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*The use of USG spatial reconstructions in diagnosing  
cholelithiasis and cholecystitis*

Recent years have shown a dynamic advancement in computer technology which enables progress in diagnostic ultrasonographic devices. The latest USG equipment makes it possible to obtain spatial reconstructions from digital data of standard 2D sections.

The aim of the study is to determine the value of USG spatial reconstructions in the diagnostics of cholelithiasis and inflammatory changes in the gallbladder.

MATERIAL AND METHODS

The material comprises 12 patients examined with the apparatus Sonoline Elegra by Siemens equipped with 3-Scape Real Time 3D Imaging software in whom cholelithiasis or inflammations of the gallbladder had been recognised. At first standard 2D USG examinations were done and then spatial reconstructions of the altered gallbladder. Spatial pictures were obtained from digital data of two-dimensional sections of US exams. Data for spatial pictures were collected by changing the position of the head of the device at a definite time, within the required angle, performed with a uniform movement 30°/3s, 45°/4s, 60°/6s.

3D pictures show that points lying closer to the examiner are brighter, more intensive and clearer /sharper/. Spatial pictures reconstructed in the scale of greyness are partly transparent.

Deposits in the gallbladder were recognised in 9 cases and in 4 cases they were accompanied by thickening of the bladder walls, in other 3 cases multiple cholesterol polyps were revealed.

3D pictures were correlated with the clinical picture, histopathologic and operative findings.

RESULTS

3D US revealed the whole of the gallbladder in perspective. In 9 cases biliary deposits were recognised in the gallbladder, 3 times single ones (Fig. 1) and 6 times multiple ones (Fig. 2). Multiple deposits formed polycyclic echo reflections of different width with a wide subsequent shadow. On 2D sections it was not possible to determine the number of deposits. Spatial reconstructions, however,

revealed them as separate structures. In two cases small non-obturbative deposits were shown in the cervical region in the Hartman's pouch. In 4 cases thickening of the walls was found which was associated with the presence of cholesterol deposits. In 2 cases thickened walls were heterogenic. Combination of chronic infection with cholelithiasis leads to considerable thickening of the walls. Multiple polyps were recognised in 3 cases (Fig. 3). Two-dimensional sections showed single parietal hyperechogenic areas without a subsequent shadow which did not move when patient's position was changed while spatial reconstructions revealed all of them.

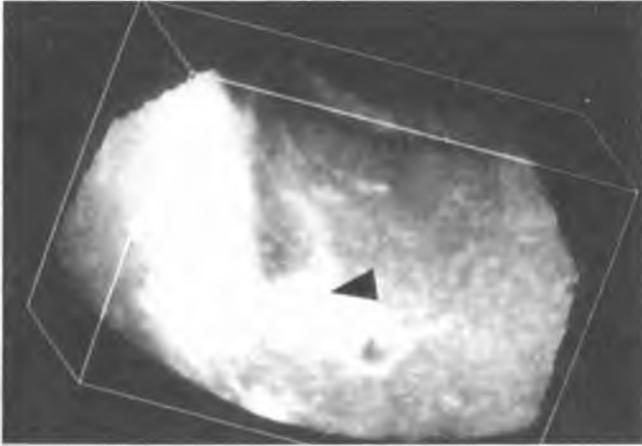


Fig. 1 Hyperechogenic area in the pericervical part of the gallbladder, thickening of its walls (biliary stone – arrow)

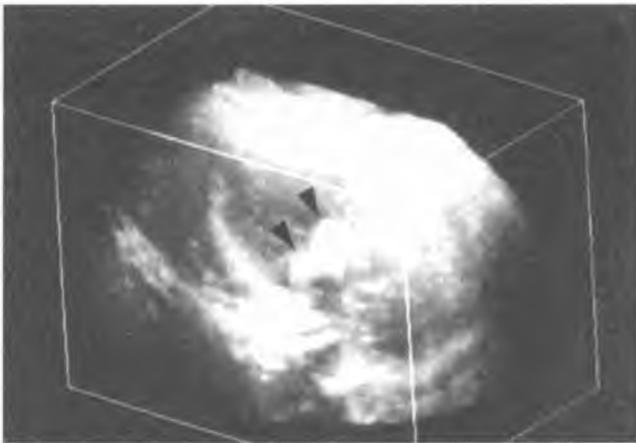


Fig. 2. Two hyperechogenic areas with marked subsequent shadows in the pericervical part of the gallbladder (biliary stones – arrows)

