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"Optimization of x-ray diagnostic of odontogenic cysts in upper jaw "

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CONTENTS

Abbreviations.

CT-computer tomography

OPG- orthopantomography

Fig.- figure

Tab.-table

Conv.u.- conventional units

Ac- accuracy

Sn- sensitivity

Sp-specificity

PVN- predictive negative result

PVP- predictive positive result

Introduction.

The actuality of the problem.

Prevalence of odontogenic cysts, especially radicular, to a certain extent depends on the population prevalence of dental caries, and the quality of the provision of dental care. In the polyclinic of surgical dentistry on average for 1 year refers about 100 patients with cysts, of which 70% are just radicular cyst. As shown by the statistics radicular cysts are tend to be more spread, and with this is determined such interest to this type of cysts.

A lot of works are devoted to X-ray diagnostics of cystic disease in maxillary sinuses (Vorobyov Y.I., 2004; Faizullin M.H., 2000; Rabuhina H.A. Et al., 2009). Diagnosis of radicular cysts also presented a considerable number of publications (Rabuhina H.A. et al., 2001; Spranger M., 2006; Foksell K. et al., 2009; Abrahams J.J. et al., 2010).

However, published data indicate that diagnostic errors in them are quite common. The latter is due to some peculiarities of the clinical course of cysts of the jaws, and their lack of radiological semiotics. This is especially true cysts, germinating in the maxillary sinus. Moreover, a significant percentage of these cysts occurs with complications as: inflammation of the cystic cavity and sinus, deformation and thinning of the walls of the maxillary sinuses, the germination of the nasal cavity, which leads to the need for more accurate and objective of their diagnostis in order to develop optimal treatment (Amos V.D., 2009; Asnina S.A., 2010; Ovrutsky G.D. et al., 2009).

An objective assessment of the nature and dynamics of these odontogenic cyst is a complex and poorly understood problem. However, in determining the nature of occurrence of odontogenic cysts, assess their current and features of reparative osteogenesis in the postoperative period has a significant place in X-ray methods of investigation (Musienko A.B., 2008; Iordanishvili A.K. 2003, Pluzhnikov M.S. et al., 2004;. Dobrotin V.E 2009; Brannon R., 2010).

In the publications of the last years there has been promising recognition odontogenic cysts on computed tomography (Anyutin R.G. Et al. 2001; Lopatin

A.C. Et al., 2006; Ruston V.E. Et al., 2007; Yoshiura K. Et al., 2007) . However, they are based on small material unfortunately illuminate only certain aspects of the problem

Thus, X-ray and computer tomography character recognition flow odontogenic cysts complement and objectifies clinical data.

Objective

Improving of diagnostic's efficiency of odontogenic cysts in upper jaw with modern diagnostic x-ray methods with studying features of reparative osteogenesis in the postoperative period.

Tasks of the research

- To study the possibilities of radiological methods in the diagnostic of odontogenic cysts in the upper jaw and justify a strategy of using computed tomography.
- To clarify the computer-tomographic semiotics of odontogenic cysts in comparison with the data of the traditional x-ray examination and the results of patients clinical examination.
- To study features of reparative osteogenesis in postcystical cavities using radiological methods.

The scientific novelty of the research

There are defined diagnostic possibilities of radiodiagnostics methods in the verification of odontogenic cysts of the upper jaw with the assessment of process dissemination. There are developed theoretical and practical bases of complex clinical and radiological assessment of the nature and course of odontogenic cysts in the upper jaw, allowing to improve their diagnosis, and also refined features of reparative osteogenesis in postoperative cavities of the upper jaw with biomedical program Image J.

The practical significance of the work

As a result of the use of modern radiation techniques we have a real opportunity to improve the quality of diagnosis of uncomplicated and complicated odontogenic cysts of the upper jaw, including germinating in the

maxillary sinus, as well as evaluating the flow of reparative osteogenesis in postoperative cavities in the upper jaw, which is essential for subsequent medical rehabilitation of patients. The rational sequence of application of different methods of radiation diagnosis in examining patients with odontogenic cysts of the upper jaw is very important.

Chapter 1. Literary review.

1.1 Modern concept about odontogenic cysts in upper jaw.

Cysts are the most common benign tumor-like formations of jaws. Odontogenic cysts - intraosseous retention formations, its appearance is due to impaired development of the dental follicle, or chronic inflammatory process in the periodontium [39]. This position is supported by many researchers [3, 52, 93]. Experimental works allow to determine the etiological factor of occurrence of odontogenic and nonodontogenic cysts in sinuses more accurately [6, 7, 34].

There many classifications of cystic formations of the jaws [3, 34]. According to the International histological classification of odontogenic tumors, jaw cystoid lesions and tumor processes (WHO, №5, 1971), epithelial cysts are classified into developing, including odontogenic (primordial or keratocyst, gingival, eruption cyst, follicular) and nonodontogenic (cyst of palato-nasal channel, globulomaxillary cyst, nasolabial or so-called nasoalveolar) and inflammatory (radicular) tumor-like formations. Thus, according to this classification of odontogenic cysts, in their origin only radicular cysts are associated with previous periodontal inflammatory changes, and the rest are associated with the vices of formation of various tooth tissues, appearing at various stages of its development.

The occurrence of radicular cysts is associated with the development of the apical granulomas, in which epithelial remnants of the periodontal ligament, activated by inflammation, proliferate (Malassez's epithelial rest). At first they lead to the formation of cystogranuloma and then fully paving the cavity form

cysts. In its turn, they suggest to emphasize odontogenic formation into: epithelial, epithelial-connective and connective nature [102, 114]. To the first they include odontogenic cysts of inflammatory origin, odontogenic cysts, that is malformation of tooth-forming epithelium, adamantinoma and odontogenic cancer. To the second they include - odontogenic fibroma, cementoma, odontogenic sarcoma. To the third- soft and solid odontoma. In the subgroup of odontogenic cysts of inflammatory origin they include radicular "tooth-containing" and paradental (conditionally), in the subgroup "odontogenic cysts that is malformation of tooth-forming epithelium" - "primary", follicular and eruption (conditionally) [34, 71, 98, 104].

The constituent elements of odontogenic cysts are: shell composed of connective and epithelial lining and of the cavity. Odontogenic cyst cavity is filled with a liquid or semi-liquid content with accumulated waste products of epithelial lining, in the form of colloids and crystalloids (particularly crystals of cholesterol). The accumulation of epithelial lining waste products leades to increased oncotic pressure, which is accompanied by an increase in hydrostatic pressure in the cavity of the cyst. As a consequence pressure on the surrounding bone increases, osteolysis occurs, which leads to increasing of bone cavity volume (cyst growth) and to deformation of the jaw.

The thin diagnostics between "tooth containing" and follicular cysts was not yet developed [105]. In most cases, the nature of cysts can be only suggested, depending on the features of its localization and the nature of the clinical and radiological data. So, for example, at the location of the cyst in the area of destroyed by caries process deciduous teeth while determining in its lumen crowns of permanent teeth (germ), the diagnosis of "tooth containing" cyst is usually not in doubt.

For "proper follicular" non-inflammatory nature of the cyst is more characterized by the absence of its connection with the teeth mixed dentition, or the location in branches of the jaw. In other cases, it is difficult to make a correct diagnosis.

The term "paradental" cyst is a concept based on the external anatomical and topographical signs pointing to localization's features of cystic formation. In most cases, clinical and morphological comparisons allow to prevent the inflammatory nature of paradental cysts the most likely. At the complicated eruption of the third lower molars paradental cysts can, for example, be formed by immersion growths of surface epithelium of oral cavity mucosa. There is a special group of odontogenic cysts in which there is no any direct anatomical and topographical connection with the dental germs. The similarity of the microscopic structure of these formations with the "proper follicular" cysts, especially of clinical and radiographic manifestations, predominant localization in the angle and in the branches of lower jaw can be considered as a malformation of the odontogenic epithelium [100]. These cysts are conventionally referred as "primary" or keratocysts.

In order to avoid the errors in diagnostics of cysts of the maxillary sinuses, including odontogenic, a number of authors [11, 31, 70] undertaked clinical and morphological, clinical and radiographic differential diagnostics of odontogenic cysts and cysts of nonodontogenic origin.

According to statistical data radicular cysts develop in the upper jaw more often than in the lower [19, 34, 37, 80]. Before turning to the clinic of odontogenic cysts in jaws, it is necessary to stop on the specifics of the spread and growth, depending on the location, as the latter circumstance determines their symptoms and the clinical picture.

According to a more subtle anatomical structure of the upper jaw, the cysts formed here, grow quickly and easily germinate into the maxillary sinus and nasal cavity [6, 11, 5, 95]. In its turn, the thick compact layer of the lower jaw causes the slower growth of cysts and its later protrusion of its walls [34, 54, 67]. It should be noted that the feature of the cysts growth, and its shape is caused by two opposing processes.

On one side, the process of atrophic - bone resorption cysts on the periphery, on the other -protective and adaptive growth of a young bone from the

periosteum, and possibly its appearance in the wall of the cyst. Thus, examining the anatomic and topographic features of cysts spread in the jaws, it is particularly necessary to consider reactive bone features [94].

Some authors consider, that in growth of cysts in the direction to the maxillary sinus new bone forms from the periosteum, resulting this between them bony septum forms. The newly formed bone septum is sometimes much greater obstacle to the spreading in the direction of the maxillary sinus, than other the bone wall. This, they explain the formation of defects in the nose and front walls of the maxillary sinus with its partial filling with cyst and presence between them the bone septum.

Thus, odontogenic cysts of the jaws have certain patterns of distribution, depending on the anatomical features of the structure of the maxilla, in which they develop [54, 61]. Cyst growth processes also depend on the reactivity of the surrounding bone. Cysts of the anterior part of maxilla grow mainly in the labial side.

Clinical manifestations of uncomplicated radicular cyst depend largely on its size. Radicular cyst, until not come protrusion of jaw walls and there is no infection, does not give subjective feelings and remains clinically unnoticed. The latent period of the disease is characterized by the complete absence of any kind subjective and objective feelings.

Cysts in this period, usually identified with the radiological examination or tooth extraction. Cysts of large sizes usually appear as deformation of the jaw and related with it discomfort (during chewing, talking, etc.). Protruding and thinning wall of jaw is covered with intact mucosa and springy when pressed - a symptom of "parchment crunch" or symptom of Dupuytren. In cases with defect of cortical bone of the jaw and subgingival cyst location palpating finger feels fluctuation. Localization of protrusion is characteristic for each "causal" tooth [67].

At growth of cysts from the front teeth toward the bottom of the nasal cavity can appear protrusion of its lower wall. This symptom is called "roll of Gerber".

Many authors point on presence roll of Gerber at cysts coming from the front of the upper teeth. Cysts from the lateral teeth form protrusion or in the area of "canine" pits or germinate into the maxillary sinus [27].

A characteristic feature of odontogenic cysts is their tendency to fester. The frequency of suppuration according to data of different authors is different and varies from 11,2% to 74% [35, 61]. The clinical picture of festering odontogenic cysts resembles acute osteomyelitis or periostitis, and during germination into the maxillary sinus can be accompanied by events of sinusitis [52].

Radicular cysts are often found in edentulous areas of jaws. They develop from the granulomas remaining during extraction of teeth. Such cysts are called "residual" [4, 9, 42].

In the development of follicular cysts are also seen staging [14]. In the first step, marked their latent development with the absence of clinical symptoms; duration of the period is difficult to establish. In the second stage the clinical manifestations are expressed clearly; duration of the period ranging from several months to several years.

In relation to the maxillary sinus radicular cysts can be contiguous, pushes and penetrates [7, 34, 102]. Radicular cyst, which is located within the alveolar bone and the body of the upper jaw from the canines to the third molars and borders with bony bottom of sinus without changing its contours, referred to adjacent to the maxillary sinus. Their sizes are small and they usually occupy an area less than 2-3 teeth. Despite the small size, the cyst, enlarging, deforms the alveolar process of the upper jaw. More frequently protrusion is determined at the vestibular side, rarely from the palate.

Complaints of the patients depends on the presence or absence of inflammation in the cysts. Cysts, pushing sinus, are called those that displace the bony bottom of the maxillary sinus and cause its deformation. Clinic of pushing cysts has some features in comparison with the adjacent one. Cysts that enter into the maxillary sinus like dome at different levels are relates to the penetrating into maxillary sinus radicular cysts. There is no bone tissue between

the cyst's shell and mucous membrane of the sinus bottom. In connection with such differentiation of radicular cysts special interest presents publications, showing that during the growth of a cyst into the maxillary sinus side out of its periosteum there is formation of new bone tissue layers.

There are two main surgical methods - cystectomy and cystotomy. In cases when cyst, with connection to the maxillary sinus, they use oronasal cystectomy and cystotomy simultaneously with maxillary sinusotomy. In addition, there are variations - plastic cystectomy and two-stage operation of cysts. Indications for their implementation depends on etiopathogenesis of the cyst, its size and number of teeth involved into the area of the cyst [26, 107, 108]:

- cystotomy - removal (resection) of the cystic wall's part and the creation of conditions for long-term posts (with the oral cavity, nasal cavity, maxillary sinus) eliminating the main mechanism of the cyst growth - is increasing hydrostatic pressure. Some authors call this method cystostomy, and under the operation cystotomy they understand dissection cyst wall for the purpose of evacuation of its contents. This operation is carried out by emergency indications in acute purulent inflammatory process;
- cystectomy - removal of the entire epithelial-connective tissue lining (cyst's shell) of bone cavity. The operation is completed by convergencing wound edges of the mucous membrane of the alveolar process (closed method of conducting bone injury) or they fill bone cavity with pad (open method).

1.2 Modern methods of clinical and radiographic studies of odontogenic cysts in upper jaw in ambulatory surgical dentistry.

Despite some symptoms of of odontogenic cysts, their clinical diagnosis can sometimes cause difficulties. In this connection, it uses a variety of invasive and non-invasive methods of investigation [73]. One of the simple, widely available and widely used methods of diagnosis of cystic formations is their puncture. At the same time in punctate cholesterol is revealed, the presence of which is characteristic of cysts. Upon accession of infection, the content of the cyst becomes serous-purulent, purulent-hemorrhagic, with or without odor, changes

in color and consistency. The nature of the cystic fluid varies depending on the current process [88].

Research of teeth electroexcitability carried out not only to establish the "causal" tooth, but also to determine the viability of teeth adjacent, or entered into the cystic cavity. It has been established that intact teeth arranged in the zone of cysts frequently have normal (2-6mA - 44, 6%) and less electroexcitability - reduced (28 to 20 mA, 5%). As we approach the "cause" tooth response to an electric current of adjacent teeth abruptly reduces to 40-90 mA or absent at all (16, 6%) [56, 57].

Intranasal endoscopy allows to evaluate the state of the soft tissues in the nasal cavity, outflows tract from paranasal sinuses and the nature of the secret [103].

A major role in the diagnosis of cysts belongs to X-ray methods. Currently, X-ray method of study in dentistry cannot be called a subsidiary. None of dental intervention cannot be considered adequate without a detailed X-ray monitoring. In full measure this applies to the odontogenic cysts [107]. Based on the challenges facing the oral surgeon in planning treatment, it is possible to formulate tasks of X-ray examination, which is an essential component of preoperative preparation:

- The first is the identification of dental system pathology: inflammation, cysts, residual fragments of teeth roots, impacted and dystopic teeth, zones of pathological adjustment or incomplete bone regeneration.
- Secondly, X-ray diagnostic measures should be aimed at the definition of volume and qualitative parameters of bone: height, thickness, inclination of the alveolar process, the width of the outer and inner cortical plates, the length of dental arch defects, bone density characteristics.

Radiographic data are extremely important to detect latent occurring cysts. In process of cysts growth their clinical recognition is facilitated [96]. It is becoming clearer radiographic picture, but it is difficult to identify its true size, spread deep into the bone, the relationship with adjacent parts, the degree of

bone walls thinning [73, 92]. At the same time as reported in literature [55, 75, 76], the resolution of the above issues, sometimes there are some difficulties in the diagnostic. For example, cysts are not always easily detected on X-ray.

At the modern stage in order to detect cysts, planning and preoperative preparation of patients used a combination of different methods of radiological examination. These are traditional X-ray techniques such as panoramic zonography of maxillofacial area (orthopantomography), transversal tomograms of separate dentoalveolar segments, intraoral periapical radiography in isometric view, long focus intraoral radiography. Less commonly they use radiography of the skull in lateral projection, lateral radiography of the lower jaw in oblique contact projection. Such a diverse range of applications radiological examinations due to the presence number of diseases in the jaws, which are clinically very similar to cysts [1, 4, 10, 107].

In examination of patients with cysts the main X-ray technique is orthopantomography that in one survey helps to get a planar representation of entire dental system [33, 111, 112].

Orthopantomography advantage is the combination of panoramic and layering effects. This makes it possible to estimate the position of the maxillary sinus bottom in the upper jaw in relation to the alveolar edge along its entire length, to visualize the state of the mucous membrane in the lower parts of the interior, exterior and posterior walls of the maxillary sinuses. An important drawback of this method is the projection magnification and displacement of anatomical structures, the degree of distortion depends on the type of device and observance of survey rules. The degree of projection zoom of anatomical structures on orthopantomogram in the central and lateral parts of the jaw is not identical. In addition, on the upper jaw it is pronounced image magnification on vertically, and on horizontally the degree of distortion depends on the distance of anatomical structures towards the occlusal plane. It is impossible to establish the bone density on orthopantomogram, which is important in the study of reparative processes after surgery. The difficulty in determining the exact

localization of anatomical structures does not allow to plan volume of surgical intervention correctly. All these factors does not allow considering orthopantomography as effective method for accurate estimation of the parameters of the alveolar process in the upper jaw.

