Case Report

Hepatectomy During the Pandemic, a Curative Treatment in High-Grade and/or Hemodynamically Unstable Blunt Liver Trauma

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ABSTRACT: The liver is among the most affected organs in the case of abdominal trauma. In the last decades there have been significant changes in therapeutic protocols, non-operative management is now the first intention in most cases due to good results offered previously. In high-grade or hemodynamically unstable injuries, hepatectomy is the best approach, even though this was viewed with skepticism in the past, technical advances in medicine have proven otherwise. This article presents a case report of a 29-year-old man with blunt abdominal trauma, who initially underwent conservative atypical right hepatectomy without a favourable outcome, later he was transferred to a liver transplant center where he underwent a controlled right hepatectomy, all this in a new epidemiological context, the COVID-19 Pandemic. We want to present the hypothesis that in making a therapeutic decision, the hemodynamic status of the patient must be considered equally along with the injury degree. This case represents an opportunity to review the role of liver resection in the management of complex liver injuries.

KEYWORDS: *Hepatectomy, Hemodynamics, COVID-19, Liver Injuries, Angioembolization.*

Introduction

The liver, despite its well-protected position, is the organ in the abdominal cavity frequently interested, both in case of blunt and penetrating trauma.

Its injury is the most common cause of death in abdominal trauma.

Mortality is directly proportional to the liver injury degree associated with other organ injuries.

The management of liver trauma has improved considerably over the past decades.

Non-surgical management is nowadays the first choice and often the best treatment option.

The natural evolution toward spontaneous hemostasis, plus the liver's high regenerative capacity, often results in healing without the need for surgery.

Hepatectomy in liver trauma is a rare surgical manoeuvre, used in very serious cases.

Being historically associated with high mortality, liver resection has gained notoriety as a manoeuvre to be avoided as much as possible.

On March 11, 2020, the World Health Organization, following the global spread of the SARS-CoV-2 coronavirus, declared a global pandemic.

The declaration gave the start, in the healthcare system, to more or less substantiated measures and decisions, finally reaching generalized chaos affecting the therapeutic conduct in the emergency protocols [1,2,3,4].

Following, we describe a case managed in a regional trauma center, for which a liver-conserving surgery was adopted without the expected results, later the patient being transferred to a larger national trauma center, demonstrating that extensive liver resection can address high-grade lesions where bleeding cannot be controlled by perihepatic packing, angioembolization, or conservative resection.

The case puts liver resection, per se, and hemodynamic status in a better light in the management of complex liver injuries, even in the circumstances of the COVID-19 Pandemic.

Even though hepatectomy is not very popular among surgeons, it represents the backup option in case of failure of non-operative management.

Case

A 29-year-old patient, an employee, with no known pathological history at the time of the event, was involved in a motorcycle accident in the countryside 6 days after the start of the pandemic.

Initially, he was taken to a small rural hospital, from where he was transferred to our unit for reasons related to facilities level and high epidemiological risk.

He was brought to ER with an altered general condition, left abdominal pain (upper level), paleness, hypotension, tachycardia, psychomotor agitation, distended abdomen, painful

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spontaneously and on diffuse palpation, HGB-11.9g/dL, HCT-35.7%, temperature 37°C, blood sugar-195mg/dL, pulse-135bpm, blood pressure-120/70mmHg, GOT-1483.9u/L, GPT-1242u/L.

CT describes a 25/15mm sub capsulated liver hematoma in segment VIII, hepatic laceration of approximately 88mm in segment VII, perihepatic fluid with a maximum thickness of 7.5mm and subcutaneous laterothoracic and right-sided abdominal emphysema (Figures 1, A-C).

Minimal fluid accumulation between the pelvic bowels (hemoperitoneum), pulmonary contusions in the entire right lung area, right pneumothorax, and multiple bone fractures in various locations.

