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CORRELATION BETWEEN COMPUTED TOMOGRAPHY AND INTRAOPERATIVE FINDING IN FUNCTIONAL ENDOSCOPIC SURGERY OF NOSE AND PARANASAL SINUSES

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Medical literature lacks sufficient data that compare preoperative computed tomography and intraoperative findings during endoscopic surgery of nose and paranasal sinuses.

The aim of the paper was to determine the practical value of CT in preoperative preparation for functional endoscopic surgery of nose and sinuses.

Cadaver head was placed in CT with subsequent scanning changing window (W) and center (C) parameters. Forty patients treated in ENT Department of Vranje and Isola were also included. Routine radiography and CT (SIMENS Smile, SIMENS Somatom 4, and spiral Simens Fach) were performed. Obtained values were compared with intraoperative findings.

We found significant difference in intraoperative findings and radiography, and intraoperative findings and CT, in favour of CT data. Contrary to this, there was no significant difference between these comparisons for cystic changes and effusion in paranasal sinuses.

CT gave significantly better agreement with intraoperative findings when compared to classic radiography. Exact diagnosis was found in 90.7% on classic radiography, and in 87.8% on CT scan. *Acta Medica Medianae 2010;49(3):19-26.*

Key words: *functional endoscopic surgery, nose, paranasal sinuses, computed tomography*

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Introduction

The foundations of modern functional endocscopic nasal and paranasal sinuses (FESS) surgery have been provided by the findings of English physicist Hopkins. The technique of systemic explorations of lateral nasal wall was first developed by Messeklinger in the late 60s and 70s (1).

There is a large number of variations in the anatomy of paransal sinuses. That is why every surgeon has to know almost all the variations that can be found, and they can be verified and diagnosed only by computerized tomography (CT) (2-4).

The basic surgery methods inside FESS are: Conservative surgery - Uncinectomy: a-partial and b-total; infundibulotomy; bulotomy, turbinoplastics (cohnoplastics), septoplastics. B-Ethmoidectomy: I-partial: frontal ehmoidectomy; back ethmoidectomy; II- total; III- radical, C-Antrostomy: lower, middle (with the reconstruction on maxillary sisnus ostium), frontal (through fossa canina); combined. D- Frontal sinus: Reconstruction of ostium (recessus) of frontal sinus; frontal sinusectomy- method of Kumell-Back or Rutemberg); combined; intrasinusal procedure- draf I, II, III and combination; endoscopy with curved rigid endo-scope. E- Sphenoidectomy: transnasal; trans-ethmoidal; transseptal; transmaxillary-ethmoidal; F-Revisional surgery; G- Adjuvant endoscopic procedures: endoscopic transseptal transsphenoidal surgery of the pituitary gland; endoscopic dacriostorinostomy; endoscopic decompression of the orbit; endoscopic decompression of nervus opticus (5-7).

There is a small number of scientific papers in the literature that compare preoperative findings of computerized tomography and the findings during functional endoscopic nasal and paranasal sinuses surgeries.

Aim

The aim of our research was to determine the practical use of CT in the preoperative preparations for functional endoscopic surgery of nose and sinuses. The special aims of this research were: 1-to determine the correlation between obtained CT and intraoperative findings by comparative analyses; 2-determine the presence of anatomical variations; 3- determine the depth of ethmoidal roof and thickness of lateral ethmoidal wall; 4-compare the left and right half of the nose and paranasal sinuses; 5-determine certain parameters of CT.

Patients and methods

Research on cadaver

The research was conducted at the Department for Otorhynolaringology, Service for Radiology and Service for Pathology of OJ Hospital HC Vranje, Department for Radiology of Military Hospital in Niš, Department for Otorhynolaringology, Service for Radiology of the General Hospital of Izola, Slovenia.

The head of the cadaver was placed in the scanner and then several hundreds shots were made. Recordings were performed in the coronal, axial and sagittal plane (some sagittals have been reconstructed). During the CT of sinuses of the cadaver head, the values of windows (W-window) and centers (C-centre) were changed. The best shots were made for the W values of 2.000 to 2.800 and C values of 300 to 600. The focus factors are dependent on the patients head size (4 or 5)- values of matrix 512. Scanning Time was 5 or 7 seconds per projection with the voltage of 125 kVp and force of 410 mAs.

Patients

Forty patients were treated at the Departments of Otorhynolaringology in Vranje and Izola and they were included into this research. The age of the patients ranged from 5.5 to 73 years with the mean age of 41.2 years. As for sex of the patients, 23 (57.5%) of them were male and 17 (42.5%) were female patients. Classical radiography was performed in all the patients.