Now the preference is given to digital method producing X-ray image using the CdTe technology, which allows you to see any given area of the image in focus, even when the shooting conditions were not complied. [62]. Digital radiography, radioviziography allows to optimize the diagnostic process, significantly reducing radiation exposure to the patient. The advantages of the method are possibility of obtaining high-quality images with high resolution and contrast, as well as the use of specialized software that allows to improve the visualization of bone structures. The posterior radiographs digital processing allows to adjust the image, to improve the visual quality, to identify subtle differential diagnostic signs of pathological conditions and plays an important role in study of the bone regeneration dynamics in postoperative area of defect [63, 64].

Questions about differential diagnostic of odontogenic cysts covered in the works of some authors, but they require further detailed study, as in some cases various anatomical structures (maxillary sinuses bay, channel openings, etc.). misdiagnosed as cysts. [29, 51, 58, 90].

Until now it is solved the question about possibility of radiological differential diagnostics between granuloma and cyst.

The difficulty of defining the relationship odontogenic cyst with maxillary sinus and nasal cavity is well known [47, 73]. Intraoral contact radiographs does not always allow diagnostic difficulties. In such cases it is necessary radiography of the skull in naso-mental projection. But this projection is unfavorable for the study of the alveolar processes, and especially to determine the relations between the sinus and cyst. In such cases there is arisen a question of use contrast agents. In this case, informativeness of radiographic examination of the paranasal sinuses is significantly increases with contrasting them. The

introduction of contrast agent in the maxillary sinus allows to determine condition of its walls, the shape and size of the gap, to identify cysts, polyps and mucosal thickening, to determine the rate of outflows contents from the sinuses, to monitor the dynamics process during the treatment. Many authors indicate that iodine oily preparations, in particular lipiodol, have a positive therapeutic effect due to the presence of iodine. Introduction lipiodol in the maxillary sinus, not only does not cause any complications, but also helps to reduce inflammatory events in the mucous membrane of sinuses, especially in cases of chronic sinusitis. Contrast mass, in the form of lipiodol is administered mostly through a puncture of the medial wall of the sinuses in the lower nasal passage with a preliminary anesthesia of the nasal mucosa with a solution of 3% dicaine. Puncture of the front wall for the introduction of the contrast mass is rarely used. In the absence of pathological changes in the maxillary sinus contrast agent fills it completely and on x-ray clearly visible contours of the mucous membrane and its thickness. In the presence of granulation tissue, polyps, cysts and other formations there occurs a defect of filling sinuses.

In recent years, water-soluble contrast agents are more and more widespread. Contrasting water-soluble drugs in a lower concentration disguise volume formations in the lumen of the sinus in lesser degree, greatly increase the information content and accuracy of radiologic studies It is also possible double contrast of maxillary sinuses [27].

But to visualize all necessary anatomical structures, to identify the anatomic and topographic features of the jaws and pathological processes, there is not enough radiographic methods listed above, because X-ray is a two-dimensional summation image which does not allow to study objects in depth, i.e., in inner-outer direction. Moreover, due to the required projection distortions caused by technology of receiving X-ray, it is difficult to make accurate measurements. All the above mentioned radiographic methods have certain limits of diagnostic capabilities. These boundaries can be even more narrowed for non-compliance techniques of shooting, positioning errors and individual anatomy of the patient.

Orthopantomogram and transversal tomography do not always allow to assess accurately the degree of atrophy of the alveolar processes in different planes, precisely calculate the distance from the alveolar crest to important anatomical structures. It is impossible to visualize reliably the geometry of the bottom of the maxillary sinus, presence and location of bone septa in the sinuses and the state of their lining mucosa. In these cases, you can use computed tomography in various projections as a method for additional examination of patients with cysts [10, 25, 28].

Almost simultaneous introduction in clinic volume computed tomography (VCT) and intranasal endoscopy changed approach to diagnostics of the paranasal sinuses diseases, as the standard radiographs are used only to limited tasks in diagnostics of the maxillary and frontal sinuses diseases. [55, 89]. Chronic sinusitis is much better evaluated by CT than on standard radiographs, because on the first one, you can also identify the anatomical features that are not available for the second method. Tomograms in the frontal plane are optimal, the axial projection is recommended for any injury or suspected cases on the defeat of the main sinus. Volumetric CT is particularly indicated in cases where surgery is planned, as it facilitates the anatomical orientation to surgeon and prevents the occurrence of some unexpected situations during operation [8].

Due to diagnostics errors of odontogenic cysts it is necessary to develop an algorithm of radiation diagnostics in order to select the next volume of surgical interventions, for solving the question of their conservative or surgical treatment [21, 32, 35], including in complicated treatment, and in the study of the subsequent process of bone regeneration.

Therefore, the interest of clinicians to the possibilities of CT in the diagnosis of diseases maxillofacial area is clear [41, 35, 53]. CT has significant advantages in terms of clarity of the resulting image in the investigated body part, the accuracy of determining the boundaries of formations and the possibility of penetration into the surrounding tissue, the nature and extent of bone's defect[34]. The device's display allows you to select a so-called "zone of

interest" or "window width", i.e. a given amplitude of difference in density, allowing selectively to reproduce the tissue of a certain density. Also volumetric CT has greater resolving power, in terms of differentiation destruction of bone trabeculaes than standard diagnostic methods, allowing to identify the resorption of bone tissue from 1-2 mm in diameter. In this case you can clearly reveal capsule of periapical granuloma or its lack of.

The main studing projections of maxillofacial area are axial and frontal (coronal). In axial projection sections are maken in a parallel line drawn from the outer corner of the eye to the external auditory canal (orbitomeatal line) in the frontal projection - at an angle of 75 -90^0 to it, in conditions of maximum extension of the neck. Computed tomography of the latest generation allows to obtain frontal tomograms by a mathematical reconstruction of the axial slices. Possibility of full visualization of all anatomical structures of the paranasal sinuses largely depends on the survey methodology, which includes laying patient, selection of tomographyc plane, slice thickness, exposure, contrasting way of normal and pathological changes in the structure of the paranasal sinuses [38, 41, 77] . Moreover, the axial plane is the principal at the CT of maxillary sinus, on frontal sections its upper and lower wall are the more visible [82, 83].

An important advantage of CT over conventional radiographic techniques was possibility of estimating the state of the maxillary clefts (anastomosis)on which depends the aeration of the sinus [16, 17]. The sizes of this natural hole in the medial wall of the sinus averaged 8-10 mm. In this zone, there is no opportunity to trace the bone structure in the region up to 2cm (due to the small thickness of the bone); most part of fistula is closed with mucosa. In this sense, CT is ideal method for monitoring the results of functional endonasal operations and maxillary sinuses. Here, it is appropriate to note that in norm in the maxillary sinuses, as in all paranasal sinuses, cannot be seen the lining mucosa due to the small thickness. Even in the absence of clinical symptoms its visualization can be a sign of early lesions of a sinus or result of fibrotic changes

after transferred diseases. Normally, the mucosa of the paranasal sinuses is a soft tissue formation with density 45-60 c.u. H.

Some experts [44, 69, 72] indicate the importance of CT in determining the prevalence of odontogenic cysts in the upper jaw, in the assessment of bone walls of the maxillary sinuses (pushing off, thinning, destruction) and surrounding tissues.

In general, diagnostic possibilities of computed tomography in patients with odontogenic cysts in the upper jaw are studied by foreign authors in detail, in the domestic literature these data are presented at this moment not fully [86].

The disadvantages of computed tomography are relatively high (compared to the radiography) radiation exposure (which does not allow its use in everyday medical practice) possibility of the artifact's appearance from dense structures, movements, relatively low soft tissue contrast resolution [60].

Introduction into medical practice of spiral computed tomography (SCT) has opened up entirely new possibilities in the diagnosis of whole number pathological conditions [45, 48]. In spiral tomography is performed the continuous movement of the tube around the zone under study during parallel movement table with the patient in the longitudinal direction. Trajectory of motion of the tube towards the longitudinal axis of the investigated object takes the shape of a spiral. In spiral scanning the end point of the cut does not coincide with the starting one due to the movement of the object scanning. Quick rotation of the emitter in the spiral computer tomography, absence of interval between cycles of radiation and promotion of the table to the next position significantly reduce the duration of the study, and reduces patient dose of radiation. The peak of development spiral tomography is the emergence of multislice computed tomography (MSCT). In this case they make not one spiral slice, but at one moment 4, 16 or more slices, at the size of detector 0,5 mm (respectively resolution - two pairs of lines per mm).

MSCT provides an opportunity to get more diagnostic information than conventional CT [59]. Due to When MSCT there is possible reconstruction of

images in any given plane. New software and hardware resources allow to carry out post-processing of data. It has become possible to implement not only the primary reconstructions as a set of axial slices by varying the level and the window width, but also the secondary image restoration simultaneously in several specified planes (multiplanar reconstruction) and three-dimensional image reconstruction. Besides this moment there was the possibility of using different modes of visualization, geometric transformations of the objects, measuring their basic geometric characteristics.

So that, the X-ray beam passing through the absorption environment, is attenuated in proportion to the density of tissue occurring in its path, and carries information about degree of its attenuation in each scan position [84, 85], it is possible to obtain the absorption coefficients (AC) of various tissues and fluids. These absorption coefficients are expressed in units of relative to scale, the lower limit is -1000 units H. and corresponds to a weakening of the X-ray radiation in air, upper 3000 units H. For zero accepted absorption coefficients of water. In this way you can measure density of tissues or fluids in Hounsfield units. Especially for implantologists it is very interesting bone tissue density Misch's classification (1990), makes for a compact substance it is 500-1300 u.H. and for spongy substance 100-2400 u.H. The density of the soft tissues, such as muscle, is 40 u.H.

The objectives of MSCT in the planning of treatment and preoperative preparation includes the necessity of defining the structure and density of bone tissue, height and width of the alveolar process, assess the possibility of operation without damaging walls of the nasal cavity and the maxillary sinus bottom, state of their mucous membrane, detecting the presence and position of the gaps in the walls of the sinuses . When a large bone defect appears after surgical intervention on odontogenic cysts there is a necessity of filling defects with osteoplastic materials. In these cases, MSCT is a way to monitor the process of restoring zone of bone transplantation. MSCT - is an additional

method of research, which eliminates the disadvantages of conventional radiographic techniques.

Spiral computer tomographs are equipped with a special program «Denta Scan» in different ways. If you use this software according to data of axial images on each jaws, you should construct curve passing through the center of the alveolar process. Perpendicular to this curve program builds oblique thin slices with a predetermined interval. Each slice is transformed into a single image. Besides this slice program creates a detailed frontal reformate (from 1 to 5 mm), on which digital marks correspond to curve on the axial image.

All types of standard programs have significant drawbacks and difficult in use. In addition, the program «Denta Scan» does not allow to carry out densitometry [6].

The first step of post-processing is to provide the slice in oblique projection coming through the middle of alveolar process. This image is studied in a thick layer (3 to 6, 5 mm), that very well allows to visualize sinuses bottom in the upper jaw, the presence of baffles, the condition of the mucosa. In addition, the image gives a clear picture of the bone tissue restoration in the wells of absent teeth. In the same projection they measure bone density. All data received in the reformates of MSCT correspond to actual size, because the distortions offset in the process of information processing.

Thus, according to the data of most authors spiral computed tomography improves effectiveness of patients preoperative process. MSCT data help to determine the exact size and density characteristics of the alveolar bone, the angle of inclination and height of the bone walls of the maxillary sinuses, the structure of their bottom, the state of the mucous membrane. After surgical procedures MSCT data allow us to estimate the volume and density of newly formed bone, the reaction of the mucous membrane of the maxillary sinuses spent on intervention, post-operative complications.

However, despite a high image quality and accuracy of the calculations, using of MSCT in dentistry has some drawbacks. Firstly, the resolution of spiral

computer tomographs does not allow to provide a detailed picture that is necessary for dentists. It is impossible to obtain an image of the object the size of which is smaller than the resolution of the system. Secondly, the metal fillings, orthopedic constructions which are often in the mouth of patients, cause scattered artifacts interfering identifying anatomical structures. The special features of MSCT include a large radiation exposure, the higher cost of the study and the lack of computer tomographs in a wide network of medical institutions.

Despite the tremendous diagnostic capabilities, until recently, computed tomography as a method of inspection is rarely used in dentistry [21]. This was largely associated with not too high diagnostic requests of dentists, high radiation dose and image quality, insufficient for the needs of therapeutic dentistry. Therefore, with development of CT technology in the beginning of the XXI century, on the market of diagnostic equipment appeared fundamentally new computer tomograph intended specifically for examination of the maxillofacial region. On this day dental volume tomography - is a fundamentally new method of radiographic examination [66, 91].

The principal difference between specialized dental computer tomographs from the serial and spiral CT consists in the following: firstly, in this case, for scanning instead of thousands of point detectors used a planar sensor similar to the sensor in orthopantomograph; secondly, the generated beam is collimated in the form of a cone (cone beam) [87]. Therefore, in foreign literature, this kind of tomography is called Cone Beam. The device has no gantry and constructively also reminds orthopantomograph. Around the patient's head console with sensor and transmitter rotate. During shooting the emitter is operated continuously or pulsed, and with the sensor several times per second information is read, after which it is processed in the computer and restored virtual three-dimensional model of the scanned area. Thereafter, a three-dimensional reformate is cut in layers of axial slices, and each layer is stored in a file format DICOM. Three-dimensional image stored in the computer's memory that allows to the radiologist or dentist to receive any section of interested zone and any

projection. Three-dimensional reconstruction can be rotated and viewed from any angle. Sensors installed in the dental computed tomographs are based on CMOS-matrix, receiving information directly or from CCD-matrix. The signal in this case is perceived indirectly after passing through the electron-optical converter. Dimensions of sensors, and hence the size of the investigated area can be different depending on the company manufacturer. They range from 3x4 cm to 20 x 19 cm.

Specialized dental computer tomographs are designed for a detailed study of bone tissue of maxillofacial region and dental solid tissues. Soft tissues are differentiated only configurational. At the same time, due to the use new technologies in the study radiation exposure as compared with other types of CT is decreased in tenfold. For example, in studies of the skull on the spiral computer tomography radiation exposure to the patient is about 400 mSv. When scanning of maxillofacial region in the dental tomography radiation exposure from 30 to 60 mSv, depending on the degree of exposure and the type of device [30]. This corresponds to the lower boundary of the film ortopantomogramm. That is, we get the same quality and quantity volume of information with minimal radiation exposure to the patient. This method allows to apply cone-beam tomography in the ambulatory and hospital medical practice as a standard diagnostics, treatment and prevention of various diseases with minimal risk to human health.

In its turn magnetic resonance imaging (MRI) is shown when after CT arises a need for additional information about the state of the soft tissue [18, 19, 20, 65]. MRI facilitates differentiation between tumor and inflammatory processes, and multiplanar technique provides better spatial landmark [13, 99, 101, 113]. MPI excludes the use of ionizing radiation, which decisively reduces the risk of this method in comparison with X-rays. However, it should point to three negative factors impact on the body in using this method.

First of all, we must remember that changes in the magnetic field due to its sharp gradients induce electric fields in the tissue. It is believed that when the

field more than the 3T / s, there are currents that can negatively affect the function of the nervous system and heart. However, magnetic field gradients in modern MR-scanners significantly lower than given the critical value.

The second source of danger is the heating of tissue, caused by high-frequency pulses. However, this effect is negligible when using the total power 4W / kg for long and 15W / kg for short-term studies. However, there is a noticeable effect of hyperthermia in metal objects, so greater then higher the degree of ferromagnetism alloy and weight of the object.

Finally, the possible source of danger is the constant magnetic field. However, to date there are no indications that the field is typically used for MRI, could cause any adverse changes in the body [78]. It is believed that the static magnetic field does not cause functional and organic changes in the tissues if its intensity is not more than 2T.

The best visualization of anatomical details achieved on T1-weighted images, T2-weighted sections provide the highest contrast resolution, which is a necessary condition for mutual differences between normal and abnormal tissue.

Normally, mucous membrane of the maxillary sinus is practically invisible on MR-tomograms, in connection with which the dark air sinus area merges with the compact bone tissue of its walls.

The mucous membrane of the nose has a rich blood supply and is visible on MRI slices in virtually all cases, reaching a maximum thickness in the area of the inferior turbinate. For the nasal mucosa is characterized cyclical physiological thickening during the day. This is reflected in increasing signal intensity from side to side, which can be mistaken for inflammatory changes. The phenomenon is known as "nasal cycle", its duration ranges from 5 to 6 hours.

Thus, MRI significantly concedes to radiography and CT in the assessment of bone tissue, but has the highest resolution in the identification of soft tissue in comparison with any of the modalities of diagnostic imaging [91, 109, 110, 115].

Currently MRI technique should be recognized as the most methodologically difficult diagnostic research. However, in none of the works we have not met clearly informed algorithm of patients study with pathology inthe upper jaw and related to her anatomical regions [81].

The outcome of the treatment of odontogenic cysts depends on a differentiated approach to the treatment of their various types [68, 79]. Despite the development of surgical treatment of odontogenic cysts there is developed a number of operational and endoscopic methods of treatment until interventions on an outpatient basis [72]. In this regard, in recent years there is information [12, 36], regarding as the questions of treatment's efficiency and selection the most optimal method [74, 79, 93]. Above-mentioned modern methods of radiological diagnostics contribute to all this. In this regard, the question about standardization of radiation methods stays sufficiently strong.

1.3 Study of reparative osteogenesis's processes.

Diagnostics of odontogenic cysts in jaw, planning of the treatment depends on the precise definition of the extent of the formation's spread, and its results from the monitoring of the regeneration in bone tissue. Optimization of bone tissue regeneration is one of the major problems of maxillofacial surgery [2, 5, 106].

Currently, the main method for studying processes of bone tissue regeneration in surgical dentistry is the radiological examination [9, 36, 50]. The value of radiation research in diagnostics of dental diseases and the evaluation of the quality of the treatment is growing steadily. This is facilitated significant advances in dentistry, and progress in the development of X-ray and computer technology in recent decade. Currently, practically all medical imaging techniques are based on the principle of forming a digital diagnostic imaging. In order to increase the reliability of methods to control the processes in osteoreparation defect radiovisiography is performed with computer analysis of the optical density of the image in the bone defect area [49, 50]. Optical densitometry allows reliable judge the state of the bone structure in periapical

parts and end plate of tooth's well, objectively evaluate the results and effectiveness of the treatment, and the standard visual inspection of X-ray data for the destructive processes in the periapical area is a subjective assessment and is not always reliable.

