

2nd Department of Medical Radiology, Medical University of Lublin

WITOLD KRUPSKI, JANUSZ ZŁOMANIEC

*Diagnostic value of HRCT and 3DCT in the assessment of chronic  
maxillary sinusitis\**

In the etiology of maxillary sinusitis there is emphasised the role of mucous-ciliary transport directed towards the ostium. The blockade of the sinus orifice, like an obstacle within the orifice duct complex leads to disturbances in ventilation and drainage and consequently, to the development of inflammatory changes. In the diagnostics of maxillary sinusitis an essential role is played by computed tomography, both standard and that of high resolution (3, 10).

OBJECTIVE

The aim of the paper is to assess a combined CT examination using modern imaging possibilities i.e. standard and high-resolution sections (HRCT) as well as secondary spatial reconstructions (3D CT) in the diagnostics of inflammatory changes in maxillary sinuses.

MATERIAL AND METHODS

The material comprises 37 patients with inflammatory changes in maxillary sinuses recognised on standard axial or coronary sections. From digital data of axial sections were secondarily reconstructed pictures in high definition algorithm, and spatial 3D CT reconstructions were performed with the threshold from -150 to -300Hu obtaining pictures of internal surfaces of maxillary sinuses assessed in real time, determined by means of virtual sinusoscopy.

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\* The study was presented at the European Congress of Radiology, Vienna 2002.

## RESULTS

In 27 cases CT examination revealed inflammatory changes within both maxillary sinuses and 10 times in one sinus. In 16 patients parietal, irregular thickenings of the mucosa were recognised with accompanying fluid in 7 cases. On standard sections the density of pathologic masses was assessed differentiating the fluid and solid tissues.

Parietal thickenings of the mucous membrane were visualised in virtual sinusoscopy when the range of reconstruction started on the section with a change (Fig. 1).

Inflammatory changes were usually localised on the alveolar recess and were also manifested by periapical changes of dental roots intussuscepted to the sinusal lumen (Fig. 2).

Polypous changes occurred in 21 patients. The morphology of polyp's surfaces was revealed by virtual sinusoscopy /VS/ (Fig. 3). In 5 cases of polyps with a diameter smaller than 5 mm, the diagnosis was established in VS. It revealed the position of polyp inside the sinus, its distance and relation to individual walls and orifices.

VS completely revealed openings of sinuses as well as the presence and sizes of additional openings. In 6 cases the openings of maxillary had reduced sizes and in 3 cases were impatent. They were usually accompanied by polypous or cast thickenings of the mucosa in the neighbouring area. VS has been compared to high resolution thin-sections (Fig. 4 A, B).



Fig. 1. Circular cast thickening of right maxillary sinus mucosa in VS picture in coronary plane



Fig. 2. VS – polyp in the left maxillary sinus (arrow)



Fig. 3. Periapical cyst of a dental root intussuscepted to the lumen of the maxillary sinus (arrow)

In 18 cases high resolution sections let recognise various anomalies of the orifice duct complex, most often it was concha bullosa and anomalies of unciform process (Fig. 5), sometimes coexisting ones. Spatial reconstructions enabled the assessment of anomalies in the orifice-duct complex. In examinations in high resolution algorithm technically good spatial pictures of maxillary sinuses and pathologic masses in their lumen were obtained. In 8 cases periapical changes of dental roots localised within the alveolar process of the jaw occurred together with anomalies of the orifice-duct complex. In dentogenic etiology of maxillary sinusitis high resolution sections revealed cysts or periapical granulomas (Fig. 6) and in a patient with oral-sinusal fistula a linear clearing up within the compact lamina of empty tooth-socket.