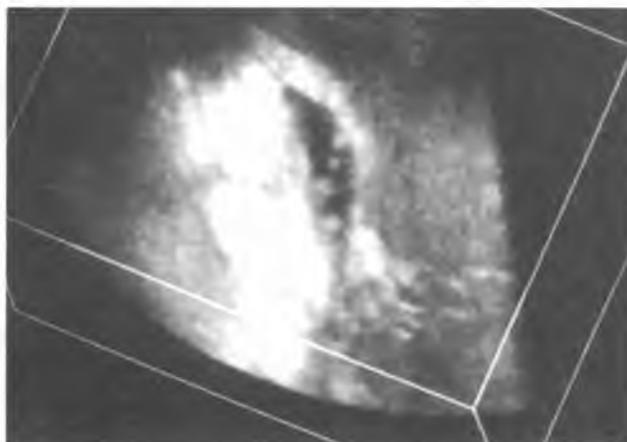


Fig. 3. Multiple polyps of the gallbladder

The thickness of the gallbladder wall should not exceed 3 mm (2, 3). 3D USG reveals thickening of gallbladder walls especially in chronic inflammation, when it is accompanied by increased echogenicity. In chronic inflammations found in 10% of surgically removed gallbladders diffuse thickening of the walls was associated with the presence of intraparietal liquid areas. They are sometimes visible in 2D USG pictures as hyperechogenic areas, when in spatial pictures heterogenic, spotty picture of the wall is obtained.

Gallbladder deposits form 3 groups: pure cholesterol stones, mixed deposits and pigmentary calculuses mainly composed of calcium (1). They give untypical mixed pictures. The usefulness of 3D USG was found in revealing small deposits sized about 3mm and not giving an acoustic shadow. Especially important was the use of 3D US in revealing cervical deposits, which were difficult to recognise in a 2-dimensional section. Spatial pictures enabled the determination of the full number of deposits and the character of their surfaces. Visualisation of the subsequent shadow was also possible in spatial pictures.

The usefulness of 3D USG is emphasised in the assessment of hypertrophic cholesterolosis and adenomatosis (1). Adenomatosis occurs in the form of diffuse, circular and abnormal mass localised at the bottom. Cholesterolosis is also defined as strawberry gallbladder. Apart from diffuse wall thickenings, in the polypous form numerous prominences consisting of cholesterol form irregular wall thickenings.

In the assessment of the polyps of gallbladder walls 3D USG enables the determination of their full number differentiating polyposis of the gallbladder from single polyps. In order to obtain legible gallbladder pictures in 3D presentation it is essential to confine the field of imaging to a small surrounding area and to lower the enhancement threshold to partly eliminate adjacent screening structures.

## CONCLUSIONS

Spatial US presentation is a valuable supplement of standard 2D USG examination. It should be used in the diagnostics of difficult and doubtful cases of gallbladder pathology.

## REFERENCES

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## SUMMARY

The aim of the paper is to determine diagnostic value of Spatial USG reconstructions in the diagnostics of cholelithiasis and inflammatory changes in the gallbladder. There was discussed the optimal way of examining the gallbladder in 3D USG presentation and advantages resulting from the use of the spatial option in diagnosing biliary deposits in selected inflammatory changes.

USG spatial reconstructions which supplement the standard 2D USG examination in the diagnostics of difficult and doubtful cases of gallbladder pathology were found useful.

Wykorzystanie rekonstrukcji przestrzennych USG w diagnostyce kamicy  
i schorzeń zapalnych pęcherzyka żółciowego

Celem pracy jest określenie wartości diagnostycznej rekonstrukcji przestrzennych USG w diagnostyce kamicy oraz zmian zapalnych pęcherzyka żółciowego. Omówiono optymalny sposób badania pęcherzyka żółciowego w prezentacji 3D USG oraz korzyści wynikające z zastosowania opcji przestrzennej w diagnostyce złożeń żółciowych i wybranych zmian o charakterze zapalnym. Stwierdzono przydatność prezentacji przestrzennych USG stanowiących uzupełnienie standardowego badania 2D USG w diagnostyce trudnych i wątpliwych przypadków patologii pęcherzyka żółciowego.