Digital image processing with using ImageJ programm can improve visualization of circuits, structure of formations and also state of the periodontal slot, end plate of the tooth's well and surrounding bone. With this program, it is also possible to evaluate bone tissue density before and after surgical invention, which is an integral part in study of reparative osteogenesis's processes.

Prospects for further use of digital radiography associated with in-depth study of technical possibilities of modern digital X-ray equipment, the optimization software analysis of the image and the development of more rational diagnostic algorithms of integrated clinical and radiological examination of dental patient profile.

As can be seen from the literature review, dynamics of odontogenic cysts and monitoring of efficiency of treatment are remained outstanding. In special works devoted to modern methods of beam diagnostics of odontogenic cysts, the dynamics of their of development and studying characteristics of reparative osteogenesis in postcystical cavity in the available literature are reflected insufficient. Complications of odontogenic cysts involving sinus bone destruction are few studied. Questions of complex study of odontogenic cysts with modern methods of radiodiagnostics in comparison with clinical and instrumental method are not sufficiently opened. Elaboration of these questions should play a significant role in diagnostics of odontogenic cysts and in choosing the optimal treatment option.

Chapter 2.Materials and methods of the own research.

In the work there are analyzed the results of a comprehensive clinical and radiological examination of 40 patients who applied to the surgical dental polyclinic of the third clinic TMA, including patients hospitalized to the maxillofacial surgery department of the third clinic TMA, about of odontogenic cysts of the upper jaw in the period from 2013 to 2014 .

All patients were performed clinical, laboratory and radiological methods.

Evaluation of patients in the primary treatment in surgical dental polyclinic included the steps indicated on Figure 1.

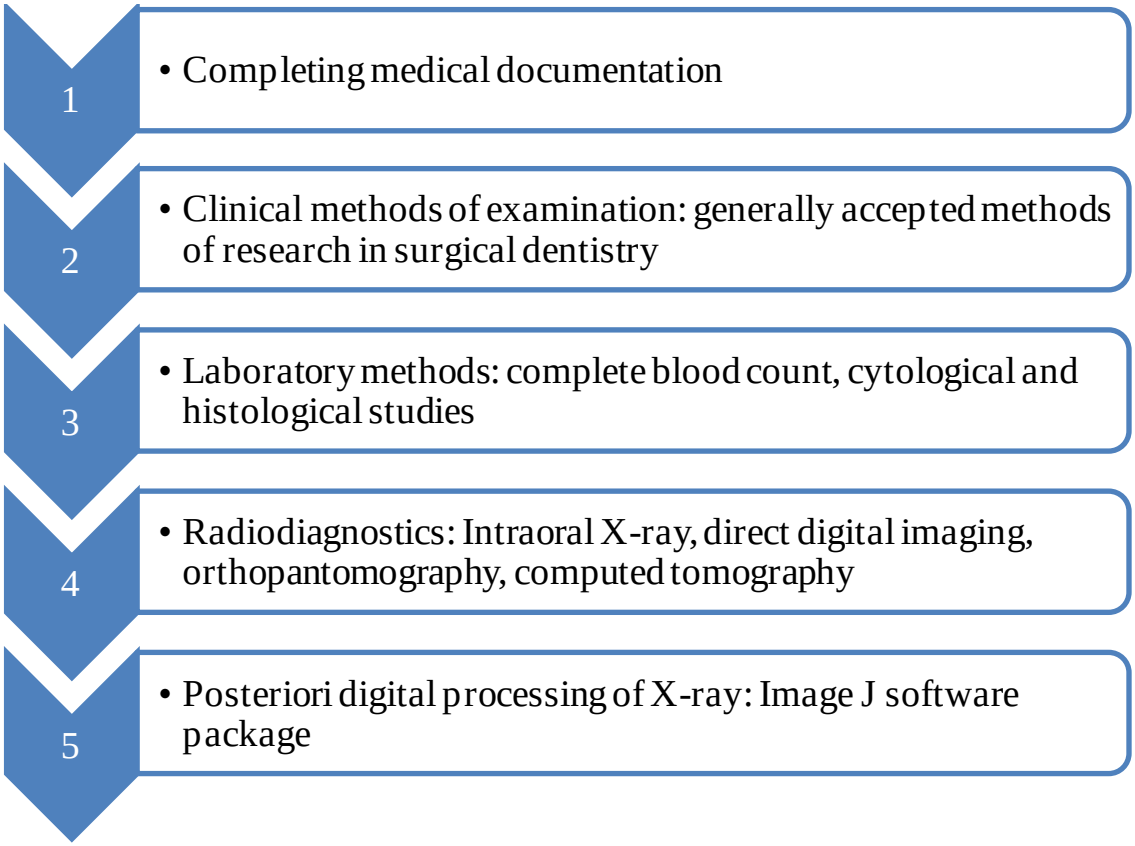


Figure 1. Stages of examination of patients with odontogenic cysts addressed to surgical dental polyclinic.

The main objective of the clinical and laboratory research at the first stage was to assess the health of the patient, with the identification of the general and local indications and contraindications for the upcoming surgical treatment, predetermined volume of surgical intervention and techniques of its execution.

If it was necessary, patients were further examined by experts of other profiles, the treatment plan was adjusted in accordance with their recommendations.

After comparing the data of the anamnesis, clinical and radiological studies plan for operative treatment was compiled - cystectomy, removal of teeth, resection of apex or hemi section the "cause" root. It was important question of the necessity in revision of the maxillary sinus or radical maxillary sinusotomy when removing odontogenic cysts. Possible risk of operations was weighed (for example, perforation at the bottom of the sinus during cystectomy).

2.1 Methods of the research

2.1.1. Clinical and laboratory methods of the research

Clinical examination of patients referred to the clinic of surgical stomatology included the identification of the patient's complaints, a thorough history taking, including the development of disease characteristics and duration of its course, and conducted earlier treatment, its effect, the history of life, carried over and concomitant disease and objective study of the patient.

Thorough and targeted survey of patient allowed to identify the main and secondary complaints, professionally evaluate them. In a survey of figured out with what the patient relates the emergence, development and dynamics of the disease, the nature of the accompanying sensations and dysfunctions. Patients complained of the presence of swelling, deformation of the alveolar process, in some cases, to change the configuration of the face, unpleasant taste in the mouth and pain. It considers the nature of the pain, its acuteness, specificity, frequency and other features. In addition to local signs of the disease, were evaluated changes in the general condition of the patient: headaches, malaise, loss of appetite, sleep. The deterioration of the general condition, increasing of complaints oriented us to the need for urgent hospitalization and surgery

Already at the first stage of this survey this allows to do the first diagnostic hypothesis.

In studying the history of the disease there were refined dynamics of the disease. Found out when the first symptoms appeared, what they were, who saw them (the patient, the physician), where the patient was treated for help, what treatment was carried out and what was its result.

In studying the history of life, first of all drew attention to the mental condition, premorbid factors of personal perceptions of the disease, working and living conditions, nutrition, rest of the patient, physical education, detect the presence of harmful habits (smoking, alcohol, drugs, narcotics). All these data allowed to get represence of the physical and moral health of the patient. Putting history, we found out the presence of hereditary, allergic, autoimmune, immunoproliferative diseases and malignant tumors. It is possible to give an objective assessment of the functional state of the organism as a whole, the various systems and protective reactions.

Interviewing the patient, it appears earlier transferred diseases, their course, the effectiveness of the treatment, residual effects, in order to reduce the risk of complications in the preparation and after surgery.

Dental examination was begun with an assessment of local status, which was assessed by the results of the inspection covers of the external face of the vestibule of the mouth and oral cavity. It was taken into account changes in the teeth-jaw system, transferred somatic diseases, including in the maxillofacial region (especially the maxillary sinus), and the presence of concomitant systemic diseases.

In a study of patients with odontogenic cysts also drew attention to the reconfiguration of the person, flattening the nasolabial folds as well as the state of the skin and mucosa (color, elasticity, signs of inflammation - redness, swelling, infiltration, pain, the presence of the fistulous, state of sensitivity, etc.). We took into account the results of palpation: localization, the nature and boundaries of odontogenic cysts, compliance of bony walls, the presence of bone defect and "parchment crunch", the state submandibular, submental,

cervical lymph nodes (their size, mobility and pain). Particular attention was paid on the localization of cysts.

With regard to the teeth, there was paid attention on their convergence, mobility, and presence of seals, pain in probing and percussion and more. For more information elektroodontometric research gave results that were carried out to determine the vitality of the teeth adjacent to the cyst. By increasing the threshold of electroexcitability in teeth adjacent to the boundaries of the cyst and more than 60mA endodontic treatment was performed by a physician dentist.

When analyzing rinological paintings attention was drawn to state of nasal breathing (not broken, difficult, absent), the color of the mucous membrane of the nasal cavity, the presence of the Gerber roller and pus.

About the size of cysts in the upper jaw was judged by the results of clinical and radial examination of patients. In view of these points are marked the cyst of small size, medium and large sizes. Also when examining patients various anatomical and morphological and topographical structure of the individual sections of the upper jaw was taken into account.

Considering the different anatomical and morphological and topographical structure of the individual sections of the upper jaw, it was divided into three sections: front - the area of incisors, the front-lateral - the canine and premolar and lateral - the molars

Laboratory examination methods included a complete blood count (n = 40) for assessing the content of hemoglobin in the blood, red blood cell count, color index, number of white blood cells, platelets. Complete blood count allows you to see leukogram and erythrocyte sedimentation rate (ESR).

That allowed to reveal anemia (decreased hemoglobin, leukocytic formula), inflammation (leukocytes, leukocytic formula), etc.

If you suspect a malignancy performed cytology punctate of cysts and histological study of the remote formation (n = 13).

2.1.2 Methods of x-ray diagnostic of odontogenic cysts in upper jaw.

To solve assigned tasks to patients with odontogenic cysts in the upper jaw radiation diagnosis was carried out using the contact dental radiography, digital orthopantomography and computer tomography of the facial skull.

On the planning phase, all patients (n = 40; 100%) was performed intraoral dental radiographic examination in different projections. In addition, all patients were divided into 2 groups. The first group of patients - the control (n = 20; 50%) is performed digital orthopantomography. Patients of the second group - main (n = 20; 50%) was carried digital orthopantomography and computer tomography study (Table 1).

Table 1

Methods of x-ray diagnostic	**Number of studies**
Intraoral dental radiographic examination	40
Digital orthopantomography	40
Computer tomography	20

To assess the state of periapical X-ray apparatus used or ProX RAY ProSesor (Figure 2).

The study was conducted in the traditional way: the film was introduced into the oral cavity and the patient held it to alveolar process and palate in studying area by the first fingers. To minimize distortion of projection the central beam is directed in accordance with our scale tilt angles of the tube for each group of teeth: maxillary incisors to 50-55 °, canines 45 °, premolars 35°, molars 25-30 °.

Fig. 2. X-ray apparatus ProX, direct digital imaging ProSesor

For inspection of the anterior part of the alveolar process the upper jaw and the palatal plate were made intraoral dental radiographs in occlusion (n = 12), which characterized the condition of the teeth and periodontal. When X-ray was into the bite film has been introduced in the mouth and fixed with serried teeth, the central beam passed perpendicularly to the film through the root of the nose.

Also there were made survey images of the skull in naso-mental projection (n = 9). Such shots allows to identify diseases of the paranasal sinuses, as well as the level of darkening of the maxillary sinuses. The patient being in an upright position, concerns cassette with chin and tip of the nose, mouth is opened, the central beam is directed vertically (perpendicular to the plane of the tape) just below the edge of the upper incisors.

Digital orthopantomograph (OPG) (n = 40) was used to study the facial bones and for better visualization of the lower divisions of the maxillary sinus (pneumatization type, the presence of septa, lightness) and to identify odontogenic cysts in the upper jaw, germinating into the maxillary sinus.

Digital orthopantomography performed on the apparatus «Planmeca» (Finland) (Figure 3), allows you to store the results in digital form in good quality that helps you quickly find previously made several shots to impose on each other and to trace the dynamics the recovery.

The patient is in a standing position, with his maximum straightens neck, the head is fixed, conditional tragoorbital line makes with the horizontal plane an angle 5-10 °. Sagittal plane is strictly perpendicular to the floor cabinet. Lips are in a closed form, tongue is pressed to the upper teeth and the palate. Beam source (X-ray tube) and a receiver (film or digital sensor "move around (270 °) goes around its head in opposite directions.

Figure 3. Orthopantomograph Planmeca

Computed tomographic (CT) study (n = 20) was carried out on the apparatus J.Morita (Japan) (Figure 4). The study was carried out with the patient positioning standing, centration was followed the corresponding light labels. Y-axis is the vertical position of the patient was determined by lateral laser, axis X-horizontal position with the upper laser. Scanning area included both the upper

and lower jaws. We started with digital projection tomography, designed for layered imaging anatomy. On average, to every examinee were done 10-15 tomograms in steps of 5 mm slice thickness of 5 mm. If it was necessary in order to accurately determine the nature of the destruction of bony walls, tomography were removed with step 1; 2mm. The primary information about the status of facial bones were represented as standard reconstructed axial slices. During postprocessing multiplanar reconstruction were built in the sagittal, frontal, oblique projections and curved sections, was performed 3D - visualization.

Figure 4. Computer tomograph J.Morita. (Japan)

In the study of volumetric CT scan of the upper jaw establish a causal tooth, there were evaluated shape, true size of the cyst, the direction of its growth and the degree of sprouting in the sinus cavity, as well as the relationship with the roots of adjacent teeth and state of bone tissue in the alveolar bone. Differential

diagnosis between odontogenic cyst, germinating into the sinus cavity, and the true sinus cyst (absence of bone septum that separates the true cyst cavity of the sinus cavity, absence of connection with the roots of the teeth, various cysts forms and intensity of her blackout zone on the X-ray, etc.). CT allowed us to study the status of bone walls surrounding odontogenic cyst - dense, uniform layer of bone, possible thinning or its absence; at the same time, as a rule, there was determined contact cysts and sinus mucosa.

Studying of parameters such as: accuracy (Ac), the sensitivity (Sn) and specificity (Sp) allowed us to study the effectiveness of methods of radiation diagnosis. The calculation of these parameters was performed using the following formulas:

$$Ac = PS+ NH/ PS+ NS+ PH+ NH,$$

$$Sn = PS / PS + NS,$$

$$Sp = NH / PH + NH,$$

where:

PS- the number of true-positive results;

NH- the number of true negative results;

PH - the number of false-positive results;

NS- number of false-negative results.

For the true positive (negative) result was taken the case of a positive (negative) matching on data of conclusion x-ray studies with a final diagnosis. For a false positive (negative) result was taken the case of a positive (negative) conclusion on the radiological examination, without an appropriate final diagnosis. Variable values PS, NH, PH, NS were calculated according to Table 2.

Table 2

Compared methods	Reference method	
	Existence of pathology	Absence of pathology

Investigated method	Existence of pathology	PS	NH
	Absence of pathology	PH	NS

The main interest, from a practical point of view, to assess the results of the study is the probability of coincidence with the conclusion of the final diagnosis. For this purpose, we evaluate the performance of predictability. Predictive positive (PVP) is defined as the frequency of its coincidence with the disease:

$$PVP = PS/PS + PH.$$

Predictive negative result (PVN) is defined as the frequency of its coincidence with the absence of the disease:

$$PVN= NH/ NS+ NH.$$

Verification of the results of research carried out in the course of surgical intervention and observation in the postoperative period.

2.2. A posteriori digital processing of X-ray.

In order to study the quality of the treatment and the dynamics of reparative processes in the postoperative defect, analysis of radiographs were performed before and immediately after cystectomy surgery, in one, three or six months after surgery. On radiographs were measured density of the newly formed bone tissue in the defect. The measurements were performed on digital images using Image J (National Institute of Health, USA. http//rsb.info.nih.gov/ij).

To estimate the density of newly formed bone was measured difference between the average luminance value of pixels in the defect region and the adjacent healthy area of bone. The results are displayed as a bar graph with the average values. Because the brightness does not depend only on the density of the object, but also on the machine's settings to avoid the influence of the settings on the index, were calculated relative performance. In calculating the

relative density of the bone, the following formula. The formula calculated the relative density after cystectomy and in 3 months.

$$\text{Relative density} = \frac{\text{The average value of bony density in the area of cyst}}{\text{The average value of bony density in the surrounding part}} \times 100\%$$

These data A - immediately after extraction and B - 3 months subtracted between themselves.

Indicators of norms of relative bone density in the ImageJ range from 150 to 200 units.

2.3. Statistical data processing.

Digital data obtained during the investigation, subjected to statistical analysis using the Student t- criterion and Fisher's exact test [Gubler E.V.; Lakin G.F.]. For computer analysis of results of research was used the software package Microsoft Office Excel 2010 / Windows XP, where the received information is processed by variation statistics. All statistical methods were based on the principles of evidence-based medicine.

Chapter 3. Results of the own research

3.1 Results of the study of clinical material.

In a clinical study were involved 40 patients with odontogenic cysts of the maxilla. All patients diagnosed with radicular cyst.

Quantitative and percentage distribution of patients studied by gender and age group is presented in Table 3.

Table 3.

Age groups	Men		Women		Total	
	abs.	%	abs.	%	abs.	%
19-29 y.o.	7	17,5	5	12,5	12	30
30-39 y.o.	6	15	7	17,5	13	32,5
40-49 y.o.	1	2,5	9	22,5	10	25
50 and older	1	2,5	4	10	5	12,5
Total:	15	37,5	25	62,5	40	100

As can be seen from the table 3, surgical intervention in about odontogenic cysts in the upper jaw was made to 15 men (37,5%) and 25 women (62,5%). The study was conducted in the age groups of 19 to 60 years. The average age of patients was 37,2 years. The highest proportion of men fell in the age group of 19 to 29 years (n = 7; 17, 5%). In the age categories from 40 to 49 years we have seen an increasing number of female patients (n = 9, 22.5%).

