DIFFUSE TRAUMA OF THE RIGHT LOBE OF THE LIVER SUCCESSFULLY TREATED WITHOUT RESECTION. CASE REPORT

ROZLEGLY URAZ PRAWEGO PŁATA WĄTROBY WYŁECZONY BEZ RESEkcJI NARZĄDU. OPIS PRZYPADKU I PRZEGŁAD PIŚMIENNICTWA

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Streszczenie

Autorzy omówili przypadek motocyklisty, Ofiary czołowego zderzenia, leczonego w szpitalu uniwersyteckim z powodu rozerwania prawego płata wątroby (stopień IV w klasyfikacji AAST/Moore). Pierwotny packing (upakowanie chust operacyjnych wokół wątroby), następnie leczenie zacieku żółciowego i ropnia z wykonaniem papillotomii oraz założeniem stentu do dróg żółciowych doprowadziło po 8 miesiącach do bliznowacenia i zagojenia uszkodzonego miąższu wątroby. W świetle tego przypadku i donieśćń naukowych autorzy są zdania, że tego typu urazy powinny być leczone w ośrodkach o najwyższym stopniu referencyjności, gdzie wszystkie nowoczesne metody interwencji małoinwazyjnej są dostępne, a resekcja chirurgiczna wątroby nie zawsze musi być najlepszym rozwiązaniem.

H a s ła: uraz wątroby – chirurgia – leczenie małoinwazyjne.

Summary

The victim of a motorcycle frontal crash was treated in a high reference teaching hospital for disruption of the right lobe of the liver (IV grade AAST/Moore). Primary packing, secondary biloma and abscess treatment including papillotomy and biliary stent, led, after 8 months, to cicatrisation of a damaged liver parenchyma. In conclusion, the authors stress that such injuries should be treated in highest level reference centres where all modern noninvasive interventional modalities are available, and that surgical resection is not always the operation of best choice.

K e y   w o r d s: liver trauma – surgery – noninvasive treatment.

Introduction

Currently in Poland the number of road injuries is one of the highest in Europe, with high posttraumatic mortality. One of the most severe and difficult injuries to treat is blunt liver trauma. The mechanism of this trauma comprises bicycle and motorcycle accidents [1], lateral car collision from the right side and other car accidents [2, 3], falls from height, and pedestrian accidents [4]. The estimated prevalence of liver injury in patients with blunt multiple trauma ranges from 1% to 8%, with 10% of them classified as grade III to V according to Moore and the American Association for the Surgery of Trauma (AAST/Moore) classification. The death rate of such patients being in the range of 10% to 31% is generally due to other organ injuries (predominantly head trauma) [4, 5]. The overall mortality attributable to liver injury is up to 4.1% [4]. Patients requiring surgery for liver laceration had fourfold increased relative odds of death; sevenfold increased relative odds of death were observed if liver laceration was considered the leading injury [4]. The introduction of Specialized Trauma Centres, and the

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technical progress in imaging methodology (Whole-body Helical Computed Tomography for every polytraumatic patient), has developed over recent years, allowing for a substantial reduction in mortality from hepatic trauma [3, 4, 6]. The case of a IV degree liver injury treated in a high reference teaching hospital is presented.

**Case description**

A male, age 18, a motorcyclist with a right hypochondrium injury as a result of a frontal crash, was transported to the primary care hospital, with suspected internal bleeding. Initially he was conscious, with good contact. At the beginning he underwent diagnostic laparoscopy there, converted to laparotomy, when deep transverse disruption of the whole right lobe of the liver was recognized. Perihepatic packing of the region of the right lobe was undertaken and the patient was transferred to the Academic Trauma Centre in Szczecin, being at admission in a critical state of haemorrhagic shock. The patient was unconscious, and was intubated on a ventilator with a BP of 40/20. At first he was admitted to the Trauma Centre, and temporary stabilization of the circulatory system was achieved. A helical whole body contrast-enhanced computer tomography (CT), performed next day, revealed still active bleeding, so the patient was reoperated on (Fig. 1). Haemostatic liver sutures were made, and haemostatic sponges applied. De novo packing of the right lobe of the liver was done. The packing proved insufficient and was redone the same day. There were 10 towels applied, as well as accessory liver stitches, which resulted in minimization of bleeding. For coagulation problems Novo Seven RT® was applied. At the next surgical intervention, after 2 days, the packing towels were removed and 4 drains around the liver were put in. Symptoms of necrosis of a great part of the right lobe of the liver were seen intraoperatively. In laboratory tests there were initially signs of severe liver damage and advancing multiorgan failure. The patient was still anaemic and required repeated blood transfusions. Because of laryngospasm steroids were administered temporarily. In the next 14 days a step by step stabilization of the patient’s general condition occurred, complicated, however, by fever, up to 39.5°C. Carbapenem antibiotic treatment was chosen after blood culture results. On the 9th day in the Trauma Centre drainage of the right pleura was indicated for growing fluid collection. The fever quickly returned to normal temperature. The chest tube was removed on the 4th day. The patient slowly improved, and his condition allowed breathing without the ventilator. Conscious, circulatorily and respiratorily stable, with biochemical parameters returning to normal, the patient was discharged from the Trauma Centre on the 14th day and sent to the Department of Alimentary Tract Surgery. Throughout the time in the Trauma Centre the patient received 10 units of red blood cells, 24 units of fresh frozen plasma, and 9 units of cryoprecipitate. In the surgical ward the drains around the liver were removed, except for one over the right lobe dome, which was removed later (Fig. 2). The control CT-scan revealed a fluid collection 153 × 88 mm in segments IVa, VII and VIII of the liver, and consequently a percutaneous drainage of the collection was undertaken with the bile obtained from the drain. Bacterial cultures taken from the drain revealed Klebsiella pneumoniae, Klebsiella oxytoca, and Bacteroides ureolyticus. Antibiotics were given according to antibiogram. However, because no therapeutic effect of

