

CONTRIBUTION OF CT EXAM TO THE ASSESSMENT OF THE LIVER TRAUMA

ALINA VENTER¹, ADRIANA PIRTE²

^{1,2} University of Oradea

Keywords: liver trauma, haematoma intraparenchyma, hemoperitoneum

Abstract: Abdominal trauma in particular closed from traffic accidents are the most common causes of liver injury. Computer tomography abdominal parenchymal organs inventoried trauma injuries, the compulsory administration of contrast CT intravenous. Aim. Hepatic evidentiatio. Material type of lesion and retrospectively method. Study 1.02.2010-30.03.2011 conducted from the patients examined in the CT Department of Hospital Oradea clinical County. Results and conclusions. Computer tomography with intravenous contrast is the method of choice in thorough review of abdominal trauma injuries, the most rapid and effective evaluation. It contributes substantially to conduct appropriate treatment. In our group traumatic lesions of liver were ranked second by the spleen in the abdominal parenchymal organ injuries. Their etiology was in 56% of traffic accidents. In 6 cases were associated with other visceral injuries

Cuvinte cheie: traumatism hepatic, hematom intraparenchimos, hemoperitoneu

Rezumat: Traumatismele abdominale, în special cele închise, din accidente de circulație constituie cea mai frecventă cauză de leziune hepatică. Computer tomografia inventariaza leziunile traumatismelor organelor parenchimotoase abdominale, fiind obligatorie administrarea de contrast intravenos. Scop: Evidențierea CT a tipului de leziune hepatică. Material și metodă: Studiu retrospectiv efectuat în perioada 1.02.2010-30.03.2011 pe pacienții examinați în Departamentul CT al Spitalului Clinic Județean Oradea. Rezultate și concluzii: Computer tomografia cu contrast intravenos reprezintă metoda de elecție în bilanțul complet al leziunilor traumatismelor abdominale, fiind cea mai rapidă și eficientă în evaluarea acestora. Ea contribuie esențial la o conduita terapeutică adecvată. În lotul nostru, leziunile traumatice hepatice au fost pe locul II după splină în cadrul traumatismelor organelor parenchimotoase abdominale. Etiologia acestora au fost în 56% din cazuri accidente de circulație. În 6 cazuri au fost asociate de alte leziuni viscerale

INTRODUCTION

Abdominal trauma, especially the closed one from the traffic accidents represent the most frequent cause of liver lesions[1]. The rupture of hepatic parenchyma with the formation of a intra-parenchyma or sub-capsullary haematoma may lead to important haemorrhages in the abdominal cavity as a result of capsullary rupture[2]. In cases of shot wounds and by stabbing, the haematoma is formed during the perforation tract. The CT exam, next to the ultrasound, represents an useful method in the imagistic emergency diagnosis of patients with abdominal traumatism[3]. However, the ultrasound does not have to be chosen as the first intervention method in the investigation of such patients due to the examination difficulties (non-cooperative patients, meteorism), due to the long time necessary for the assessment of parenchyma lesions. The CT inventorizes the lesions of traumatism of abdominal parenchyma organs, the administration of intravenous contrast being compulsory[3,4].

THE AIM OF THE STUDY

The aim of the study is to emphasis the type of hepatic lesion through CT.

MATERIAL AND METHODS

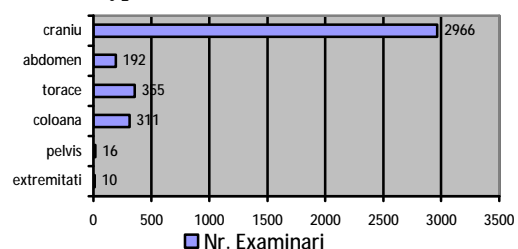
The retrospective study performed during the period 1.02.2010-30.03.2011 on the patients examined in the CT

Department of the Oradea County Clinical Hospital.