Studying history data of patients, it was noted that more growth of cysts was slow (n = 65%), unbeknownst to the patient without causing discomfort, and

often discovered by chance during examination by physicians of other profile, as demonstrated on the figure 5.

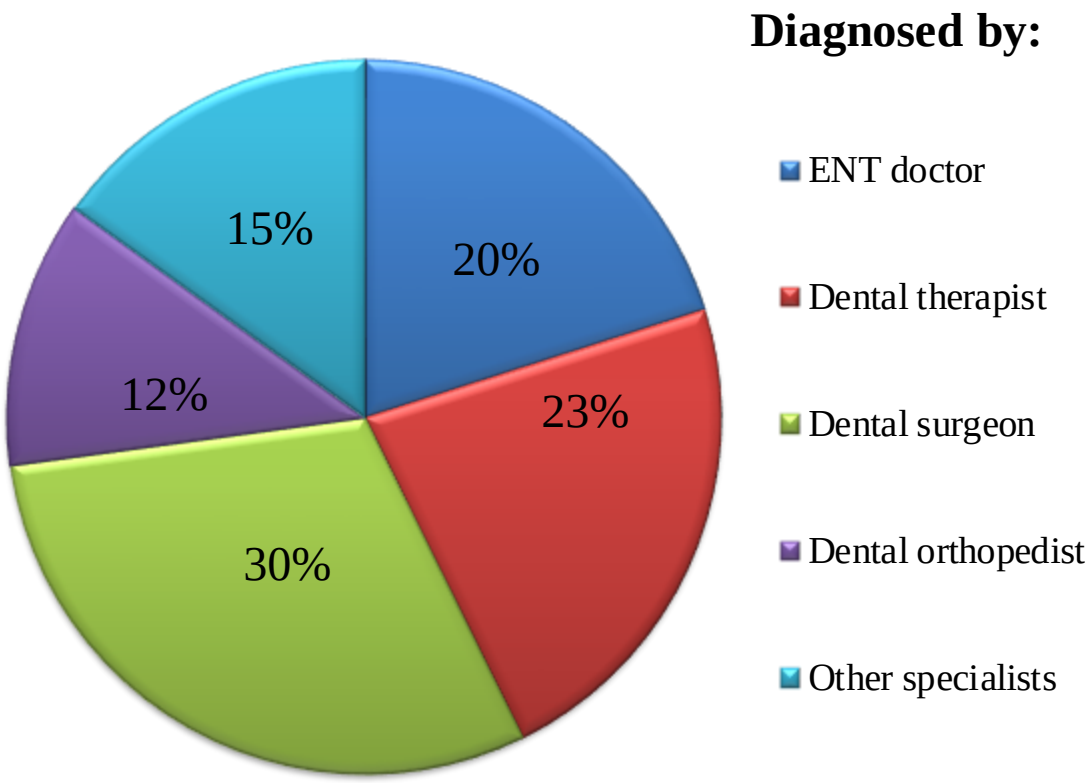


Figure 5.Distribution of patients with odontogenic cysts of the upper jaw depending on the primary of diagnosis.

In 20% of cases of odontogenic cysts were found out by ENT doctors in the treatment of patients with complaints of difficulty of nasal breathing (nasal congestion), usually on the side of the lesion, a feeling of heaviness, fullness in the cheeks, etc. In 23% of the patients cysts in the upper jaw were found at a reception at the therapist-dentist, 12% of patients the cysts were found at a reception at the orthopedic dentist during the examination maxillofacial complex for selecting prosthetic. 15% of patients were referred to a surgeon dentist by other specialists (neurologists, neurosurgeons, therapists). 30% of patients with

the appearance of symptoms characteristic of the cyst turned to the dental surgeon.

Depending on the duration of the disease., patients were distributed as follows: the largest number of patients, 65,5% indicated that the disease appeared till 1 year, 25% from 1 year to 3 years, 12,5% - more than 3 years (Figure 6)

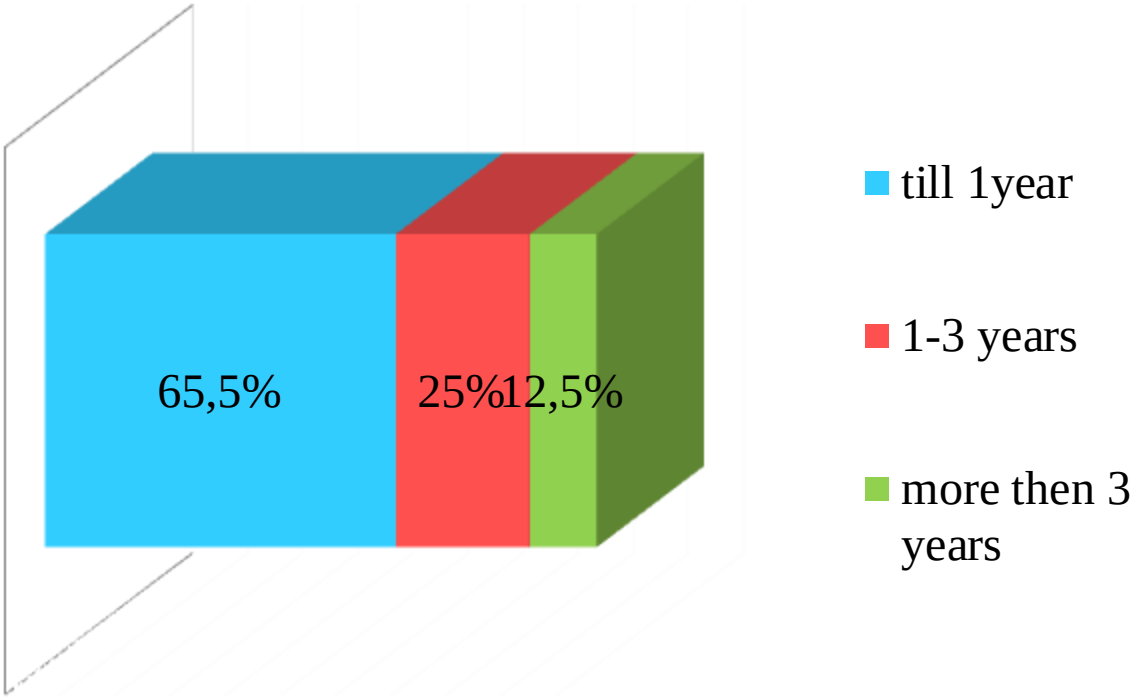


Figure 6.Distribution of patients depending on the duration of the disease.

The reason for the occurrence of cysts in the surveyed patients was often odontogenic inflammation, than trauma or other causes. Odontogenic cyst observed in 33 patients (82,5%), posttraumatic cysts were in 3 patients (7,5%). Also in 4 patients (10%) were diagnosed, so-called "residual" cysts. Common causes of late diagnosis of "residual" cyst was the lack of X-ray control to remove the tooth and errors in treatment methods (a technique of removing the wrong hands). "Residual" cysts were observed in the anterior part of upper jaw.

Frequency of radicular cysts arrangement of separate groups of teeth is different and is reflected in the table 4.

Table 4.

Section of jaw	**Causal teeth**	**abs.**	**%**
Front	First incisors	8	20
	Second incisors	7	17,5
Anterolateral	Canines	6	15
	First premolars	4	10
	Second premolars	5	12,5
Lateral	First molars	6	15
	Second molars	4	10
	Third molars	0	0
Total:		40	100

Table 4 shows that the cysts in the anterior teeth were more common in the central incisors (n = 20%) in the anterolateral section of jaw - from canines (n = 15%). In lateral section of jaw cysts were more frequent on the first molars (n = 15%). Cysts of the third molars in this study were not found.

Such localization of cysts by section in jaws is caused by the presence in this area of various pathologies. Frequency lesion of respective groups of teeth depending on the causative tooth is shown on figure 7.

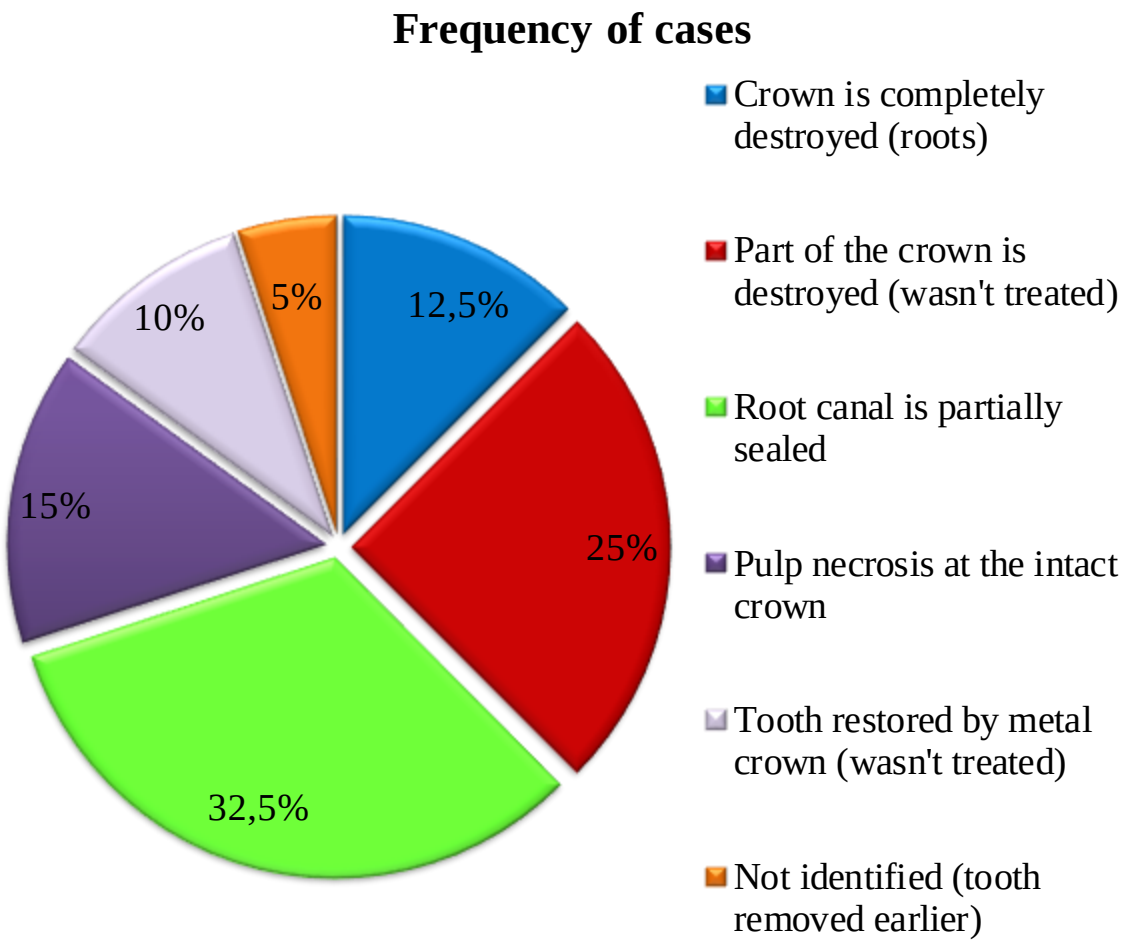


Figure 7. Distribution of patients with odontogenic cysts in the upper jaw, depending on the causative tooth.

Clinical observations have shown that the growth of cysts, mainly distributed in the vestibular side of the mouth. This was observed, depending on the location of the cyst and its size, a characteristic deformity of face and alveolar bone, cortical bone thinning and bulging of a certain area of jaw (Figure 8), thinning or destruction of the bone wall, including the vestibular - at 32,5%, the palatal - 10%.

Visual signs

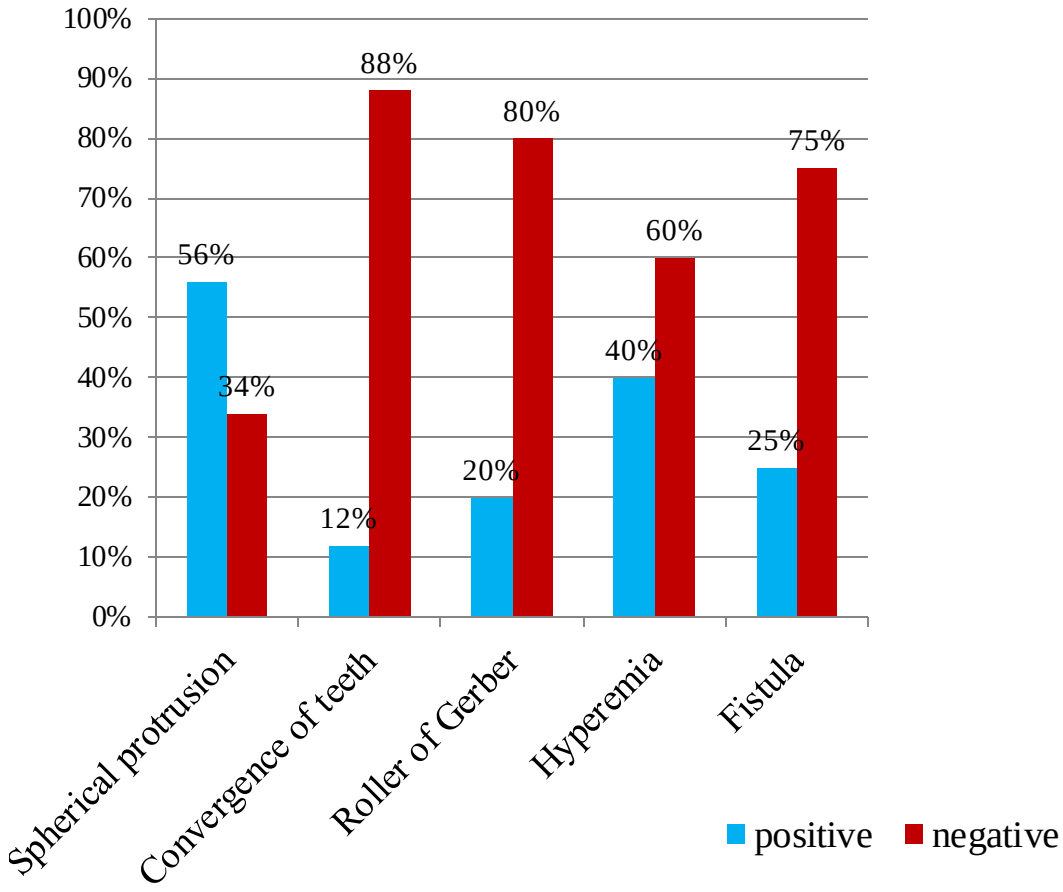


Figure 8. Comparative frequency of the most visual characteristic symptoms of radicular cyst.

Also oval of the face was prolonged, the upper lip was lifted, the wing of the nose deformed and smoothed nasolabial or transitional fold. Cysts size is not always determined by the clinical picture: so sometimes large cysts clinically not manifest itself (n = 7,5%), while the small size of the cyst can cause local deformation of the alveolar bone (n = 10%). As a rule, often there was deformation of the outer plate of the alveolar process (n = 87,5%), less often - palatal (n = 12,5%). Protrusion from the palate usually noted in the cysts coming from the second incisors (n = 7,5%). Rarely cysts were observed distorting at the same time as the outer plate of the alveolar process and so palatal (n = 5%). The skin and mucous membranes of the oral cavity with the no suppurated cysts

were remained unchanged, mobile, elastic, normal color. Often it appears shortness of nasal breathing, stick out the bottom or side wall of the nasal cavity.

During escalating symptoms of cysts lost their specificity. In 12,5% of cases there was deterioration in the general condition of patients. At the same time, patients complained of headache, weakness, malaise, loss of sleep and appetite. In 10% of patients body temperature sometimes rised to 38 ° C. For the skin of the face and oral mucosa reactive changes manifested as redness, swelling, infiltration, and severe pain.

Comparative characteristics of the visual and palpable signs of odontogenic cysts in the upper jaw are shown in fig. 8 and 9, which shows that the most common visual symptoms are spherical protrusion (n = 56%), and palpatory - pain (n = 86%).

Palpable signs

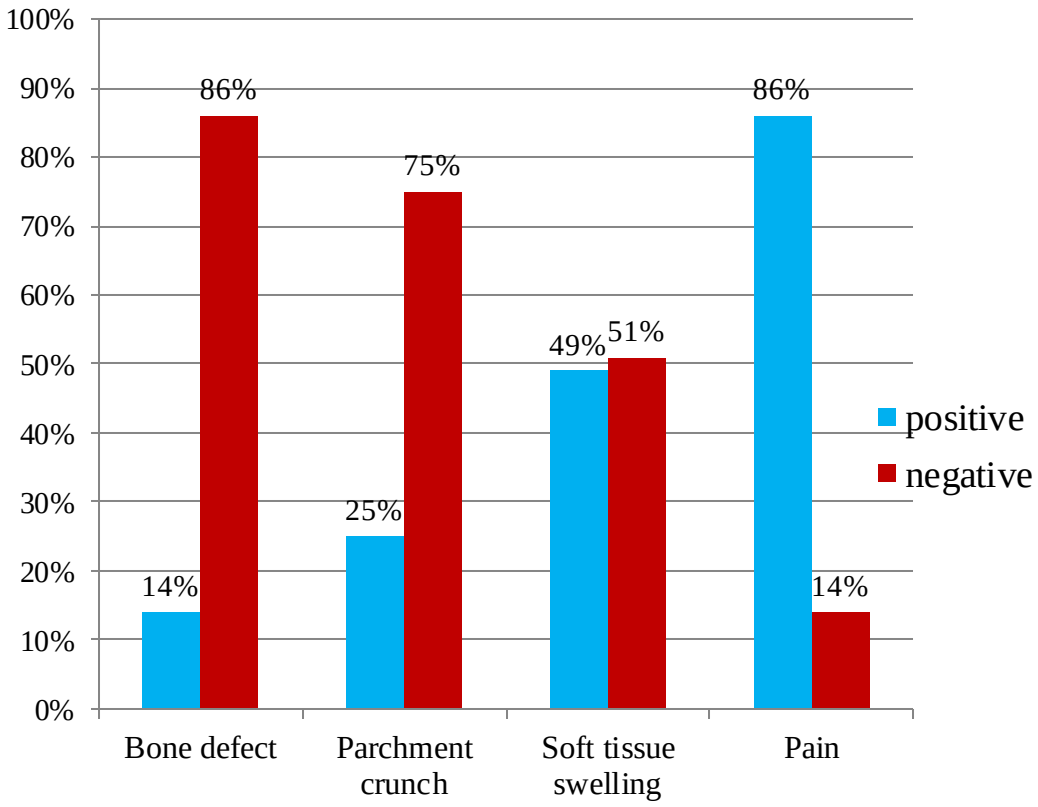


Figure 9. Comparative frequency of the most palpable characteristic signs of radicular cyst.