![Fig. 1. Computer tomography scan 2nd day after trauma; despite packing of the liver active hemorrhage and fluid is seen in abdominal cavity. The air persists after first operation](image1)

![Fig. 2. Computer tomography scan 14th day after trauma; 153 mm × 88 mm collection in IVa VII and VIII segment of the liver. Effusion in right pleura](image2)
Ciprofloxacin and Amoxicilin with Clavulanic Acid was achieved, Carbapenem was administered once more. Nevertheless, on consecutive days 300–500 cc of bile were collected from the drain daily, and therefore a decision was made to perform Endoscopic Retrograde Cholangio-Pancreatography (ERCP) and Endoscopic Papillotomy, and to put a stent into the Common bile Duct to improve bile outflow. After this drainage the daily amount of bile obtained from the drain successively lowered. All this time the patient was in good condition without any fever (fig. 3). Carbapenem was withdrawn, and the patient received only fractioned heparin one dose daily, Omeprazole 2 × 20 mg and analgesic drugs if necessary.

Because of increased fluid the pleural cavity was punctured 3 times, and a short time suction drainage of the right pleura was maintained. The patient was temporarily discharged in a state of improvement with open percutaneous drainage of up to 50 cc daily. A control CT-scan revealed minimization of the collection in the VIII segment of the liver (fig. 4). The patient was admitted again to the ward after 7 days and operated on electively on the 2nd day; percutaneous drainage was removed and adequate drainage of the collection in the right lobe of the liver was performed with a wider diameter drain. Infected bile was obtained from the drain. Postoperatively, Total Parenteral Nutrition was administered for 7 days. The postoperative course was uncomplicated, and the discharge from the drain minimized, down to a trace of fluid. The patient was discharged from the ward in good general condition with a permanent drainage. He was admitted again after 6 months for drain removal and control ERCP, which revealed no changes in the biliary system except for papillotomy. The stent from the biliary tree was removed. The patient was discharged in good general condition with advice concerning temporary control. An additional CT-scan was done 3 months later. This revealed cicatrisation in the VIII segment of the liver without any collection (Fig. 5). The patient was considered cured of the disease, and periodical checks were recommended.

Discussion

The case was assessed as a IV degree of trauma to the liver, according to AAST and Moore classification. According the guidelines in this type of injury, the indications for the appropriate mode of handling depend on the hemodynamic stability of the patient [2, 7, 8]. Immediately after the admission of such a patient to the Hospital Emergency Department it is indispensable to maintain the hemodynamic stability of the posttraumatic patient [2, 3, 4, 6, 9]. If it is possible and seems helpful, Focused Assessment with Sonography for Trauma (fAST) ultrasonography can be performed, in a search for abdominal free fluid around the liver, spleen and in the Douglas pouch [3, 10, 11]. However, it is considered that FAST ultrasound is a rough and highly physician-dependent investigation, and if it costs a time delay, it would be better to postpone it in favour of a CT-scan. An essential diagnostic modality for severe trauma patients is helical whole body computer tomography with a protocol for multiple trauma patients [4]. It provides appropriate assessment of lesions, and can discover concomitant injuries to other organs, e.g. homolateral costal fractures, laceration or contusion of the inferior right pulmonary lobe, haemothorax, pneumothorax.

