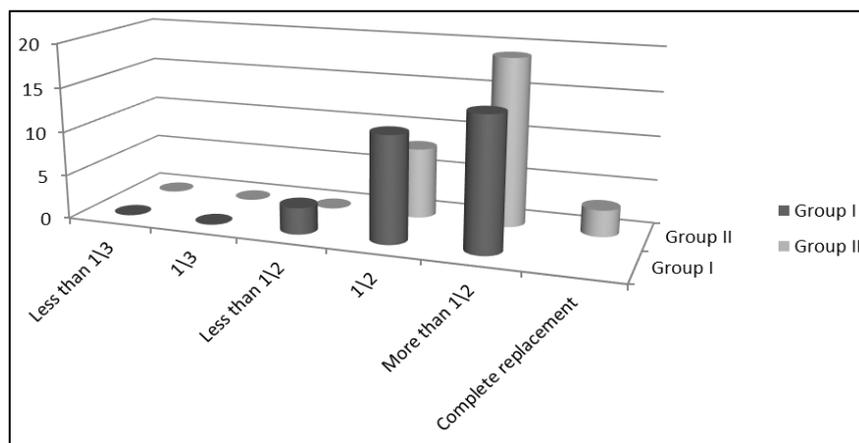
\* – the probability of difference from Group I.

**Fig 2:** Dynamics of radiological picture indices in 3 months after the treatment in the patients of Group I and Group II

The postoperative defect recovery was less than 1/2 in 3 cases (10.0%), within 1/2 of the initial volume in 12 cases (40.0%) and more than 1/2 in 15 cases (50.0%) in the patients of Group I in 6 months.

The number of cases when the recovery of postoperative bone

defect was more than 1/3-1/2 of the existing increased in Group II. About 1/2 recovery was observed in 8 patients (26.67%), more than 1/2 recovery was noted in 19 patients (63.33%), and complete replacement of the defect with bony tissue was observed in 3 cases (10.0%) (Fig. 3).



\* – the probability of difference from Group I.

**Fig 3:** Dynamics of radiological picture indices in 6 months after the treatment in the patients of Group I and Group II

**Conclusions**

The application of transcanal radio-wave cystotomy is possible only in combination with standard endodontic treatment. The advantages of our proposed method include higher effectiveness of treatment in cases of combined pathology, minimal postoperative pain, minimal trauma and quick healing. Since the used frequency is very high, the current produced by the device passes through the body without causing painful muscles contractions or stimulation of nerve endings. Noteworthy is the fact that the important advantage of transcanal radio-wave cystotomy over other types of electro-action is a scarless wound healing and the absence of relapses.

**Prospects for Further Research**

The issue of further study of radio-waves influence on the tissues of the maxillofacial area, clinical, biochemical and histological changes arises taking into account the high prevalence of the disease.

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