1.2 The results of laboratory research.

Laboratory methods of examination of general blood analysis (n = 40) showed that there were not any contraindications for further surgical intervention there. So average indicators level of hemoglobin in the blood of women amounted to 106 g / l in men = 118 g / l, the number of red blood cells in the blood of women = 3,8 * 10^{13} / l in men = 4,2 * 10^{13} / l color rate among patients of both genders = 1, number of white blood cells =10, ESR = 13 mm / h. Blood tests revealed that patients do not have contraindications to the operation.

Histological study of the extracted formation (n = 13) in 100% cases confirmed diagnosis of radicular cyst.

3.3. Results of x-ray diagnostic.

All of the patients, depending on the applied methods of radiation diagnostics were divided into two groups: the main group (n = 20) and control group (n = 20). To patients in both groups series of dental sighting shots were produced. In the first group of patients examination carried out mainly digital orthopantomography (OPG), the second group - orthopantomography and computed tomography, as clarifying method.

Depending on the clinical course and the ray examination of patients with odontogenic cysts in each group were allocated two subgroups: patients with radicular cysts within the bone and radicular cysts germinated in maxillary sinus (tab. 5).

Table 5

	Cysts within the bone		**Cysts germinated into maxillary sinus**	
	abs.	**%**	**abs.**	**%**
Group 1	18	45	2	5
Group 2	12	30	8	20
Total:	30	75	10	25

Also, in each group were allocated patients with not suppurated cysts (without deformation and with deformation of bone) and suppurated cysts (in the acute stage, and without it, with the deformation and deformation without bone) (tab. 6).

Table 6.

	Suppurated cysts				**No suppurated cysts**			
	without deformation of bone		with deformation of bone		without deformation of bone		with deformation of bone	
	abs.	**%**	**abs.**	**%**	**abs.**	**%**	**abs.**	**%**
Group 1	1	2,5	2	5	13	32,5	4	10
Group 2	0	0	2	5	10	25	8	20
Total:	1	2,5	4	10	23	57,5	12	30

Given the radiographic data there were allocated cysts of smaller sizes, which were located in the region of one tooth (n = 13) (1-1,5 cm.), medium - in two or three teeth (n = 18) (within 1,5-3 cm.) and large - in four or more teeth (n = 9) (Table 7, Fig. 10). The average size of the cyst among patients in both groups was 1,9 cm

Table 7

Section of jaw	**Causal teeth**	**Small**		**Medium**		**Large**	
		абс	%	абс	%	абс	%
Front	First incisors	4	10	4	10	0	0
	Second incisors	3	7,5	4	10	0	0
Anterolate	Canines	3	7,5	3	7,5	0	0

ral	First premolars	1	2,5	2	5	1	2,5
	Second premolars	1	2,5	2	5	2	5
Lateral	First molars	1	2,5	2	5	3	7,5
	Second molars	0	0	1	2,5	3	5
	Third molars	0	0	0	0	0	0
Total:		13	32,5	18	45	9	22,5

Analysis of the data indicated in table 7 shows that the cysts of small and medium-sized frequently detected in the anterior (n = 37,5%) section, than in the anterolateral (n = 30%) of the upper jaw. In turn, in anterolateral section they were more frequent than in the lateral part, of 30% and 10% respectively. Regarding large cysts, they are preferably arranged in a lateral section (n = 15%) of the maxilla, in contrast to which the other two sections are detected less frequently. In general, the upper jaw cysts number average size was greater (n = 40%).

In the first and second groups there were dominated patients with cysts of medium sized cysts: in 1st group - 9 people (45%), in the 2nd - 9 people (45%). Patients with cystic small sizes in the 1st group were 35% (n = 7), large 20% (n = 4). In a second group of small dimensions cysts occurred in 30% (n = 6) patients, large - in 25% (n = 5) (Fig. 10).

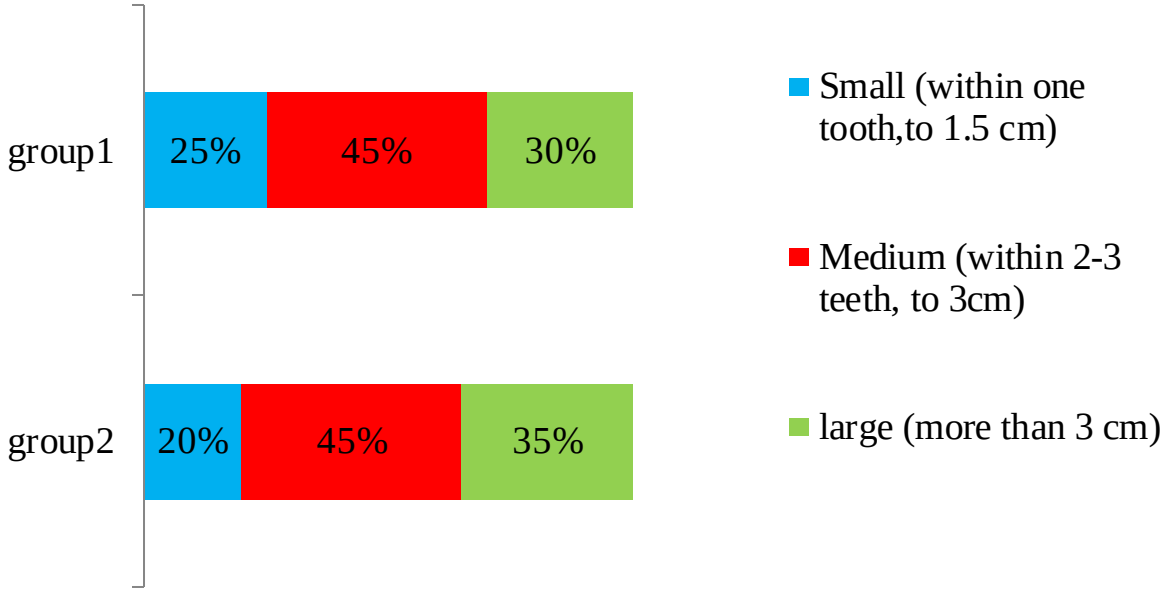


Figure 10. Distribution of patients with the size of odontogenic cysts of the upper jaw.

The obtained data of radiation survey were analyzed in two ways: visual (qualitative) and densitometric image analysis (quantitative) analysis. The criteria for qualitative analysis were: localization of lesions, number, shape, contours, structure, state of the lower divisions of the maxillary sinuses, the relationship with the near lying areas. The criteria for quantitative analysis were: studying of bone density before and after surgery.

In cases with small size of cysts in both groups (n = 40) intraoral X-rays and OPG were the main methods of diagnostic. Due to them were gotten comprehensive diagnostic data: the shape and approximate size of the cyst, its relation to the roots of adjacent teeth, which was a great importance for planning subsequent surgery (tab. 8).

In cases with small size of cysts the part of bone destruction detected in the area of one tooth. The ratio of the tooth to the bone cavity before the operation and after removal of the cyst are determined quite clear. In the case of the small size cysts in the 2nd group it was not necessary to carry out computer - tomographic study.

Table 8

X-ray and computed tomography signs of small size odontogenic cysts

Signs	X-ray	CT
Size and shape	correspond to the true	wasn't assessed
Structure	homogeneous	
Intensity	high	
Outlines	clearly defined border of cyst distribution	

In cases of distributing cysts in the region of several teeth, their roots were represented like displaced or involved into the cyst cavity. On OPG were not always clearly defined boundaries of the cyst, unlike computed tomography studies, which clearly defined the boundaries of the cysts spread, as well as thinning and deformation of the bony walls (tab. 9)

Table 9

X-ray and computed tomography signs of medium and large size odontogenic cysts

Signs	X-ray	CT
Size and shape	correspond to the true	correspond to the true
Structure	homogeneous	homogeneous/nonhomogeneous when suppuration
Intensity	high	medium
Deformation of the maxillary sinus	not always clearly defined border of cyst distribution	clearly defined border of cyst distribution
Thinning, destruction of bony walls	often lower parts of the anterior-lateral and medial walls (in	clearly defined (in the early stages

	the later stages)	

Clinical data and radial surveys in patients of the first group with cysts medium sized converged in 77,7% with the data obtained during the operation and patients in the second group converged in 100%.

In cases with cysts of medium and large sizes, germinating into the maxillary sinus, intraoral shots did not give a full picture of the cyst topography and the nature of its spread in the maxillary sinus. On ortopantomogramm there was determined partial (group 1 - n = 1; group 2 - n = 2) or full blackout (group 1 - n = 3; group 2 - n = 3) of corresponding sinuses.

Sometimes, on the extraoral shots there were well contoured rounded shadow of the cyst on the background of the maxillary sinus. In cases with computed tomography of the paranasal sinuses of patients in the second group in 6 of the 8 cases, on CT were determined the change in the mucous membrane of the maxillary sinus - a thickening of the wall in the projection of odontogenic cyst (3 cases), to the changes of the mucous membrane like cushion (3 cases), reaching 1/2 sinus. When the cyst occupied a third of the maxillary sinus (3 patients) that was detected on the CT scan, only in 1case on OPG there were determined radiological signs of sinus cysts. In other cases, the picture was regarded as either parietal thickening of maxillary sinus mucosa or as polypous mucosal changes in maxillary sinus (3 patients).

In the study of no suppurated cysts quality indicators (n = 60%) sensitivity of OPG was 77,63%; specificity 78,9%; accuracy – 93,4%, and of CT- 95,6%; 91,3%; 93,4% respectively (Fig. 11).

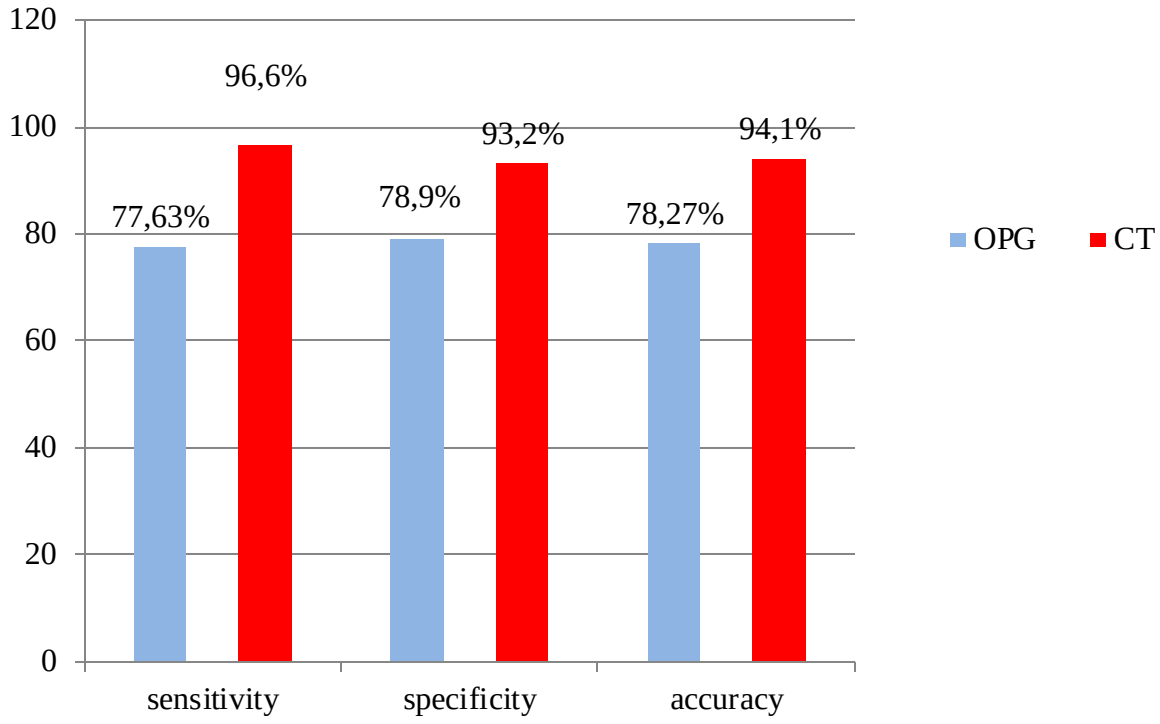


Figure 11. Comparison results of diagnostic indicators of nonsuppurated cysts.

Germination of odontogenic cysts in the maxillary sinus was determined in 30% of patients who was undergone CT examination. Qualitative analysis of the sensitivity, specificity, and accuracy of the method in this case amounted to 95,65%; 91,3%; 93,48%, respectively. Suppuration of cysts content was observed in 40% of patients. The sensitivity of CT was 90%, specificity-86,95%, accuracy – 85,29%. The destruction of bony walls was observed in 25% of patients. The sensitivity, specificity and accuracy of CT in the detection of this trait amounted to 91,67%; 95,65%; 94,29%. (Fig. 12).

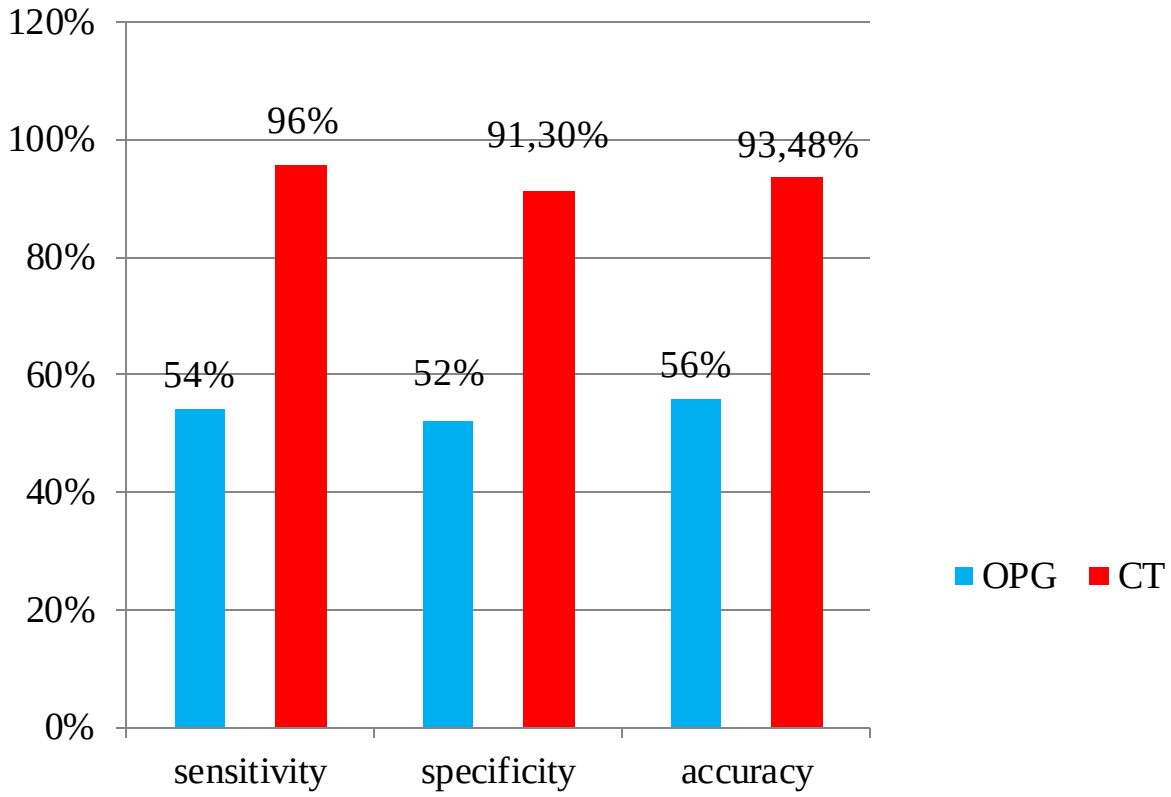


Figure 12. Comparison results of diagnostic indicators at germination cysts into maxillary sinuses.

The effectiveness of computed tomography in the diagnosis of odontogenic cysts of the maxilla was higher than that of OPG, which is evident from the figures 11 and 12. Therefore, computer-tomographic examination may be the method of choice in recognition of the complex clinical and radiological diagnostics of cases. Regard to the "typical" clinical situations (without complications), that was met more than in half cases of our observations, the infallibility of such diagnostic approaches the level of computer tomography.

Analysis of CT scans allowed to determine linear dimensions, area, and in some cases (very large cyst's size) - volume. Research at the small width of the layer in subsequent does it possible to make quality reconstructions, that helps to get a more objective representation about the amount of destruction and it was

important for the surgeons when planning surgical intervention and determining the most optimal access to the surgical area.

The results of radial studies showed that in clinically clear cases to send patient on CT is not required, whereas in difficult diagnostic situations, the use of these methods of radiodiagnostics is preferably.

3.3. Results of surgical treatment according to data of x-ray diagnostic.

After analyzing the data of ortopantomogramm and CT scans and comparison with the data of the clinical studies were determined access to the surgical field the question of the operation and stationary or ambulatory conditions. In 85% of cases, surgery is performed in ambulatory conditions of surgical dentistry in the polyclinic, 15% of stationary in the department of oral and maxillofacial surgery.