RESULTS

Out of a total of 11881 patients examined in this period, 4515 (38%) came from the Emergency Care Unit; from these, 1788 patients (aged between 4 and 69 years old - 57% males and 43% females) respectively 39% were involved in major or minor traumas. They performed a number of 3962 examinations, that is:

Figure. no. 1. Type of CT exams



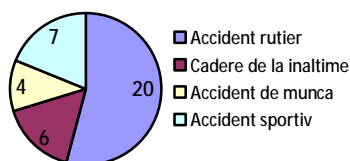
Out of the 192 abdomen examinations, 37 presented lesions of abdominal parenchyma organs. The study contains the analysis of the 37 cases at which were identified lesions of parenchyma organs. Their etiology is shown in figure no. 2. Abdominal lesions identified on CT scan are shown in Figure no. 4:

¹ Corresponding Author: Alina Venter, 51, block of flats D65, app.9, Bdul Stefan cel Mare street, Oradea, Romania; e-mail: alinaventer@gmail.com; tel +40-0 724243934

Article received on 07.05.2011 and accepted for publication on 21.08.2011
ACTA MEDICA TRANSILVANICA September 2011; 2(3)382-384

CLINICAL ASPECTS

Figure no. 2. The etiology of the lesions



Cele 37 de cazuri au avut și leziuni asociate și anume:

Figure no. 3. The associated lesions

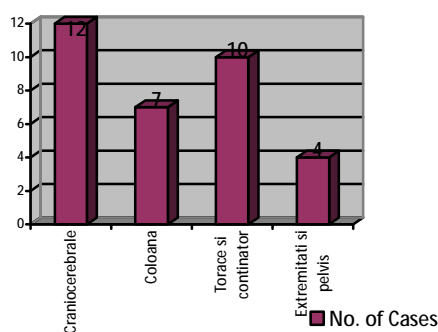
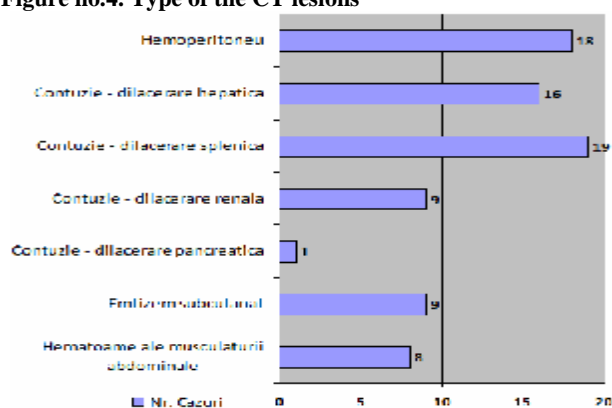


Figure no.4. Type of the CT lesions



DISCUSSIONS

The liver is on the second place as the most injured organ following the spleen in the closed abdominal traumatism[5]. There is a preference of localization of lesions in the right lobe of the liver, especially in the posterior segment, probably due to its large dimensions and to a better accessibility of the traumatism[2,6]. The mortality in hepatic lesions is relatively high, between 8-25 % [1,7]. The singular hepatic lesions are rare and in 50-75 % of the cases there are also other visceral lesions[8,9].

In principle, there are two types of classifications of hepatic lesions, a group correlated with laparotomy and another one based on characteristics. The classification of hepatic traumatic lesions takes into account the presence and depth of laceration, the interest of surface capsule, the presence of perihepatic blood, haemoperitoneum and organ rupture.

Periportal hypodensity it is considered a minimal form of hepatic traumatism. Constantly the periportal lymphedema is emphasized secondary to the lymphatic obstruction; it appears as circumference hypodensities which surround the port vessels[3,6].

The hepatic contusion is an area of minimum intraparenchyma haemorrhage and oedema, presenting as a hypodense area, marked hepatic oedema area, unclearly delimited, with decreased attenuation on the contrast sections[2,3,4].

The intraparenchyma haematoma is the result of a severe intraparenchymal bleeding and appears as a round-oval hyperdense collection on the native examination, which, after the administration of contrast does not charge. The density is changed in time due to the resorption of blood. The plaques interesting the liver surface may cause subcapsullary haematomas[2,3].

