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INTRAOPERATIVE ULTRASOUND EXAMINATION OF HEPATOCELLULAR CARCINOMA

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Abstract :- Purpose: To study and define the opportunities of intraoperative ultrasound examination (IOUS) in the contemporary diagnostics and the treatment of hepatocellular carcinoma (HCC).
Patients and Methods Used: This is a prospective study for the period 2007 – 2013 of 40 patients who had undergone an open operative inervention for hepatocellular carcinoma. The engaging of the liver by the tumor process is examined preoperatively with percutaneous ultrasound examination (US) and computer tomography with contrast amplification (CT) and during the surgical operation – with inspection and palpation and IOUS. The number and localization of the hepatic lesions are compared to the preoperative results and the focal changes are verified histologically.
Results: IOUS found malignant hepatic lesions which were not found by US and CT in 10/40 patients (25%). Most of them were measuring up to 2 cm - 19/25 (76%). The additional information from IOUS led to change of the operative plan in 13/40 of the patients or 32,5%. Besides with the help of this examination the malignant lesions were localized exactly on the amatomical segments of Couinaud.
Conclusions: The routine use of IOUS in patients with primary hepatic tumors emhances the detection of malignant hepatic lesions as well as helps the surgeon to choose the suitable strategy during the operation. The use of IOUS is particularly valuable in patients with HCC and cirrhosis of the liver, where the precise defining of the localization of the tumor and its interrelations with the hepatic vessels allows an economical resection to be performed and securing adequate borders of the removed by the resection tumor.

Key words: percutaneous ultrasound, computer tomography, intraoperative ultrasound, hepatocellulsr carcinoma.

I. INTRODUCTION:

The hepatocellular carcinoma is the third common cause for death from the oncologic diseases in world and it's the most common primary carcinoma of the liver – 75-80% of these tumors.[1] The tumor represents an important diagnostic and therapeutic problem in every day work of gastroenterologists, surgeons, oncologists and roentgenologists and is detected mainly by the imaging methods of examination.[2] The small lesions in the liver are diagnosed with particular difficulty, being early HCC, regenerative or dysplastic nodules.[3] In contrast to the classic HCC, the early HCC is hypovascular, since there is a reduction of the portal venous supply of the lesion, but the arterial vascularization is not developed well and there is no radiological mark of HCC – arterial vascularization and venous wash away.[4]

The purpose of this study is to determine the benefit of the use of IOUS in patients who are treated operatively for hepatocellular carcinoma, as well as its influence on the therapeutic strategy in our population of patients.

II. PATIENTS AND METHODS USED

40 patients with hepatocellular carcinoma who were operated consequtively are included in the study. In almost all patients the malignant lesions were found or a doubt arises from percutaneous US (periodic scanning) of the liver and CT with contrast amplification.Percutaneous ultrasound imaging was performed with apparatuses AlokaSDD 4000+ and Aloka SDD 5500 (Aloka Ltd, Tokyo), equipped with standard 3-6 MHz convex transducers, maximum 1 week prior to the operation. Computer tomography for estimation of the focal processes in the liver was performed in all 40 patients. The period between CT examination and the operation was maximum 4 weeks. All of the CT examinations were carried out with i.v. contrast agents. During the operative intervention IOUS was performed with apparatuses AlokaSDD 4000+ and Aloka SDD 5500 (Aloka Ltd, Tokyo), equipped with UST-MC11-8731 Aloka Ultrasound electronic convex intraoperative transducer.

III. RESULTS AND DISCUSSION:

The study was carried out from February 2007 to April 2013 including 40 consequtively operated patients with hepatocellular carcinoma – 32 men and 8 women. The average age of the patients was 59 years, the youngest was 39 and the oldest – 77 years old. The most affected age group was between 50 and 60 years – 20 patients totally, followed by the group 60-70 years – 12 patients. Etiologically 10 of the patients had cirrhosis of the liver – 6 patients with Hepatitis C viral genesis and 4 with Hepatitis B. From the remaining 30 patients 17 have Chronic B viral Hepatitis, 8 –

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with Chronic C Hepatitis, 3 – with Chronic B and C viral hepatitis, and one patient with un known etiologic factor.