All patients in 1st group were underwent surgery -cystectomy with removal (n = 15%) or without removal of the causative teeth (n = 85%). In the second group 30% of patients with a cyst in the upper jaw cystectomy was performed simultaneously with the operation in the maxillary sinus, 10% of patients underwent surgery - cystoplasty maxillary sinusotomy. In 33 patients, operation cystectomy performed simultaneously and the operating wound was sewn up tightly. In 5 patients was performed two-step treatment, first held periostotomiya, 5-10 days after the calming down of the inflammatory process was carried cystectomy.

In the area of the incisors patients were undergone treatment in 37,5% cases in the area of canines and premolars – 37,5%, in the molar area – 22,5%.

In order to confirm the diagnosis, cystic shell subjected compulsory histopathological examination.

Postoperatively, 40 patients with odontogenic cysts of the upper jaw were examined. To study reparative osteogenesis in postcystical cavities digital x-ray survey was conducted, with followed by a posteriori processing of X-ray in ImageJ.

About the effectiveness of surgical treatment was judged according to the assessment of the results obtained immediately after treatment and in long-term period (3-6 months to 1year).

In evaluating the immediate results of the treatment were taken into account complaints of the patient, the visual data (color of the mucous membrane, a condition of the alveolar bone, the presence or absence of fistulous) and the results of percussion.

Long-term results of treatment were assessed on the basis of repeated clinical examination and radiographic examination.

During surgical intervention in the control group in 5% cases there were complications. In the main group the operation was without complications.

Verification of revealed changes was carried out in the course of clinical observation by comparison with the data of a conventional X-ray examination.

The outcome of of surgical treatment was assessed by two-grade system: favorable and unfavorable.

As a favorable outcome were considered those cases (82,5%), when in the next timing after surgery, patients did not show any complaints and tooth with resected apex safely participated in the act of chewing. This group also includes persons who have subjective feelings that were associated with a slight sanies discharge, with a burning sensation, numbness, increased sensitivity of the skin to the cold in winter, but there were no clinical signs of inflammation in periapical tissues.

According to X-ray examination as a favorable outcome it was considered replenishment hearth of destruction of bone tissue in the periapical pathological focus. In this case during 1-3 months was observed partial replenishment of the destruction source (group 1 - n = 12, group 2 - n = 13) and in 6-month after surgery full replenishment of the destruction source (group 1 - n = 8, group 2 - n = 7. The latter manifested itself as isolated areas of enlightenment in the area of previously conducted intervention, against which was visible the newly formed bone structure with clear or blurred contours.

In 17,5% of cases there was an adverse outcome after surgical intervention. As unfavorable outcome were considered cases where after the treatment in the early and late periods appeared pain during biting on a tooth, complaints of pyorrhea in the area of the former cyst, constant bad breath, need special care for the rest of the cavity, and sometimes exacerbation of angina, headaches, and sometimes cancerophobia forced them to seek help. Clinical examination revealed fistulous course, the deformation of the alveolar bone, redness of the mucous membrane. Radiological findings did not show signs of recovery in the hearth of destruction of bone tissue after surgery.

Restoration of bone tissue after cystectomy of radicular cysts radiographically detected in the observation period of 3 months to a year (9 cases – 64,3% in the 1st group of 14 patients examined in this period, and 13 cases in the 2nd group of 15 examinees patients in this term), basically, after the treatment of cysts of small sizes (group1 - 6 of 7, group2 - 6 of 6). When cysts are medium in size in this period a favorable outcome was observed in 7,5% of patients in group 1 and 15% of patients in group 2. Restoration of bone tissue in the area of radicular cysts in the upper jaw of large sizes in this period was not observed.

A survey in late periods after surgical intervention showed that with increasing time after the treatment number of cases of favorable outcome in radicular cysts increased.

In a period of three to six months after surgical intervention, the bone was restored in all cases, the treatment of cysts of small size (100%) in both groups. Restoration of bone in cysts the medium size, in this period was observed in 15 patients (83,3%) of 18. In large cysts favorable outcome in this period was observed in 5 patients (55,5%)

Long-term results of surgical treatment showed that the recovery of bone cysts in patients with small size occurs generally in a period of 1-3 months, medium size - from 3 to 6 months, large cysts – in a period of more than six months.

Some interest represented the study of long-term outcomes, depending on the age of the patients. The most rapid regeneration of bone tissue according to the radiological survey observed in both groups of patients under the age of 30 years. At the same plots radiographically were observed parts of enlightenment before the operation, against which the tender was visible bone structure with clear or blurred contours. This clinical configuration of alveolar bone and mucosa in the area of intervention did not differ from the opposite side of the jaw.

The results of the clinical and radiological examination of patients in long-term period showed that in the lateral sections of the upper jaw bone regeneration cavity is much slower (30% of cases at the time of the survey) than in its anterior region (73.3% of cases at the time of the survey). Radiologically on the place of former surgical intervention was an irregularly shaped portion of enlightenment, against which in peripheral parts were visible elements of a well-formed bone.

Analysis of results of operations for medium and large cysts in the upper jaw, regardless of age showed that the favorable long-term outcomes with full restoration of bone defect were more common after cystectomy than after cystotomy. So, after cystectomy marked a good outcome in 25 patients out of 36, after cystotomy in 2 of 4.

Cystotomy was performed in 4 patients. 1 patient had a medium-sized cysts, 3 patients - large. Patients were distributed by age as follows: under 30 years - 2 patients older than 30 years - 2 patients.

Complete clinical and radiological welfare at the time of the survey 6 months after cystotomy noted in patients under the age of 30 years.

Thus, the clinical and radiological follow-up after cystotomy of cysts medium and large size showed that in patients over the age of 30 years, the postoperative bone defect completely recovered a year later.

Also one of some interest was the study of the results of surgical treatment of radicular cysts, depending on the characteristics of the postoperative period.

The studies of 17 patients with partial recovery of the bone defect after cystectomy, 4 (1st group of patients) cases were observed after the intervention of complications such as postoperative festering cavity formation of fistulous, etc. Therefore, prevention of postoperative complications was one of the factors contributing to the increase in the number of favorable long-term outcomes of cystectomy.

In the study of long-term results of surgical treatment of cysts we were interested in the fate of as "causal" tooth and teeth belonging to the cyst cavity, the top of which were resected. On the upper jaws were resected root apex of 29 teeth. Of these, 29 remained stable. Others were removed at different times after the operation. The immediate cause of tooth extraction with resected root apex usually was worsening of inflammation and injury leading to a pathological tooth mobility.

In 9 patients in long-term period we noticed a change in color of the tooth crown with resected root apex. Sometimes these patients are treated in dental clinic requesting removal of these teeth.

Thus, the clinical and radiological surveillance carried out at different times after the intervention showed that the outcome of surgical treatment depended on clinics, location and size of cysts on the type of operation, the characteristics of postoperative period and the age of patients.

3.5. Results of a posteriori digital processing of radiographs.

Posteriori computer image processing (post-processing) allowed to optimize its quality. Images in digital form analyzed on specific image processing workstations. With that were calculated the linear dimensions, area and volume of formation both automatically and at a special choice of doctor.

To evaluate bone density in the cyst area before and after the operation all the radiographic images are digitally processed using ImageJ. For this was measure the difference between the average luminance value of pixels in the defect region and in adjacent healthy area of bone. The result is displayed as a bar graph with the average values. Then the indicators of healthy tissue and

pathological section were compared with each other (Fig. 13).

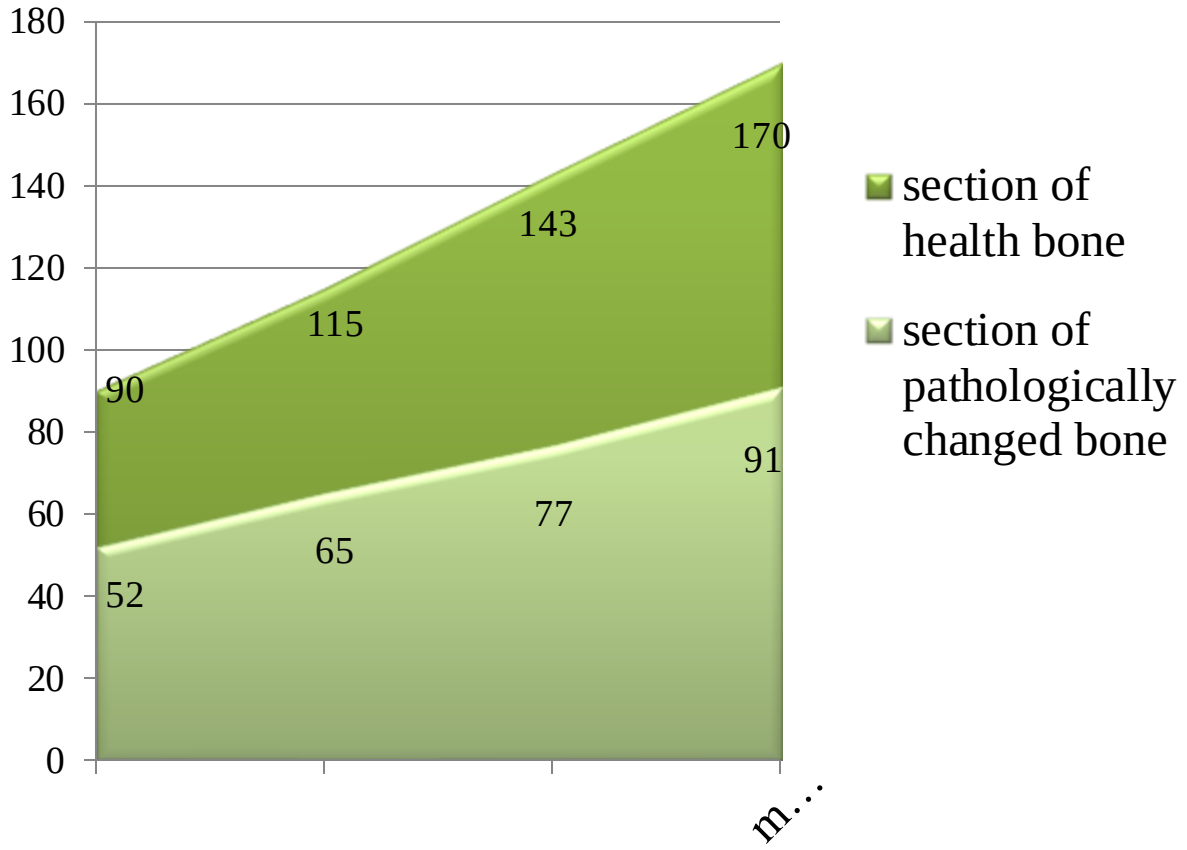


Figure13. Comparing of average indicators of bone optical density in the zone of cysts in the upper jaw on Image J program in sections of health and pathologically changed bone.

Relative density of bone tissue in the frontal area was 56,86 ± 1,54, in the anterolateral part of jaw was 66,1 ± 1,87, and in the lateral part of - 84,3 ± 2,28 nominal units. Analysis of optical density bone comparing in the area of molars, premolars, canines and incisors in the upper jaw with each other, showed that bone density decreases in the direction of the distal portions to the center line. Indicators of bone density in the defect in the area of healthy bone tissue increases in the direction of the cutters (pathology - 52 standard units, a healthy portion of bone-90 standard units) to the molars (pathology- 91 nominal units, a healthy portion of bone -170 nominal units).

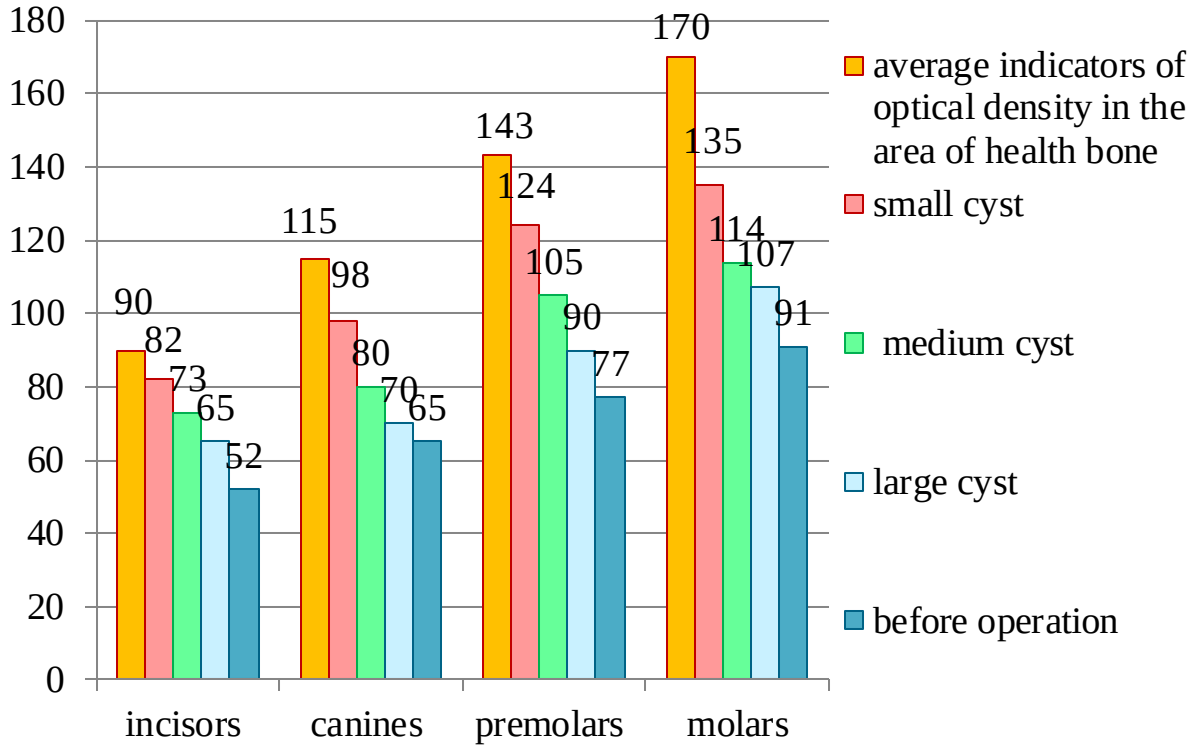


Figure 14. Dynamic of changing indicators of bone optical density in the zone of surgical intervention before and in 3 months after surgical intervention.

The data of comparative optical density analysis of bone were used for dynamic control of the regeneration process of bone postoperatively.

Figure 14 shows the dynamics of the process of bone tissue regeneration in the cyst removal postoperatively at 3 months, which is also determined by analyzing the optical density of the image on the X-ray. Analysis comparing of optical density data showed that the most rapid recovery of bone tissue at the time of re-examination (3 months) takes place in the frontal section of the upper jaw (with small cysts - up to 91%, medium – 81,1%, large – 72,2 %), longer restores bone in the molar area (with small cysts - to 79, 4%, medium - 67% large - 62.9%).

Thus, by analyzing and comparing the data obtained it failed to prove a sufficiently high efficiency of CT in detecting complications of odontogenic cysts of the upper jaw.

As a result of the research was made an algorithm of using modern radiological methods in examination of patients with odontogenic cysts of the upper jaw (Figure 15), allowing to define the role and importance of each used methods.

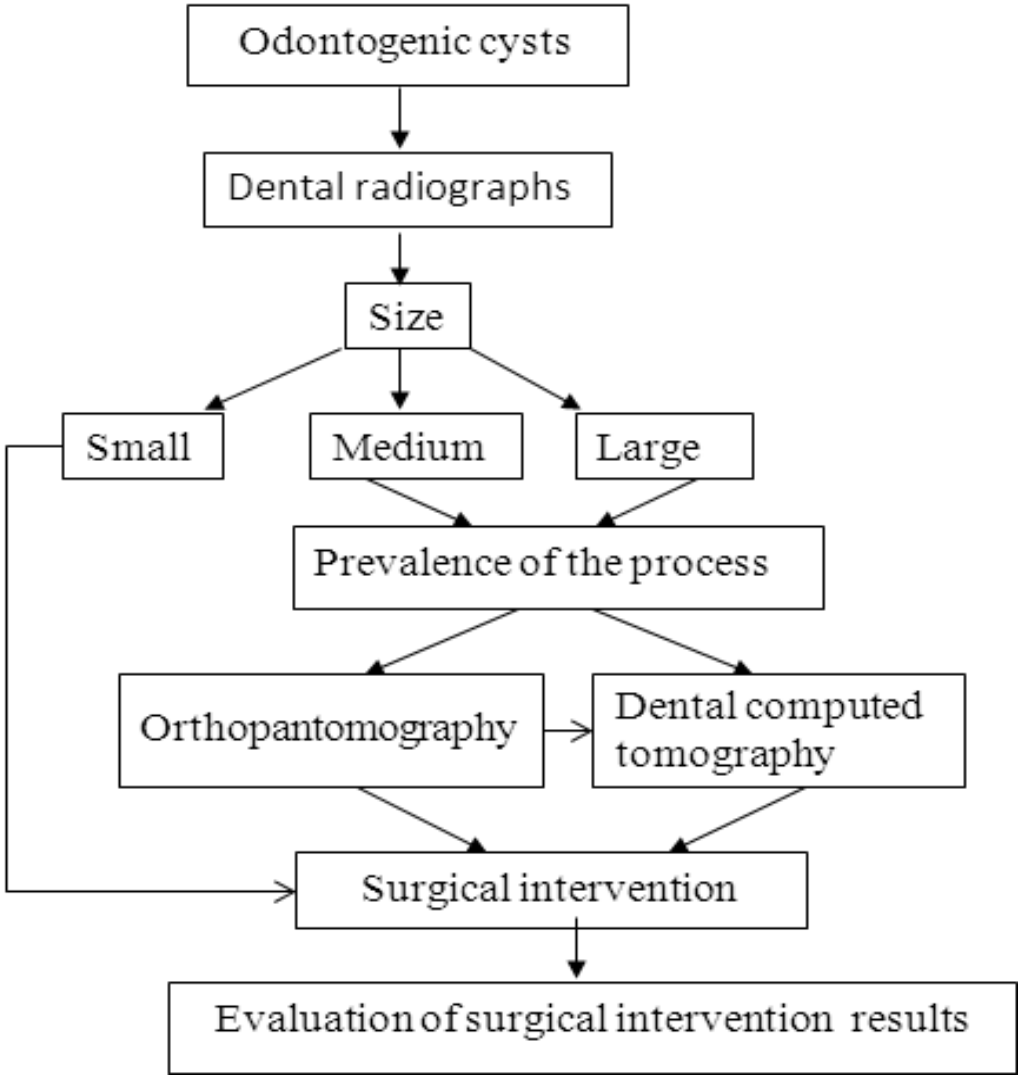


Figure 15. The algorithm of using modern radiological methods in examination of patients with odontogenic cysts in the upper jaw

At the beginning of this algorithm is the radiological method of investigation (intraoral and extraoral images - OPG), as to date it is the almost only available tool of all methods, has a number of functions: informative, easy execution of the relative cheapness. This means that the search and verification of odontogenic cysts of the upper jaw should begin with him.