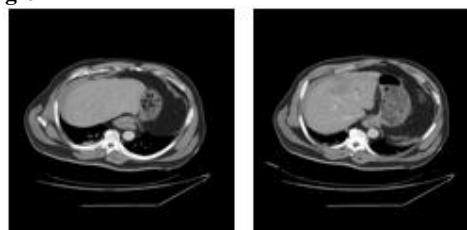
Table no. 1. Gradual classification of the hepatic traumatic lesions (Moore and others, 1989)

1st degree	Small capsulary laceration or/and parenchyma laceration not deeper than 1 cm, periportal hypodensities. Small subcapsullary haematoma smaller than 10 % of the liver's surface.
2nd degree	Parenchymatous wound of 1-3 cm. Central or subcapsullary haematoma with the diameter of 1-3 cm.
3rd degree	Deeper parenchymatous wound of 3 cm, central or subcapsullary haematoma larger than 3 cm.
4th degree	Devascularization and distruction of the hepatic lobe. Haematoma larger than 10 cm in diameter.
5th degree	Devascularization and distruction of both hepatic lobes with hepatic snatching.

The subcapsullary haematoma is a blood lentiform collection between the hepatic capsule and the parenchyma, being hypodense[2].

Hepatic laceration / wound. It is the most common hepatic lesion, especially interesting the right hepatic lobe. In the massive traumatism may exist multiple lacerations which have as result the star aspect and which may reach to the capsule. In the majority of cases in which the capsule is interested, the anterior face of the liver is lacerated, and in the right paracolic space a collection may be noticed [2,3]

Figure no. 5. Liver injury subcapsular hematoma gr II-b-intraparenchimatous hematoma associated with active bleeding-c



The hepatic fracture is a term used for the extended lacerations from a hepatic surface to another one, having as result a segmentary or lobe rupture[1,8].

The posttraumatic infarction occurs if the lesion leads to the occlusion of great intrahepatic vessels; in relation to the calibre of such vessels it may interest segments or even lobes. The infarctions appear as unclearly limited hypodense areas, without postcontrast intensification. Ocasionaly, these infarctions by overinfection may be transformed in hepatic abscesses[1,9,10].

Haemoperitoneum in hepatic lesions. The quantity of intraperitoneal free blood was found to be a significant index of prognosis for the patients with hepatic traumatism[5]. If the blood is not resorbed within a week from the native CT exam, we may consider that we have a persistent haemorrhage in case of the lesion[6].

Vascular complications. The pseudoaneurisms are developed after closed abdominal traumatism, as well as after abdominal penetrating traumatism[8,9,11]. Although their

CLINICAL ASPECTS

presence may be sometimes proven by CT exam with i.v. contrast, the angiographic emphasis is necessary. Their typical positioning at the margin of laceration and the clinical symptomatology is demonstrated by the haemorrhage. The embolization represents the chosen treatment which may be effectively and safely performed[6,12].

Figure no. 6. Intraparenchymatous hematoma that interest and liver surface



Figure no. 7. Right lobe infarction posttraumatic

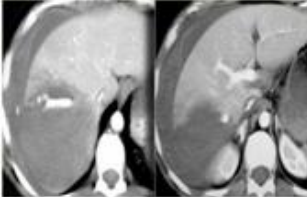


Figure no. 8 Hematoma intraparenchymatous LS and LD dilacerare small area

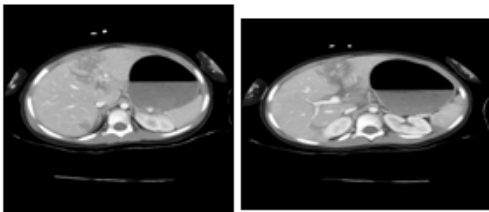


Figure no. 9. Intraparenchymatous hematoma LD

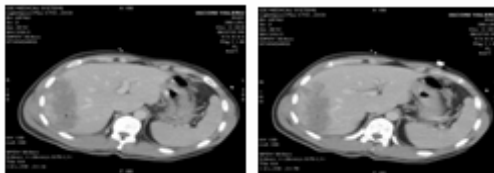
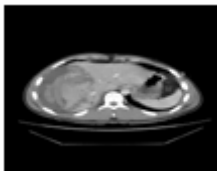