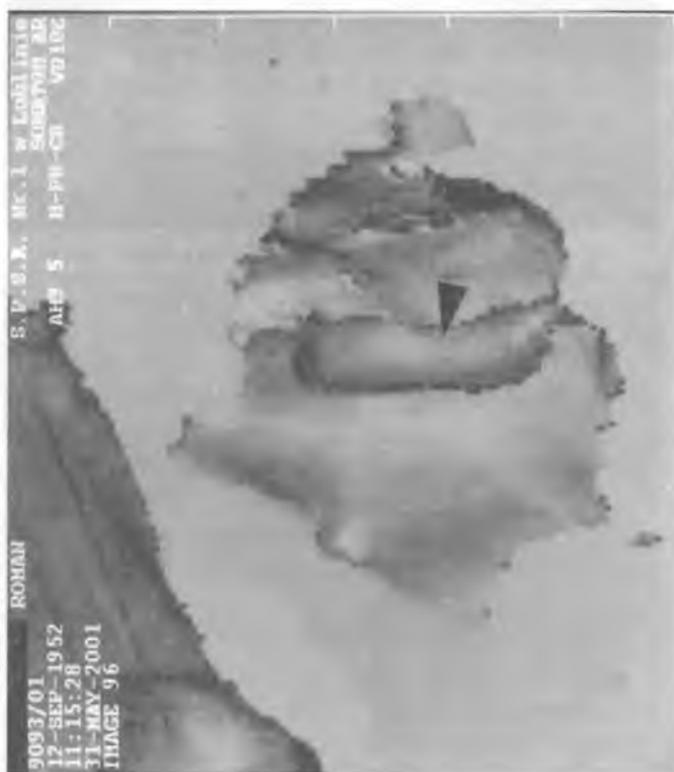


Fig. 4A. VS projection on the medial wall. Polyp on the medial wall of the left maxillary sinus (arrow)



Fig. 4B. Polyp on the medial wall of the left maxillary sinus in high resolution coronary sections (arrow). Thickening of the mucosa in alveolar recesses of maxillary sinuses



Fig. 5. Pneumatisation of unciform process on the left (arrow)



Fig. 6. Periapical granuloma (arrow)

## DISCUSSION

Computed tomography still remains the most accurate tool in the diagnostics of chronic maxillary sinusitis showing high precision in recognising, differentiating and determining anatomical etiologic factors (2, 7).

Anomalies of the orifice-duct complex in patients with periapical dental changes indicate the role of the nasal factor in dentogenic sinusitis (1).

The endoscopic effect of VS is obtained due to the perspective reconstruction of the surface with the use of a big difference of the density between the air filling up the sinus and the walls and soft tissue formations in their lumen (6, 8).

VS pictures, whose data come from 2 dimensional sections do not contain more information, but details of the mucosa surface and intrasinus formations are better visible on them due to perspective imaging at an appropriate reconstruction threshold. VS gives pictures of walls, orifices as well as pathologic intrasinus formations (4, 5). VS enables imaging of polypous overgrowths and thickenings of the mucosa and localisation of these changes within maxillary sinuses and high resolution sections supplement the examination by an accurate assessment of anomalies in the orifice-duct complex (9).

The use of standard data of axial sections for various secondary reconstructions increases CT possibilities in the diagnostics of maxillary sinusitis.

## CONCLUSIONS

Combination of modern CT imaging techniques in the diagnostics of maxillary sinusitis enables precise diagnoses and determination of a probable etiology of the disease for planning optimal therapeutic procedure.

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## SUMMARY

In a group of 37 patients with chronic maxillary sinusitis in whom CT examination had been performed diagnostic value of secondary spatial reconstructions and high-resolution sections was analysed. It was found that the supplementation of standard CT ex-

amination with high-resolution sections and spatial pictures increases diagnostic possibilities in the assessment of maxillary sinusitis as for recognising, differentiating and determining anatomical etiologic factors.

#### Wartość diagnostyczna WRTK i 3DTK w ocenie przewlekłych zapaleń zatok szczękowych

W grupie 37 chorych z przewlekłym zapaleniem zatok szczękowych, u których wykonano badanie TK, analizowano wartość diagnostyczną wtórnych rekonstrukcji przestrzennych (3DTK) i przekrojów wysokiej rozdzielczości (WRTK). Stwierdzono, że uzupełnienie standardowego badania TK o przekroje wysokiej rozdzielczości oraz obrazy przestrzenne w ocenie przewlekłych zapaleń zatok szczękowych zwiększa możliwości diagnostyczne rozpoznania, różnicowania i określenia anatomicznych czynników etiologicznych.