Intraoral images are informative enough to detect the small size of cysts. For large cysts, they do not give its the exact topography, relationship with the maxillary sinus. In such cases there is a need in OPG.

However, the complex anatomy of the facial skull is displayed on the OPG as a summation of the different shades of bone formation, as well as individual characteristics that are not always taken into account when reading the image, often creates certain difficulties in interpreting radiographs. In this regard, there is a need for additional methods of radiological research. In complicated cases, odontogenic cysts, namely during germination odontogenic cyst in the maxillary sinus, with thinning, destruction of bone walls of the maxillary sinuses and strains it when the inflammatory process is to show the contents of the cyst modern computer-tomographic study.

Using of computer-tomography makes it possible to clarify the indications for surgical treatment and characteristics of the intervention. Comparison of CT and OPG in identifying bone destruction found indisputable advantages of computed tomography that can show bone changes at the earliest stages. To determine the size of small areas of destruction, it is desirable to carry out CT scans of a thickness less than 5 mm, the optimal projection conditions are achieved when the studied sinus wall perpendicular to the plane of the cut.

Clinical Example №1

Patient S.32 y.o.

Gender: male

Address: Tashkent, Yunusobod, 19-50-52

Workplace: Employee

Date of treatment: 28/09/2013

Complaints handling in PSD: asymmetry in the face, swelling in the cheek area on the right, pain in the teeth 765 | area, a feeling of heaviness and discomfort in the right maxillary sinus.

Anamnesis vitae: concomitant diseases and bad habits denies.

Anamnesis morbi: 5| Tooth was removed six years ago, 76| teeth were before treated, periodically appeared aching and swelling for medical help did not apply, self-medicated. Due to the fact that in recent time was increased pain and swelling, he appealed to the PSD.

Status localis: while external examination indicated a slight asymmetry of the face due to swelling in the cheek area on the right. The skin over the swelling is not hyperemiad, palpation slightly painful. Submandibular and cervical limfatic nodes slightly enlarged, palpation painless. In the mouth: the crown of the tooth 6| destroyed on ½ by caries, teeth changed in color, painful percussion; transitional fold in 765| flattened teeth, mucosa is hyperemiad, swelling; palpation of transitional fold is painful palpation, defined bone defect Ø 0,5 cm and parchment crunch.

Preliminary diagnosis: odontogenic cyst of the upper jaw to the right of 6| tooth.

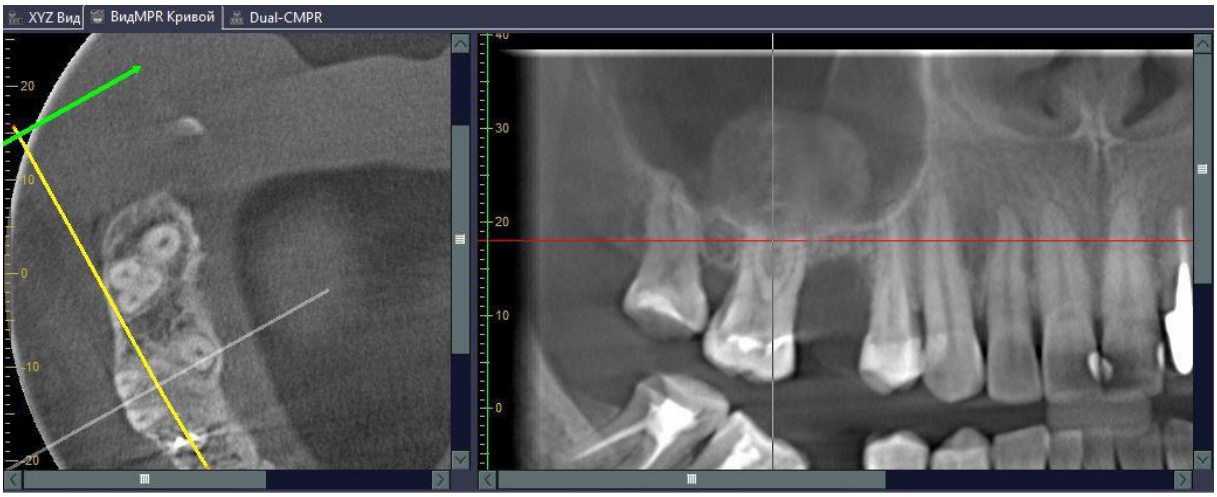
To confirm the diagnosis the patient is directed to X-ray examination

1) Dental intraoral picture: marked loss of bone tissue in the area of 76| teeth, roots are in the maxillary sinus

Results: The size and boundaries of the pathological focus is not determined.
2) Orthopantomogram: marked loss of bone tissue in the roots 6|, tooth roots are in the maxillary sinus. There darkening of the maxillary sinus in its entirety.

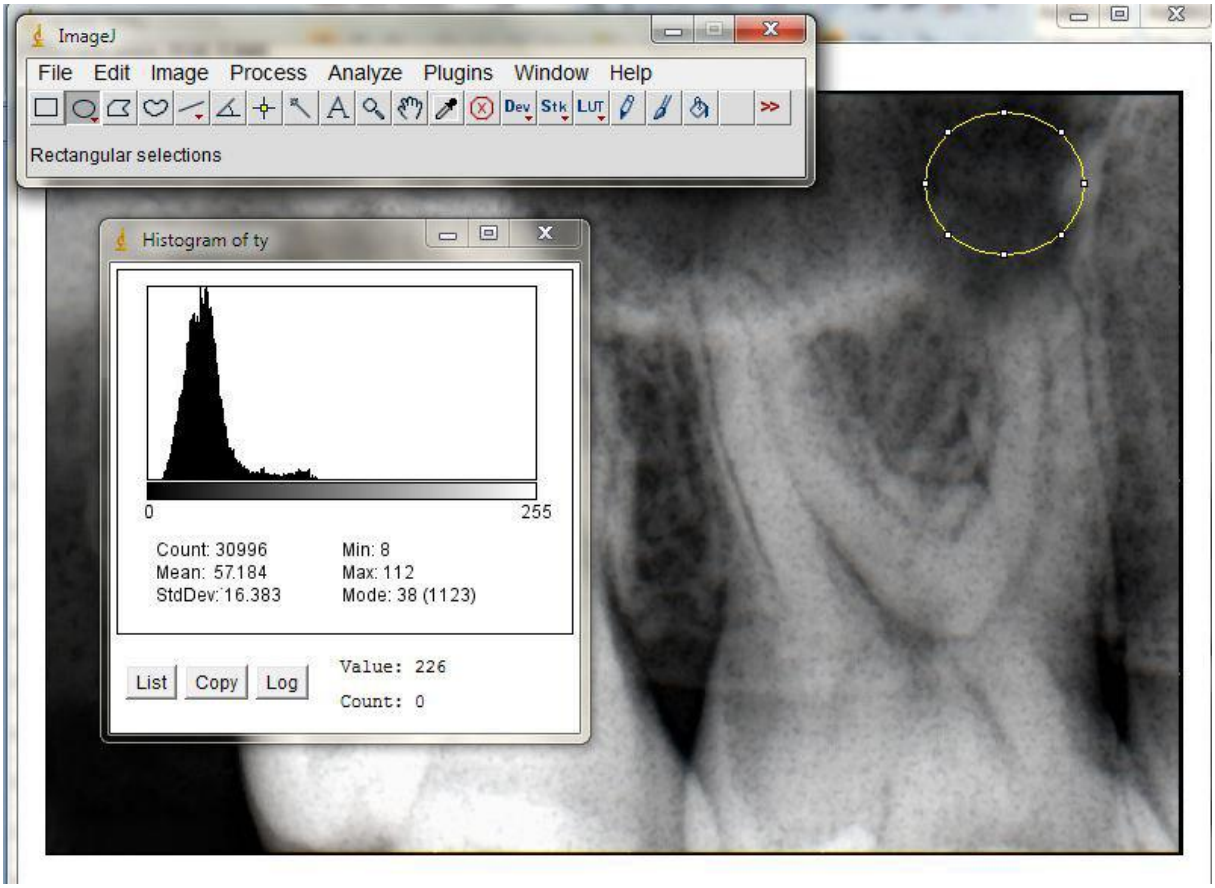
Results: The size and boundaries of the pathological focus is not determined, it is revealed that 7| tooth has no connection with the maxillary sinus and the pathological focus.

2) Computed tomography: CT image is marked on a cyst in maxillary sinus sprouted from 6| tooth dimensions 25.3 mm x 19.5 mm, it covers 1/3 of the sinus on sections visible connection with medial cysts and palatal roots; places marked thinning and destruction of the lower portion of the anterolateral wall of the sinus.



Results: size the cyst, its borders, its direction of growth are exactly determined. The patient is recommended surgical treatment in a hospital.

In preparation for the surgery was carried out laboratory testing of blood hemoglobin, leukocytes, ESR; examination of cardiologist, internist, neurologist, held flyurografiya. Contraindications for surgery in a hospital is not revealed. Performance EDI 7 | tooth - 5mkA 6 | -60 mA. Therapeutic treatment conducted 6 | tooth. Indicators of relative bone density before surgery = 57.18 conventional units.

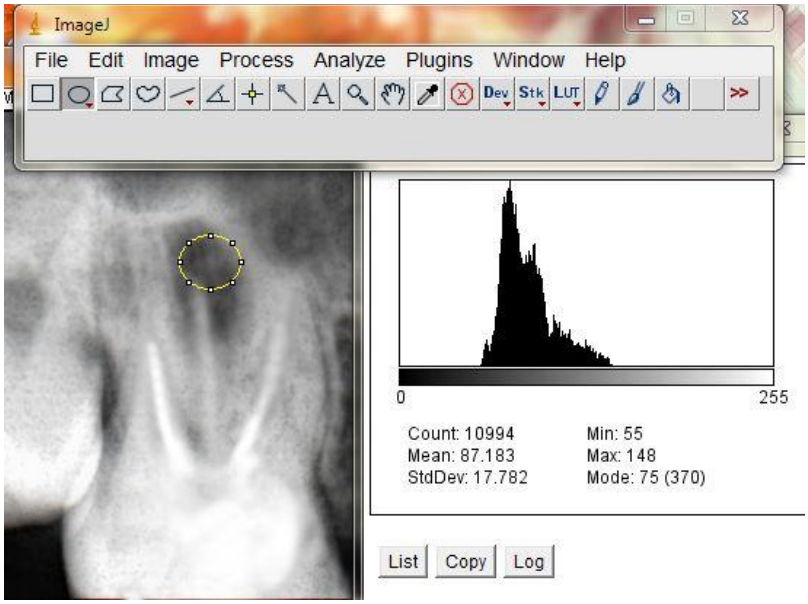


10/07/2013 – in stationary conditions operation performed - cystoplasty maxillary sinusotomy with resection of the tooth root 6| .Taking into account the CT data for the purpose of the least traumatic access selected from the vestibular side. Postoperative diagnosis: odontogenic cyst in the upper jaw, germinated into the maxillary sinus from the 6| tooth confirmed by cytology.

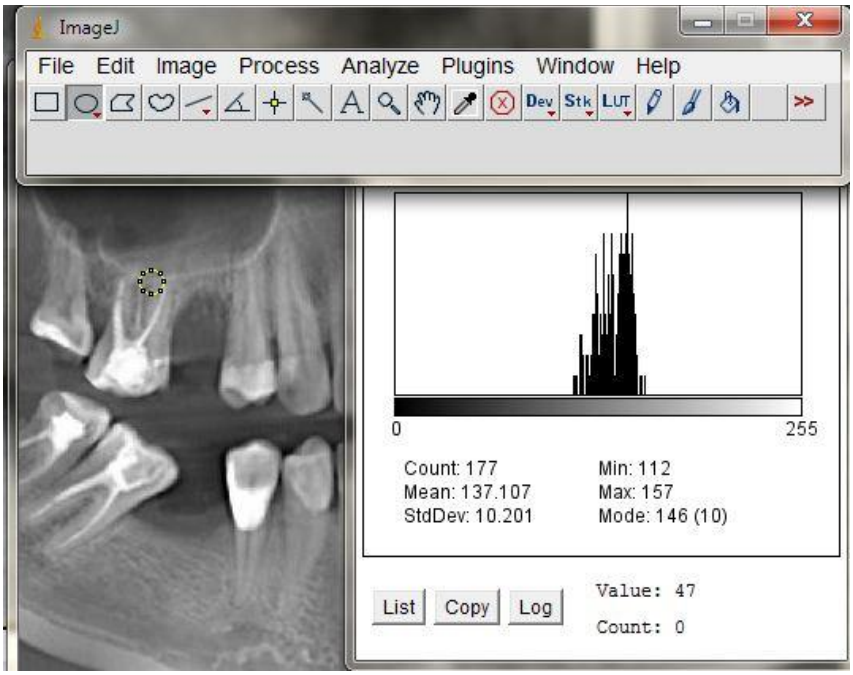
10/10/2013- Complaints of minor pain in the wound and swelling, difficult meal

17/10/2013- virtually no complaints. Sutures are removed.

X-ray inspection: 3 months - on the radiograph places marked sections of the newly formed bone. Indicators of relative bone density 87.1 conv. u.



in 6 months- picture of healthy bone. Indicators of of relative bone density of 137 conventional units



Clinical Example №2

Patient S.35 y.o.

Gender: female

Address: Tashkent, Mirabad district, Lohuti 12-26

Workplace: Housewife

Date of treatment: 14/10/2013

Complaints handling in PSD: swelling in the left upper lip in |2 tooth and pain.

Anamnesis vitae: comorbidity and bad habits denies.

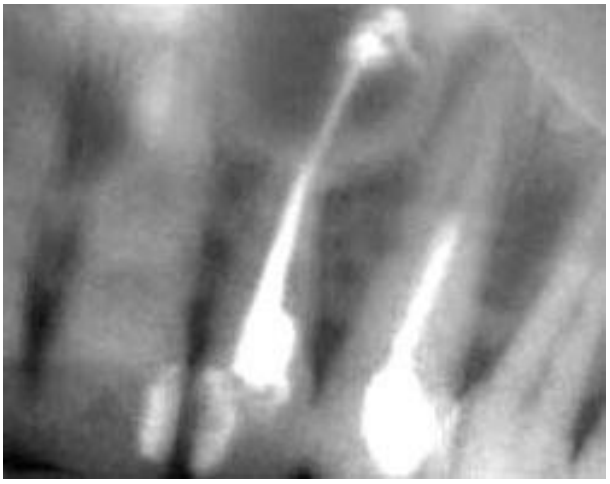
Anamnesis morbi: |2 tooth had previously been treated, but after treatment appears intermittently aching and swelling, see a physician dentist has made dental picture, diagnosed a cyst, and therefore sent to the Department of PSD.

Status localis: at external survey indicated a slight asymmetry of the face due to swelling in the mouth on the left. The skin over the swelling is not hyperemiad, palpation slightly painful. In the mouth: the crown of the tooth is covered with a seal |2 tooth changed in color, painful percussion, there is mobility grade 2, in the area of transitional fold |123 flattened teeth, mucosa hyperemiad, swelling; in the projection of root |12 determined spherical protrusion the size of 1,5 cm x 1,0 cm, palpation of transitional fold painful palpation defined bone defect parchment crunch.

Preliminary diagnosis: cystogranulem of upper jaw from |2 tooth.

To confirm the diagnosis of the patient is directed to X-ray examination

1) Dental intraoral picture: marked bone loss in the tooth roots |2.



Results: The size and boundaries of the pathological focus is not clearly defined.

2) Orthopantomogram: marked bone loss in the root of |2 tooth, Ø 2,0 cm., Between the cyst and the maxillary sinus there is a bone plate.

Results: size the cyst, its borders, its direction of growth are exactly determined. The patient is recommended surgical treatment in a hospital.

In preparation for the surgery were carried out laboratory testing of blood hemoglobin, leukocytes, ESR; examination of cardiologist, internist, neurologist, held flyurografiya. Contraindications for surgery in a hospital is not revealed. Performance EDI |1 tooth - 25mkA, |2 -58 mA Therapeutic treatment of |12 teeth conducted.