CT shots were made (on SIMENS Smile, SIMENS Somatom4 and spiral- Simens Fach). Bone and mucosal elements were described on CT shots: processus uncinatus, ostiomeatal complex, bullae ethmoidales, middle nasal conhae, ethmoidal sinuses, maxillar sinuses with their natural and accessory confluence, frontal sinuses with naso-frontal canals, sphenoidal sinuses, nasal septum and choanae. The type of the roof by Keros was determined.

Shots were made with 3mm thickness (if needed even 1.5 mm) without interslice gaps with 120 kV and 80 mAs, starting from the frontal margin of frontal sinus extending from frontal margin of clinoidal processuss. Also, the shots were made with the thickness of 1 mm coronally, i.e. vertically (90°) towards the hard plate and 0.5 mm thickness sagittaly following the oblique line in the reconstructed shot. Sagittal oblique sections were created as slices, starting from the medial to lower part of the nasal septum basis and lateral of athmoidal bulla by about 10% craniocaudal angle from sagittal line. They were separated on the left and right side. All the measurements were performed bilaterally on the monitor of CT console and on the CT shots. A horizontal line was drawn from the inferior contour of the nasal fossa on the coronal sections. A vertical line was drawn from the ethmoidal roof to horizontal line on the middle level between the middle sagittal line and laminae paparaceae, also from cribriform lamina to horizontal line. The height of ethmoidal roof and cribriform plate was measured in three different coronal planes, starting from crista galli, ethmoidal bulla and sphenoethmoidal joint. The height of lateral lamina between the medial part of ethmoidal roof and lamina cribrosa was measured at the level of crista galli and bulla ethmoidalis. An angle of ethmoidal roof was measured on the coronal section from the horizontal at the level of bulla and crista galli (8).

On the reconstructed sagittal section, anterior nasal spine was set as a focus, or as a starting point of a line that connects anterior skull base at the level of ethmoidal bulla nasofrontal cavity and goes to the spheno-ethmoidal joint. The points on this line were measured, or the distance between the focus point and anterior skull base.

Distances in anterior skull base in the right and left part of the nasal cavity were determined by measuring, as follows: distance from anterior nasal crest and cranial base at three levels, which are important in the coronal and sagittal reconstructed CT sections.

We complied with the Stammberger's recommendations (1993) with records of required parameters: 1 – Are information on computed tomography scan correct? 2 – Were the windows properly elected? 3 - Is there a correlation between anamnesis and current CT images? 4 - Position of nasal septum. 5 – Can ager nasi cells be identified? 6 - What is the configuration of ethmoidal infundibulum? 7 - What is the ratio of procesus uncinatus cranially, particularly to the frontal recessus? 8 - What is the configuration of the frontal sinus? 9 - Can ethmoidal bulla be identified? 10 – How does the middle concha look like? 11 - Are there any ethmoidal roof variations and which? 12 - What is the vertical distance between maxillary sinus ostium upper edge and posterior ethmoidal roof? 13 - What is the relation between posterior ethmoid and sphenoidal sinus? 14 - A detailed description, if operation has been previously performed. 15 - In cases of diffuse nasal polyposis: Is there a "white-out" or whether "black halo" can be seen? 16 - Is there a yeast infection? 17 - In case of traumas, a detailed description of fracture lines, with a detailed examination of rhinobasis; 18 - Special cases: endonasal orbital decompression procedure: "Sign of the bottle". 19 - The paranasal sinuses tumors diagnosis and their surrounding tissue infiltration. 20 - Acute sinusitis complications (5). Intra-operative finding considers what type of operation was used in the surgical treatment of various diseases of particular sinus, as well as accurate description of the intraoperative findings in the sinus.

Data analysis was performed on PC using Microsoft Excel 8 and Word 11 for database, tables, graphs and text processing. The software package SPSS 11.5 and Statcalc EpiInfo version 5 were used for statistical analysis.

X2 - test - measures significance of differences between the two attribute characteristics from independent sample; Mantel-Haenszel test with Yates's correction, Fisher's test (to establish the correlation between the tested attribute characteristics), Pearson's linear correlation coefficient measure of the degree-dependence for numerical characteristics, coefficient of variation - Cv; Sperman's coefficient of rank correlation (to determine the degree of interdependence between two variables); Kolmogarov-Smirnov compliance test in two independent samples (9.10).