There are different systems of staging of HCC - – Tumor-Node-Metastasis (TNM), American Joint Committee on Cancer (AJCC)/International Union Against Cancer (UICC), Barcelona-Clinic Liver Cancer (BCLC), Okuda, Cancer of the Liver Italian Program (CLIP), , JIS (Japan Integrated Staging Score), CUPI (Chinese University Prognostic Index for hepatocellular carcinoma), GRETCH (Groupe d'Etude et de Traitement du Carcinome Hépatocellulaire), Liver Cancer Study Group of Japan, Tokyo staging systems, Model for End-stage Liver Disease.[5] In our study we were staging the patients by the Barcelona classification (BCLC).[6] As a result of the preoperative US and CACT all the 40 patients were staged in stages A1 and A2 by BCLC, and after IOUS 5/40 (12.5%) moved on to stage B and 3/40 (7,5%) in stage C. As a final result 8/40 or 20% of the patients in our study as a result of IOUS were assessed as inoperable for finding additional lesions – intrahepatic metastases (stage B) (fig. 1 and 2) or vascular invasion or tumor emboli in vena portae (stage C) (fig.3 and 4) of the tumor.

The additional malignant lesions in five patients were totally 20 (average 4 in a patient). Most of them were up to 2 cm -15/20 (75%). In other 5 patients (12,5%) IOUS found an additional lesion which changed the operative plan. The lesions smaller than 2 cm predominated here – 4/5 (80%). Totally in 10/40 patients (25%) additional lesions were found. All focal changes were verified histologically.

Fig. 1 and 2 Intrahepatic metastases in patients with HCC

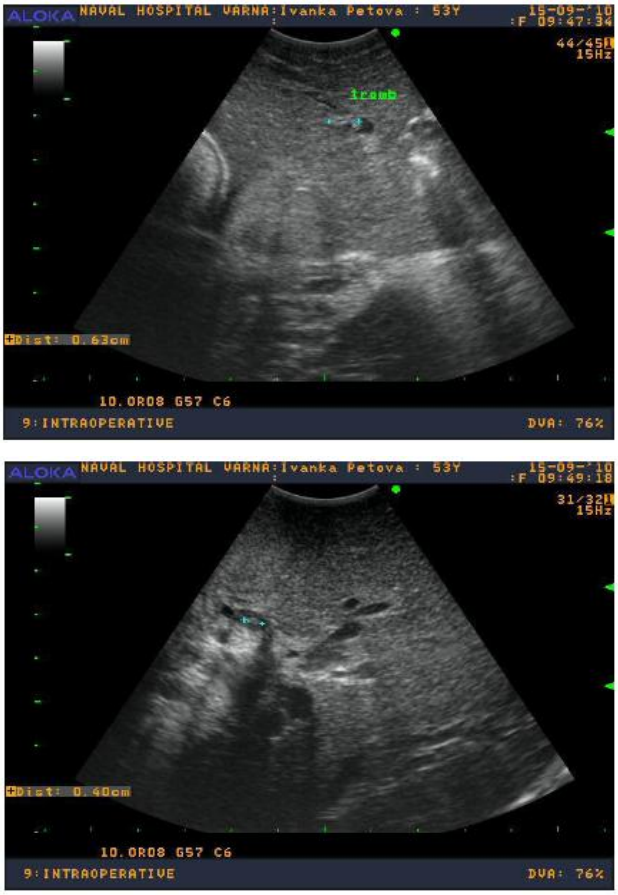

Fig. 3 and 4 Tumor emboli in segment braches of vena portae

There was a change of the operative plan in 13/40 of the patients or 32,5% as a result of IOUS which is in conformity to the literature data.

Except for finding additional focuses IOUS localized precisely the malignant lesions on the anatomical segments of Couinaud,[8] because the hepatic resection follows the segment allocation.