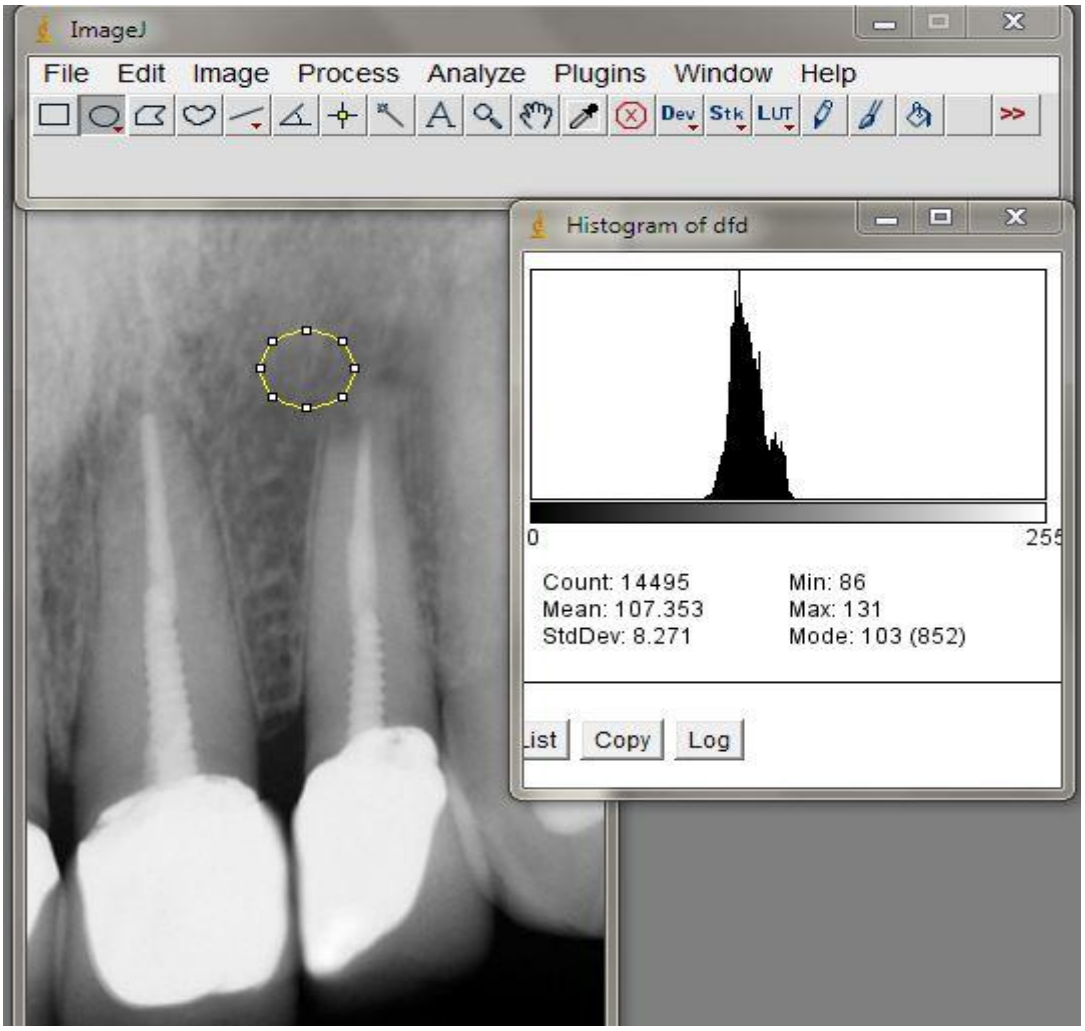
14.10.2013- in stationary conditions operation performed - cystoplasty maxillary sinusotomy with resection of the tooth root |2. Taking into account data of OPG with the purpose of the least traumatic access selected from the vestibular side, the product of the cut - in accordance with the size of the brush. during surgery revealed no coincidence the true dimensions formation to those of organized crime groups. Postoperative diagnosis - radicular cyst of the upper jaw at the left from |2 tooth.

17.10.2013- Complaints of minor pain in the wound and swelling, difficult eating.

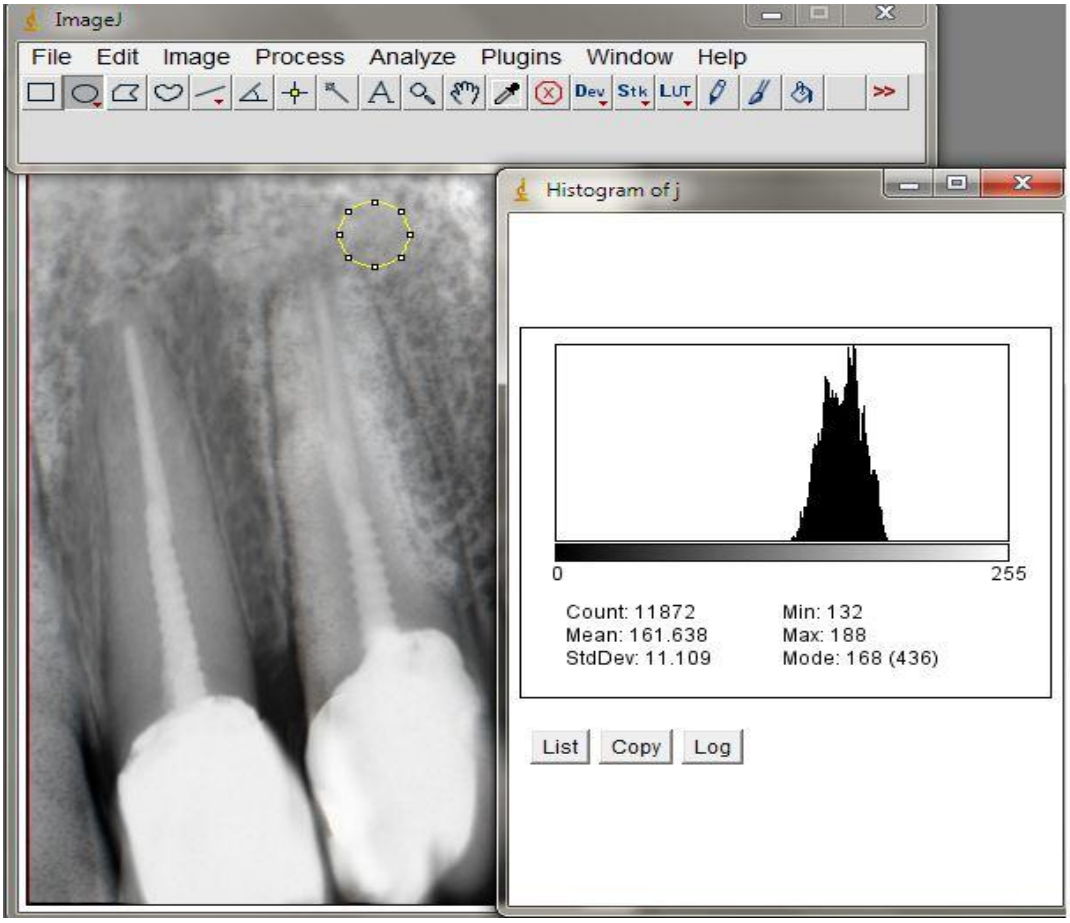
24.10.2013- virtually no complaints. Sutures are removed.

X-ray inspection:

in 1 month - on the radiograph places of the newly formed bone tissue sections marked. Indicators of relative bone density 107 conventional units.



in 3 months - picture of healthy bone. Indicators of relative bone density 161 conventional units.



Chapter 4. Discussion of the results and inference.

There are many works devoted to radial diagnostics of diseases of the maxillary sinuses, including odontogenic cyst [Vernadsky Y.I., Vyklyuk M.V. Agapov B.C., Smirenskaya T.V.]. However, there are indications of errors in their diagnostics [Toplenninova D.Y., Shishkov H.A., Spranger H.].

Especially there are a lot of works devoted to the treatment of radicular cysts, mainly operational [Iordanishvili A.K., Vasiliev M.V., Semenov G.M., Souture RA.,]. Unfortunately, questions abour effectiveness of treatment of cysts in most of the known works are reflected totally inadequate. Incomplete submitted results of research of postoperative recovery in the bone defect at them.

In order to achieve the objectives the material was analyzed regarding clinical course and radiodiagnostics of odontogenic cysts in 40 patients.

Among which the share of men accounted for 15 (37,5%), women - 25 (62,5%). The largest number of patients was in the age of 30-39 years (32,5%).

Our results showed that odontogenic cysts were detected with equal frequency in the front (n = 15) and anterolateral parts of upper jaw, at least in the lateral section (n = 10), which is consistent with the data of other authors [Andruson M.V., DmitrievaB.C., Vorobyov Y.I.].

In general, the upper jaw cysts indicated the highest number of medium size (n = 18). And their number was 2 times more than large cysts (n = 9).

The analysis and statistical processing of clinical material showed that no suppurated odontogenic cysts were more frequent (87,5%) than suppurated (12,5%). According to the data of other authors [Andruson M.V., Dmitriev V.M., Golubeva G.I.]. The frequency of suppurated radicular cysts ranged from 11,2 to 74%.

Suppuration of odontogenic cysts led to a change in their X-ray pictures. In such cases, the contours of a cyst on OPG submitted blurred, indistinct, and the intensity of illumination hearth of destruction of bone tissue was much less pronounced than in no suppurated cysts.

So our data concerning the clinical course of odontogenic cysts of various localization, are not contrary to the generally accepted representations [Zegdenidze G.A., Shilov-Mhanik P.C., Marus V.A. Ermolaev I.I., Dmitriev B.C., Rabuhina H.A., Chuprynin N.M.].

Initially, radiological examination of patients with odontogenic cysts of the upper jaw began with the sighting (dental, palatal) radiographs. 40 patients underwent digital orthopantomogram, 20 patients - computed tomography.

At the initial stage of diagnosis of odontogenic cysts in the upper jaw was preferred method of X-ray studies. In particular, the latent cysts occurring such data is crucial for their identification.

On the basis of the studied material, we have concluded that radiological symptoms as well as the clinical, closely related to the localization of the cyst, its value and the relationship with the surrounding bone tissue.

X-ray diagnostics of cysts from the front teeth of the upper jaw is not difficult. Considering features location of the first incisor and palatal slope of apex of the second incisor, the localization of the cysts were detected only in the intraoral images. Extraoral images in such cases were not informative because of the shadow overlaps of facial bone structures of the skull.

In the anterior section of the upper jaw also were noted the following features: radicular cyst grew primarily only on the affected side. This symptom was important in the differential diagnostic with cysts of undental origin.

In the area of second incisors, the roots of which are located closer to the palatal plate, a cyst growing in the direction of the palate, fast thinner palatal plate and manifested itself in the form of a bulge in the anterior palate. Therefore, for their research resorted to produce a picture of the palatal plate.

In X-ray diagnostics of cysts localized in the sides of the upper jaw, it was especially important to take into account the anatomical structure of the possible options of alveolar maxillary sinuses bays and their relationship to the teeth, as well as the possible distortion of the projection.

The roots of the premolars and molars were located closer to the anterior-lateral wall of the maxillary sinus. In addition, the structure of the bone wall was more apart. The increase in the size of the cyst put pressure on the anterior-lateral and posterior wall of the maxillary sinus. Determination of the X-ray image of cysts as rounded hearth of destruction of bone tissue with clear contours was not always justified.

Cysts of small size (between 1 tooth) were detected on the radiograph as a site more or less intense protrusion of the bone with rounded shape. When cysts medium size (within 2-3 teeth) has been a gradual transition

from the central portion - a homogenous and unstructured to structural, in most cases having none sharp boundaries. In large cysts (involving more than 3 teeth) on the radiograph was detected an extensive round-shaped hearth of destruction of bone tissue with sharply defined boundaries.

A particular interest was the X-ray picture of radicular cysts, germinating in the maxillary sinus. Cyst on background of pneumatized sinus was detected as an intense homogeneous shade with an upper semi-circular contour. When filling the lumen of the sinus cyst, on OPG the latter appeared as homogeneously darkened throughout. Blackout of sinus resembled those in the exudative sinusitis. In this case there were difficulties in their differential diagnosis.

During filling the lumen of the sinus, cyst stretched and thinned its walls. If it came from the front teeth, changes initially underwent anterior and medial wall of the maxillary sinus. Cysts of the molars deformed, primarily external and its rear wall. Due to the fact that the cysts grow into the maxillary sinus often came from the molars, then the X-ray in the first place disappeared lower part of the outer wall and the rear wall of the sinus (outer line chiasm of Ginzburg) defined by the axial image of the skull.

It was found that the areas of destruction in certain bone walls of the maxillary sinuses were found even in those cases where the cyst is still occupy a small part of the volume of the maxillary sinus, that is when most of the sinus volume was still free. The reason for this is bone septum, which could be detected quite frequently during surgery. The origin of the bone walls we associated with periosteal reaction in response to the irritation caused by pressure on the wall of her cysts and possibly prolonged chronic inflammatory condition of sinuses. As a result, between the cyst and the maxillary sinus bone formed dense partition, which later becomes thinner, and when festering destroyed, because it occurred along with a new formation process of bone destruction. Parts of the walls of the maxillary sinuses located below the bone walls and devoid of periosteum, resolving to form defects in them, even before

the maxillary sinus cyst filled completely. This newly formed bone septum is a significant obstacle to the spread of a large cyst in the maxillary sinus side, compared to other bony walls of the sinus bone located below the partition and devoid of periosteum.

As a result, studying odontogenic cysts of the upper jaw by traditional radiographic techniques, we are faced with several challenges:

- because of the imposing shadow images of bone structures study of of the upper jaw, was sometimes difficult;

- to establish the exact size of the cyst prior to surgery it was not always possible (OPG often distorted picture of its exact size), which depended on the position of cystic formation in the maxillary sinus and the direction of the beam of X-rays;

- with cysts of large size to determine the degree of filling maxillary sinus and the state of its bony walls caused difficulties.

In this connection, we set the goal of improving radiation diagnosis of odontogenic cysts of the maxilla. Moreover, that plan surgery and forecasting its results depend on the precise definition of the extent of the pathological process, destructive changes in bone walls of the maxillary sinus during germination of cysts in it. For these purposes, it was examined 20 patients with odontogenic cysts of the maxilla using computer-tomography.

In each study, conducted visual and densitometric analysis of the CT scans. Visual analysis provide information on location, shape of the cyst, its size and the relationship with the surrounding tissues. An important property of CT scans was also an opportunity to identify areas of bone destruction of the walls of the maxillary sinus, sometimes not determined on plain radiographs. When visual analysis can be established and the relationship of the roots of the teeth with a cyst. Densitometric method includes measuring the optical density in the zone of cysts. As a result, CT made it possible to obtain a high degree of accuracy not only qualitative but also quantitative characteristics. The latter being a major advantage over conventional radiography, provides an objective assessment of

the nature of reparative osteogenesis in odontogenic cysts of the upper jaw, both before and during the postoperative period.

According to our data, the optical density of the bone tissue in the cysts varied over a wide range (from 52 to 91 conventional units) and depended on the nature of the process. The sensitivity, specificity and accuracy of CT in detecting germination odontogenic cyst in the maxillary sinus was respectively 95,65%; 91,30%; 93,48%; in the presence of bone destruction walls respectively 91,67%; 95,65%; 94,29%. The sensitivity of CT in detecting of festering cyst was 90%, specificity – 86,95%, accuracy – 87,88%.

Thus, CT is an adequate method of determining the odontogenic cyst geminating into the maxillary sinus, suppuration of the cyst contents and destruction of bone walls.

Comparison of the efficacy of traditional methods of X-ray study and CT in determining of odontogenic cysts showed the advantage of computed tomography techniques. Thus, the sensitivity, specificity and accuracy of CT in detecting odontogenic cysts of the upper jaw and their complications were, respectively, 95,65%; 91,30%; 93,48%. For a traditional X-ray examination sensitivity was 77,63%; specificity - 78, 9%; accuracy -78,27%.

On the basis of this algorithm was developed modern methods of radial investigation of patients with odontogenic cysts of the upper jaw. Analyzing the results of the study, we concluded that CT in the diagnosis of odontogenic cysts may be used as a method of clarifying when clinical examination and radiographs reliability of the information is questionable.

Such use of CT does not significantly increase the cost of inspection and at the same time, maximizes the diagnostic information. Both methods have their advantages and their choice depends on the specific research objectives and opportunities of medical establishment.

Results of surgical treatment of odontogenic cysts was studied by repeated clinical and radiological examination of the patients in the early and late periods after surgical intervention (from 3 months to six months).

It was found that 5% of patients in the postoperative complications were observed. Their analysis indicated that in the majority of cases (57,14%) they were associated with the divergence of joints, at least - a hematoma (28,57%) and postoperative suppuration blood clot cavity (14,29%). Most complicated festering cysts were cysts especially medium and large sizes.

In a period of three to six months after surgery, the bone was restored in all cases during the treatment of cysts of small size (13) in both groups. Restoration of bone cysts in the medium size, this period was observed in 15 patients (83,3%) of 18. In large cysts favorable outcome in this period was observed in 5 patients (55,5%).

It is significant that at the age of 30 years after cystectomy cysts of small and medium-sized postoperative bone defect is completely restored in the period up to 2 months, the average size of 3 to 6 months, and cysts large - more than 6 months. At the age of 30 after cystectomy of cysts small size postoperative bone defect completely regenerated in a period of 6 month, the medium - in the period up to 9 month and, large - more than 9 month. A good outcome of the operation was observed significantly more frequently after cystectomy than after cystotomy.

The criteria for qualitative analysis were: localization of lesions, number, shape, contours, structure, state of the lower divisions of the maxillary sinuses, the relationship with the near lying areas. The association of odontogenic cyst with adjacent anatomical structures, in particular with the maxillary sinus is one of the most important aspects in planning surgery. The criteria for the study was the quantitative analysis of bone density before and after surgery. Planning for surgery and determination of the results depended on the precise definition of the extent of the pathological process, destructive changes in bone walls of the maxillary sinus during germination of cysts in it, and evaluation of the postoperative period.

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- In the first stage of diagnostic is rational using of conventional dental x-ray methods, in particular digital. In the cases with medium or large-sizes pathological focus it is recommended to do orthopantomography. In cases with spreading of the process to neighboring areas it is advisable to use dental computed tomography as a clarifying method in order to choose the right tactic of surgery.
- Obtained data of computed tomography about localization of the cyst, its value and the relationship with the surrounding areas allow to recommend the best access to the pathological focus, to reduce the volume of surgery and rehabilitation period of patients.
- The results of the clinical and radiological research suggest that the regeneration of bone in patients with cysts small and medium-sized occurs in the period of 9 months. In lateral part of upper jaw regeneration in bone cavity is slower than in its anterior part.

PRACTICAL RECOMMENDATIONS

- CT should be used in cases with established cysts to assess the prevalence of the process, in complicated cases, and if in clinical examination and on radiographs reliability of the information is questionable.
- To monitor the effectiveness of surgical treatment of patients with odontogenic cysts in the upper jaw is recommended to use the digital radiographic methods of investigation with following image processing in biomedical program Image J.

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