Results

CT images correctness

CT scanning window selection during the scanning was satisfactory in 38 patients (95%) and unsatisfactory in 2 patients (5%). The results of the anatomical and pathological structures involvement in the scan showed that the image is adequate in 100% of cases. Validity of the plane and thickness of selected CT images sections was satisfactory in 38 (95%) and unsatisfactory in 2 (5%) patients.

Position and appearance of the nasal septum, nasal septum pneumatization, frontal recessus width

Lack of septal deformities was observed in five patients (12.5%), moderate deviation in 24 patients (60%) and severe deformation in 11 patients (27.5%). The existence of small or big cristae was found in 34 patients (85%). Pneumatized septum was found in two patients (5%) in posterior parts. The results of the frontal recess width show that there was a narrowing in nine patients (22.5%).

Size of paranasal sinuses

There was no statistically significant difference in the size of the maxillary sinus on both sides ($p<0.05$). There was a significant asymmetry between the frontal sinuses size. Left sinuses were bigger than the right ones ($p<0.05$).

CT prevalence of bone and mucosal abnormalities in the paranasal sinuses

There was no statistical significance in the existence of pneumatization in the sphenoid bone, lesser and greater wings and crista galli ($p<0.05$). We found no statistically significant difference between bone and sinus mucosa malformation ($p<0.05$) (Table 1).

Measurements in the anterior skull base, coronal and sagittal reconstructed CT

Measuring the ethmoidal roof according to Keros, type 1 was found at the right side in five (12.5%), type 2 was found in 27 (67.5%) and type 3 in 8 patients (20%). On the left side type 1 was found in 6 patients (15%), type 2 in 25 patients (62.5%) and type 3 in 9 patients (22.5%). There was no statistical significance between all three types of ethmoid, but type 2 by Keros was most often represented on both sides ($p<0.05$) (Table 2).

Potentially dangerous operations were present in 17 ethmoids which were, by the height of lateral lamella, ethmoidal type 3 by Keros. Cribriform palate halves were placed at different heights in 72.5% of cases. A significant difference was found between height of the right and left sides of lateral lamellas at the level of nasofrontal cavity ($p = 0.001$) (Table 3).

Table 2. Type of ethmoid roof by Keros

	Ethmoid roof sides			
	Right		Right	
Type 1 (1-3mm)	5	12.5 %	6	15.0 %
Type 2 (4-7mm)	27	67.5 %	25	62.5 %
Type 3 (8-16mm)	8	20.0 %	9	22.5 %

Table 5. Intraoperative findings (IOF) concordance with conventional radiographs (CR) and computed tomography (CT)

Parameter	Yes	No	Total
CR with IOF	164 (89.62%)	19 (10.38%)	183 (100%)
CT with IOF	180 (98.36%)	3 (1.64 %)	183 (100%)

Table 1. CT prevalence of bone and mucosa abnormalities in maxillary sinus

Bone, mucosa and anatomical variations	Nasal sides			Patients	
	Bill	Unil	Bill	Unil	Bill
Polyp or cyst	6	16	35.0	22	55.0
Mucosal abnormalities	15	13	53.75	28	70.0
Liquid content existence	4	3	13.75	7	17.5
Septum – double sinus	0	1	1.25	1	2.5
Infraorbital nerve dehiscence	1	0	2.5	1	2.5
Bone walls fracture	2	1	6.25	3	7.5
Foreign body in sinus	0	3	3.75	3	7.5
Tumor or fungus	0	3	3.75	3	7.5

Table 3. Anterior scull base distance and statistical evaluation of normal distributional variable

Parameter		Right			Left				
	Level	Min	Max	SD	Min	Max	SD	t	p
Hard palate-etmoid roof (mm)	Crista Galli Bulla ethmoidalis Sphenoethmoidal joint	39.37 37.67 39.47	63.13 67.01 60.57	8.01 5.73 3.64	39.27 37.90 39.51	62.89 66.23 60.55	7.70 5.48 3.55	0.233 0.345 0.770	0.001 0.001 0.001
Hard palate (CP)	Crista Galli Bulla ethmoidalis Sphenoethmoidal joint	37.14 35.49 38.35	57.45 35.49 59.56	4.06 4.96 4.65	37.17 35.48 38.10	57.10 59.15 59.56	4.04 4.97 4.71	-0.400 -0.145 -0.051	0.001 0.001 0.001
Lateral lamella hight (LL)	Crista Galli Bulla ethmoidalis	1.03 1.03	14.6 5.01	2.89 1.41	1.01 1.12	15.0 5.11	3.10 1.04	0.242 0.429	0.001 0.001
Spina nasalis anterior-anterior scull base distance	Nasofrontal recessus Bulla ethmoidalis Sphenoethmoidal joint	41.45 40.44 42.39	86.14 78.33 76.04	11.99 10.01 6.12	41.15 40.41 42.42	86.02 78.45 75.87	11.92 10.18 6.24	0.094 0.011 0.255	0.001 0.001 0.001
LL to CP angle	Crista Galli	11.89	47.2	11.30	11.50	48.10	11.86	0.647	0.001