As it was stated above cirrhosis of the liver was found in 10 patients or 25%. It's logical that the cases with cirrhosis are too little because the indications of resection of cirrhosis of the liver are strict. In patients with hepatic cirrhosis the tumor was localized precisely, it was assessed that the tumor is not spread in more than two hepatic segments and there's no vascular invasion. The precise localization of the tumor and its interrelations with the hepatic vessels ensures adequate borders of the removed tumor in resection.(fig. 5, 6 and 7)

This corresponds to the conclusions of leading authors that patients with HCC and hepatic cirrhosis in stages B and C by Child-Pugh tolerate well hepatic resection with low mortality, acceptable morbidity and survival, if the operation is performed under the strict guidance of IOUS.[10]

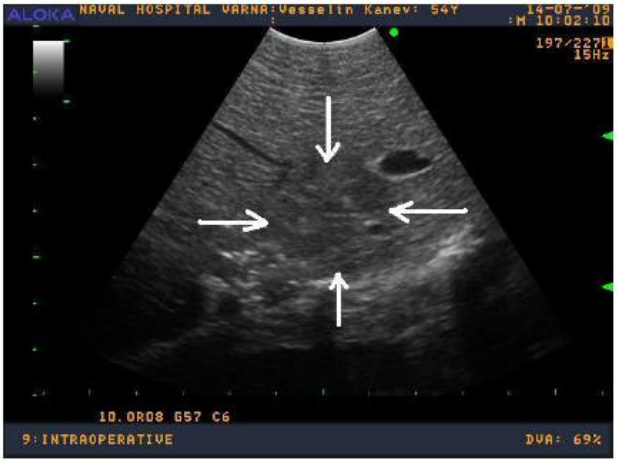

Fig. 5 IOUS of HCC localized just next to a. hepatica.

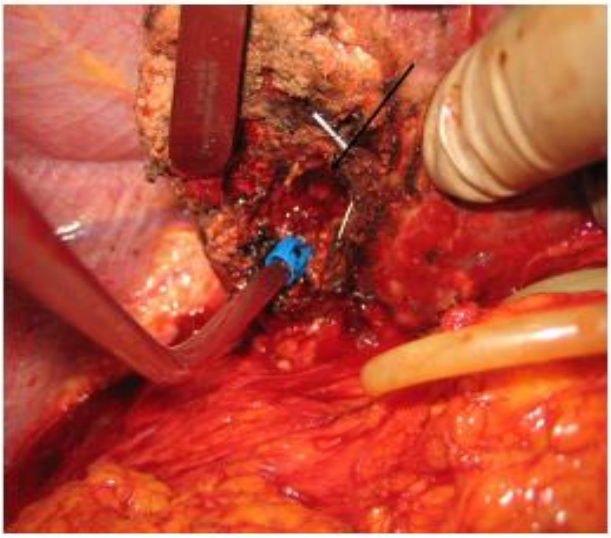

Fig. 6 After resection of HCC a pulsating a. hepatica is seen

Fig. 7 Postoperative US. The place of the hemostatic sponge is seen.

Histological diagnosis

Hepatocholangiocellular carcinoma had 1/40 (2,5%) patient, 14 (35%) - low differentiated hepatocellular carcinoma, 15/40 (37,7%) - moderately differentiated hepatocellular carcinoma, 9/40 (22,5%) - well differentiated hepatocellular carcinoma.

Falsely positive diagnosis

One patient (2,5%) with cirrhosis of the liver and chronic C viral hepatitis was operated with a preoperative diagnosis HCC with a formation in the liver measuring 50/50 mm. The latter was found by percutaneous US, confirmed with CT, IOUS and intraoperative inspection and palpation. Preoperative FNAB under ultrasound control was not performed in view of the difficult access to the lesion / VII segment/. The histological examination found a regenerative nodule in mixed (micro- and macro-nodular) cirrhosis of the liver. This error was due to the background disease – hepatic cirrhosis.

IV. CONCLUSIONS

The routine use of IOUS in patients with hepatocellular carcinoma improves the detection of malignant hepatic lesionss and helps the surgeon to choose the right strategy during the operation. In almost all cases the discrepancy between the preoperative US and CT scanning and IOUS resulted in change of the operative treatment. The use of IOUS in patients with HCC and cirrhosis of the liver is especially valuable where the precise localization of the tumor and its relations with the hepatic vessels allows for an economic resection to be performed and simultaneously ensuring adequate borders of the removed tumor in resection.

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