Figure no. 10. Intraparenchymatous hematoma associated with haemoperitoneum



Arteriovenous fistulae. The arteriovenous intrahepatic communication is very rare and less than 50 cases were described in the specialty literature. The majority of cases are due to traumatism: penetrating traumatism, the status following the biopsy and the closed abdominal traumatism. The majority of fistulae occur between the hepatic artery and branches of port vein. In cases with large communication, the portal hypertension may develop with all its consequences. In case of communication between the hepatic artery and the hepatic vein, a severe cardiac insufficiency may instal, depending on the shunt's size. Also, large fistulae have to be embolized or, if this is not possible, operated[7,9,11].

Lesions of juxtahepatic veins. The leaf juxtahepatic veins are rare, but almost always fatal. They include rupture or grabbing of the cave retrohepatic vein or of the large hepatic vein. The majority of these patients cannot benefit from the imagistic examination due to the seriousness of extreme gravity of lesions[9,12].

Hepatic avulsion. It is the most severe hepatic lesion, having as result the devascularization of the liver. Due to this cause, there is no intensification with contrast of the entire organ at CT exploration [8,9,12].

Haemobilia. The haemobilia occurs after the post-traumatic communication between the blood vessels and the biliary channel. The most frequent etiology is the rupture of pseudoaneurism in the biliary channel. The diagnosis is usually angiographically performed[2,9,11].

CONCLUSIONS

1. The CT with intravenous contrast represents the chosen method in the complete analysis of the lesions of abdominal traumatism, being the fastest and most efficient method in their assessment. It essentially contributes to an adequate therapeutical behavior.
2. In our lot, the hepatic traumatic lesions were classified on the 2nd place following the spleen within the traumatism of abdominal parenchyma organs.
3. Their etiology was in 56% of the cases the traffic accidents.
4. In 6 cases these were associated to other visceral lesions.

REFERENCES

1. Boyd-Kranis R. Solid organ trauma. *Semin Intervent Radiol.* 2003; 20: 71-80.
2. Woong Yoon, Yong Yeon Jeong, Jae Kyu Kim, Jeong Jin Seo, Hyo Soon Lim, Sang Soo Shin, Jung Chul Kim, Seong Wook Jeong, Jin Gyoong Park, Heoung Keun Kang. *CT in Blunt Liver Trauma, Radiographics,* 2005; 25: 87-104.
3. Mathias Prokop, Michael Galanski, Spiral and multislice Computed Tomography of the Body, 2003, 16: 614-615.
4. David Sutton *Textbook of Radiology and Imaging*, 7th edition, 202 volume I, Section 3, 25: 744-745
5. Poletti P.A., Wintermark M., Scnyer P., Becker C.D. Traumatic injuries: role of imaging in the management of the polytrauma victim. *Eur Radiol* 2002; 12: 969-978.
6. Parks R.W., Chryos E., Diamond T. Management of liver trauma. *Br J Surg.* 1999; 86: 1121-1135.
7. Konig T., Aylwin C., Walsh M., Hutchins R., *Modern management of liver trauma, J of Injury Extra.* 2007; 38 (4): 117.
8. Oschner M.G., Jaffin J.H., Golocovsky M., Jones R.C. Major hepatic trauma. *J of Surg Clin North Am* 1993; 73: 337-352.
9. Pierre A. Poletti, Kahirkamanathan Shanmuganathan, Karen L. Killeen, Douglas Coldwel. *CT Criteria for Management of Blunt Liver Trauma: correlation with Angiographic and surgical Findings, Radiology* 2000; 216: 418-427
10. Galvan D.A., Gibron D., Canfield C., Levy P. Selective non-operative management of blunt abdominal Trauma. *J of Emergency medicine.* 2006; 31 (2): 215-221.
11. Croce M.A., Fabian T.C., Spiers J.P., Kudsk K.A. Traumatic hepatic artery pseudoaneurysm with hemobilia. *Am J Surg* 1994; 168: 235-238.
12. Fang J.F. Pooling of contrast material on computed tomography mandates aggressive management of blunt hepatic injury. *The American journal of Surgery.* 1998; 176(40): 315-319.