Table 4. Types of performed operations

Nasal and sinus operations	Sinus side			Patients	
	Bill	Uni	Bill	Uni	Bill
Partiel/total uncinectomy	12	12	32.5	24	60.0
Bulectomy	19	12	62.5	31	77.5
Meatotomy inferior	15	10	50.0	25	62.5
Sinoscopy MS via natural ostium	15	10	50.0	25	62.5
Sinoscopy MS combined aproach	2	10	17.5	12	30.0
Polyp/cyst/muco/piocella extirpation from MS	6	16	35.0	22	55.0
Polyp/cyst/muco/piocella extirpation from FS	0	1	1.25	1	2.5
Sinoscopy via alveolus	0	3	3.75	3	7.5
MS operation by Caldwell Luc	7	3	21.25	10	25.0
Sinoscopy FS via anterior wall	2	2	7.5	4	10.0
Sinoscopy FS via ductus nasofrontalis	14	8	45.0	22	55.0
Osteoplastic operation FS by Tatous	1	0	2.25	1	2.5
External ethmoidectomi – Grunwald	0	1	1.25	1	2.5
Endoscopical partial and/or total ethmoidectomy	19	10	60.0	29	72.5
Endonasal endoscopical polypectomy	16	7	48.75	23	57.5
Sphenoidotomy	13	10	45.0	23	57.5
Standard or endoscopic septoplasty	0	10	0.0	10	25.0
Endoscopic hoana plasty	0	1	1.25	1	2.5
De Limi operation – one sided	0	1	1.25	1	2.5
Sinus foreign body extirpation	1	2	5.0	3	7.5
Alveolaplasty	0	2	2.5	2	5.0

MS=maxillar sinus, FS=frontal sinus

Intraoperative findings

Performed surgeries were shown in Table 4.

Intraoperative findings correlation with the findings of computed tomography

There was a difference in concordance between intraoperative and computed tomography findings and intraoperative with the x-ray findings for hypertrophic mucosa parameter in favor to computerized tomography (for the Dmax = 0.62 threshold is 0.14, for n = 92 and $p<0.05$).The difference in the percentage of hypertrophic mucosa appearance was statistically significant compared to 92 findings. A higher percentage, 96.74% (89 findings) was in favor of computerized tomography in contrast to the percentage of standard X-ray recording 88.04% (81 findings).

There was no difference in concordance between intraoperative and conventional radiographs findings and intraoperative with the findings of computed tomography for cystic changes parameters in paranasal sinuses (for the Dmax=0.51, threshold n=29 for the 0:27 p<0.05). The difference in the percentage of paranasal sinuses cystic changes findings compared to 29 cystic changes was not statistically significant. The percentage of concordance for computed tomography was 93.10% (27 cysts) and conventional radiography was 89.66% (26 cysts) - the findings of cystic changes in the paranasal sinuses.

There was no difference in concordance between intraoperative and conventional radiographs findings and intraoperative with the findings of computed tomography for discharge characteristic of paranasal sinuses (for the Dmax = 0.30, threshold n = 11 for the 0391 p<0.05). The difference in the percentage of the findings, characteristic of secretions in the paranasal sinuses compared to 11 findings was statistically significant in favor of computerized tomography. The percentage of concordance for computed tomography was 90.90% (11 findings) and the conventional radiography findings 54.54% (6 reports).

There is a difference in analogy of intraoperative and conventional radiographs findings and intraoperative findings with the findings of computed tomography for all intraoperative findings identified in 183 reports in favor of computerized tomography (for the Dmax = 0.65 threshold for n = 183 for the 0101 p<0.05). The percentage of concordance for all intraoperative findings of computed tomography was 98.36% (180 findings) and for conventional radiographs was 90.71% (166 findings).