![Fig. 3. Computer tomography scan 56th day; percutaneous drainage of an abscess in the liver with carbapenem treatment](image3)

![Fig. 4. Computer tomography scan 120th day; shrinkage of the collection after long term drainage to 50 mm × 30 mm](image4)

![Fig. 5. Computer tomography scan after 10 months from the injury; cicatrix in segment VIII of the liver](image5)
renal and adrenal injuries [3, 4]. In suspected blood vessel injury CT can be contrast-enhanced, and at an early phase focal high attenuation areas that represent a collection of extravasated contrast material secondary to arterial bleeding can be identified [8]. The liver is the most frequently injured abdominal organ, despite its relatively protected location [9]. It is important to know the mechanism of impact, as the lateral, usually right side blunt trauma, which is more common, affects the right lobe (segments VI and VII of the posterior sector and segments V and VIII of the anterior sector), whereas a central crush injury which appears as a stellate-type laceration, involving segments IV, V and VIII, can be associated with major arterial injury and adjacent organ disruption, such as kidney [4, 9], as seen in the presented case. It is essential to obtain the result of the CT-scan as quickly as possible, and on this base to discuss the priorities of treatment with other specialists on the canvas of other injuries (intracranial hematoma, chest, spleen, pancreas kidney, pelvis or other) [2]. It is widely accepted that conservative treatment brings the best results in handling liver trauma, which allows for self-limitation of hepatic lesions [7] when follow-up CT examinations may allow monitoring of the lesion in the hospital [3]. If this type of management in grades I–III trauma (AAST/Moore) leads to good results [11], in grades IV and V active bleeding occurs, which usually necessitates surgical intervention [7]. Here the method of choice is to pack the damaged liver parenchyma with operative towels (at last 6 towels are preferred) without compression of the portal area [2, 9]. Not infrequently one packing operation is not enough, as in this case, and more towels need to be used. Resection of the damaged liver parenchyma is not advised immediately after trauma, taking into account liver trauma as self-limiting, and the good regeneration capabilities of this organ. Nevertheless, immediately after severe trauma the liver patient should be treated in the Intensive Care Unit or in the Trauma Centre for his poor general condition, and the possibility of early complications such as acidosis, coagulopathy or hypothermia [2, 9]. If the degree of hepatic trauma justifies operative treatment and wide perihaptic packing, secondary intervention for towel removal after 2–3 days of patient stabilization allows for intraoperative assessment of the damage zone and the application of adequate drainage or repair, according to the concept of damage control [9]. The first surgical intervention, if necessary, should be as quick as possible, providing only control of bleeding, as prolonged and complex surgical repair on patient at the limit of their physiological reserves will cause exceptionally high mortality [2, 9]. In the range of modalities to stop bleeding from liver trauma angiography may be considered, as well in the identification of a bleeding vessel and embolization [2, 9]. Further, patient is passing the time of necrosis and rebuilding of hepatic damaged parenchyma which can lead to formation of abscesses or bilomas in the liver, with generalized inflammatory reaction and jaundice, complicating posttraumatic course [2, 8, 9]. The reported prevalence of complications during non-surgical management of liver trauma ranges from 5% to 23% [8]. Therefore, it is necessity to trace this process by frequent ultrasound and CT-scans. The first control CT scan is recommended not later than 7–9 days after trauma [8]. The frequency of CT scans should be adjusted, taking into consideration on one hand proper diagnosis, and on the other hand the invasiveness of this investigation, and the large doses of radiation evoked during the CT scan. So it seems reasonable to more frequently perform ultrasound investigation, and in the case of doubt a CT scan [11]. When fluid collection is detected (abscess, biloma or both) a percutaneous drainage is recommended with the application of a drain of appropriate diameter [2]. Inadequate drainage or liver sequestrum still requires surgery [2]. If the essential element of the drained collection is bile, and the biliary exudates persists, ERCP and papillotomy can be recommended, with the introduction of a stent into the common bile duct to enable better bile drainage from the liver [4, 9]. These nonsurgical interventional techniques, such as selective angiographic embolization, biliary endostent placement, and CT-guided drainage of infected collections or bilomas can handle potential complications of liver trauma as nonsurgical management [5]. The tracing of changes in frequently taken blood and urine investigations brings data regarding the general condition and advancement in the treatment of the patient, and warns about possibilities of complications requiring discovery and subsequent appropriate treatment. The time period of such observations is not defined, although there is some evidence that in children the most severe liver trauma is completely healed within 9 months [11]. As a last salvage procedure in severe hepatic trauma, when all other treatment modalities have failed, a liver transplantation may be considered [5, 9]. There have been 20 cases of total hepatectomy and liver transplantation performed in trauma patients described in the literature [5]. Summarizing the handling of severe hepatic trauma should be the domain of high reference centres which are fully provided with adequate diagnostic equipment, and with possibilities of noninvasive procedures to be performed in patients treated in Intensive Care Unit or trauma centres. The role of surgical intervention in these patients, however apparently essential, seems to be limited.

**References**