Discussion

Comparing the results of endoscopic examination and x-ray indicated the possibility of small precision of endomorphologic assessment of the maxillary sinuses mucous membrane state based on the classic X-ray. In addition, in the sinuses secretion analysis it was found that the discharge was present almost in the same number (50%) in sinusitis cases with positive and negative (x-rays) cephalograms. Viscous secretion (purulent, caseous) was present in sinusitis cases with marked shadowing as well as in significant number of sinusitis cases with less severe X-ray changes (inhomogeneous/blotchy, homogeneous/ nonintensive). Positive X-ray reflected some of endomorphologic manifestations of the inflammatory diseases of the sinus mucosa (91.8%) and this was statistically significant. Except for circular shadow that was in 82.6% the reflection of the endoscopic verified cystic formation, other endomorphologic changes in individual X-ray findings were most represented in the 30-37%. False positive (11.46%) and false negative (3.38%) X-rays together involved a group of 14.85% examined sinuses where complete incompatibility of endoscopic and X-ray findings was identified.

In our studies on coronal CT images, type I of the ethmoid roof by Keros was found in 5 halves on the right and 6 halves on the left, in total at 11 ethmoid sinuses. Type II was found in 27 halves on the right and 25 halves on the left, in total in 52 ethmoidal sinuses. Type III, which is the most dangerous for surgical operation was found in 8 ethmoids on the right and 9 on the left, in total 17 ethmoid sinuses. Asymmetry was discovered in 29 subjects (72%). No statistical significance was found between all three types of ethmoids, but most often represented was type 2 (<0.05).

Mann W (1983) based on its examination and test of other authors showed that percentage of false-positive radiographs was higher than percentage of false negative ones. The first one ranges from 13-25%, and other one between 6-20%. Degree of correlation, by Mann, depends on the accuracy of the X-ray procedure and interpretation of rentgenograms (X-rays), on the basis of which the errors of X-ray procedures are the cause of false positive findings (14).

X-ray signs of bone fracture sinus walls were present in six patients (3%) with injury to the sinus areas. Osteoma of the frontal sinus was noted in one case (0.5%). Inhomogeneous, linearly shaded sinus was present in one patient (0.5%), and also in one (0.5%) patient a good clinical x-ray of paranasal sinuses was noted.

Interpretation of CT results, except for statistical differences in the level of the lateral lamina at the level of crista Ghali between sides, suggests statistically insignificant difference between the mean values of the left and right sides at grade level of the anterior cranial base.

Average height of the left and right side of the crista Ghali and sphenoethmoidal compound in our study was lower on the left side compared to the right one by 0.05-0.79mm.

The form of the anterior cranial fossa varies widely individually. Height of the nasal cavity was measured from the bone of nasal floor cavity with mucosa and without mucosa. Distance was measured between nasal floor cavity without mucosa and level of cribriform panel, level of crista Ghali and bulla ethmoidalis and it was 46.68 (37-57) and 46.78 (35-59) mm.

Measurements on CT scans in this study were compatible with the results of other authors (1,11-13).

Endocranial side of lamina cribrosa forms the base of fossa olfactory, where the olfactory

bulge is located. The anterior part of the ethmoidal roof is higher than posterior, while anterior cranial base decreases by 140 from the horizontal level and goes posteriorly. Variations in the ethmoidal roof by Keros is always taken into consideration before planning the operational procedure.

Height measured between the cribriform plate and the highest point of ethmoidal roof on the right were 8.1 (2-10) mm in the anterior third and 6.7 (2 - 17) mm in the posterior third. In our study, the differences in height between these two structures at the level of crista Ghali, bulla ethmoidalis and sphenoethmoidal circuit were 6.79, 4.78 and 0.46mm.

Two halves of cribriform plate were placed at different levels in 72.5% of cases, mean height of the left half of the crista Ghali and sphenoethmoidal joint in our study was lower than on the right by 0.05-0.78 mm.

The level of bulla ethmoidalis on the right side was higher than on the left side by 0.40 mm. Before sinus surgery, the operator must examine the declining level of the skull base and cribriform plate height difference between both sides. Joint structures of the lateral nasal cavity can be easily identified by sagittal reconstructed image. The most important is anterior-posterior approach to the skull base, and on the reconstructed sagittal image the distance between the nasal spine and the anterior cranial pit can be measured. This is very important so that during the endonasal sinus surgery precise and safe FESS surgery procedure could be performed and to maximally reduce the possibility of complications.

Suonpaa J and Revonta M (1989) in their study included 407 patients with acute frontal sinusitis, who were examined radiographically and ultrasonographically. According to these authors, the ultrasonic method showed better results in detection of the secretion delay in the frontal sinus (96%), while the x-ray appeared to be a better method in showing mucosal thickening (87%) compared to the ultrasound (86%) (15).

Otten W, et al. (1991) conducted a prospective study evaluating the reliability of echosonographic method in detecting retained secretion and mucosal thickening in the frontal sinuses. This evaluation was based on a comparison of preoperative echosonographic results with surgical findings in 27 patients. Ultrasonography was confirmed as a reliable method for the detection or exclusion of mucosal thickening existence with accuracy of 92% and secretion retention (93%) (16).

Gianola G et al. (1992) compared B - mod echosonography of paranasal sinuses with CT findings in 41 patients. With the exception of isolated mucous retention cysts and minimal focal mucosal thickening (defined as less than 4 mm), other findings of the patients with maxillary, frontal and anterior ethmoid cells were presented with high echosonography accuracy rate (17).

Computerized tomography is a noninvasive endoscopic technique that provides accurate diagnosis of nose and sinuses diseases in more than 90%. Computerized tomography can accurately diagnose almost all bone and mucosal malformations, anatomical variations, as well as establish ethmoidal type according to the Keros and amount of lateral lamellae in order to avoid intraoperative mistakes. Coronal CT image gives more details than the axial, but sometimes it is necessary to make an image in both projections. According to our research, properly selected routes of recording the standard x-ray technique in more than 90.71% contribute to establishing the accurate diagnosis. In addition, the percentage of false positive or false negative results in our study was less than 10% (18-23).

Conclusions

CT is more accurate diagnostic means (97.82% of correct findings) compared to standard radiograms (90.71% of correct findings).

There is a better concordance between intraoperative finding and CT compared to intraoperatve finding and radiogram for hypertrophic mucosa.

There was not significant difference between two methods (CT and radiogram) for concordance with intraoperative findings of cystic degeneration in the paranasal cavity.

There was not significant difference between two methods (CT and radiogram) for concordance with intraoperative findings of the phlegm presence in the paranasal cavity.

There is better concordance of CT findings with all other intraoperative findings compared to standard radiograms.

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KORELACIJA KOMPJUTERIZOVANE TOMOGRAFIJE I INTRAOPERATIVNOG NALAZA KOD FUNKCIONALNE ENDOSKOPSKE HIRURGIJE NOSA I PARANAZALNIH SINUSA

Vladan Stanojković

U medicinskoj literatuturi ima malo radova koji upoređuju nalaze preoperativne kompjuterizovane tomografije i nalaz koji se ustanovi tokom endoskopskih operacija nosa i paranazalnih sinusa.

Cilj istraživanja bio je utvrđivanje praktične primene KT u preoperativnoj pripremi za funkcionalnu endoskopsku hirurgiju nosa i sinusa.

Glava kadavera je postavljena u skener aparat i potom je načinjeno više stotina snimaka menjanjem vrednosti prozora (W-window) i centriranja (C-centar). U odeljenju za otorinolaringologiju u Vranju i Izoli lečeno je 40 ispitanika koji su obrađeni u ovom ispitivanju. Kod svih bolesnika načinjena je klasična radiografija. Načinjeni su snimci kompjuterizovane tomografije (na aparatima SIMENS Smile, SIMENS Somatom 4 i spiralni-Simens Fach). Dobijene vrednosti su upoređivane sa intraoperativnim nalazom.

Postoji razlika u slaganju intraoperativnog nalaza sa nalazom kompjuterizovane tomografije i intraoperativnog nalaza sa rentgenološkim nalazom za obeležje hipertofične sluzokože u korist kompjuterizovane tomografije. Nasuprot tome, ne postoji razlika u slaganju intraoperativnog nalaza sa nalazom konvencionalne radiografije i intra-operativnog nalaza sa nalazom kompjuterizovane tomografije za obeležje cistične promene i sekret u paranazalnim sinusima.

Postoji razlika u slaganju intraoperativnog nalaza sa nalazom konvencionalne radiografije i intraoperativnog nalaza sa nalazom kompjuterizovane tomografije za sve intraoperativno identifikovane nalaze u korist kompjuterizovane tomografije. Standardni rentgenološki snimci su davali tačnu dijagnozu u 90.7%, u odnosu na kompjuterizovanu tomografiju sa 97.8%. *Acta Medica Medianae 2010;49(3):19-26.*

***Ključne reči**: funkcionalna endoskopska hirurgija nosa i sinusa, kompjuterizovana tomografija*