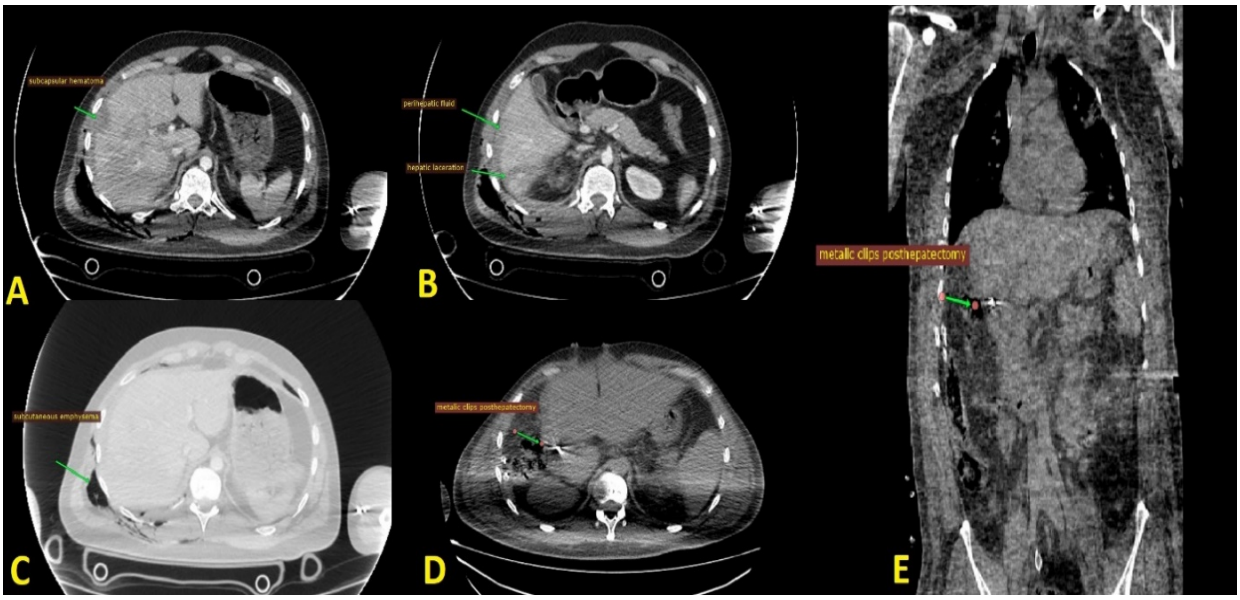

Figure 1. A-Hepatic subcapsular hematoma, B-Liver laceration and perihepatic fluid, C Subcutaneous emphysema, D-Residual right hepatic lobe and metal clips placed vascularly (transverse view), E-Residual right hepatic lobe and metal clips placed vascularly (anteroposterior view).

In ER, under local anaesthesia, a drain tube is mounted in the right intercostal V space on the middle axillary line, pleural drainage is performed and 400ml of hemorrhagic fluid and air are spontaneously evacuated incident free.

Atypical Right Hepatectomy

An exploratory laparotomy is urgently performed through a xipho-umbilical incision.

Free blood was found in the peritoneal cavity (approximately 1500ml) which was aspirated, retroperitoneal hematoma, a liver trauma by 4th-grade liver injury in the right liver lobe, segments VII and VIII, and multiple hematomas with a diameter of 40-50mm.

2 vessels with active bleeding were clamped and the bleeding was stopped, under hemostatic control a devitalized 90/90mm liver segment was excised (Figure 2).

Multiple 20-30mm lacerations on the visceral face of the right hepatic lobe, hemostatized, and drain tubes were placed in Douglas and inter-hepato-diaphragmatic space.

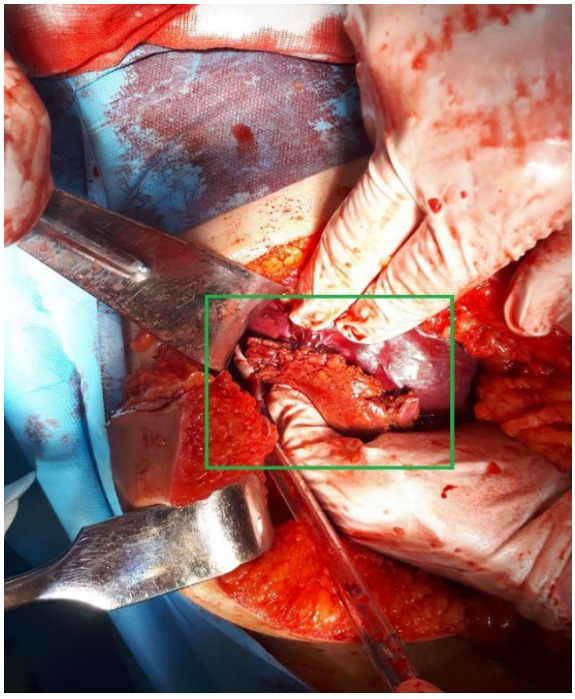

Figure 2. Conservative liver resection-devitalized liver fragment.

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Post-op, the patient was transferred to ICU Department with an extremely altered status, there, the patient's condition deteriorates more, he receives a blood transfusion, and approximately 400ml of blood was externalized on the drain tubes.

It is decided to embolize the gastroduodenal artery and a branch of the left hepatic artery, being considered sources of bleeding.

In the given epidemiological context, the patient was transferred to a clinic specialized in liver transplant.

Controlled Right Hepatectomy

In the liver transplant center, on day 3 after the first intervention, decompression laparotomy is performed through a right Kocher incision, controlled right hepatectomy, perihepatic packing for hepatic dilaceration of segments VII-VIII, and laparorrhaphy.

Evolution Post Hepatectomy

CT imaging shows a liver with an anteroposterior diameter of the remaining right lobe of 128mm, left lobe of 95mm, vascularly metallic clips, and free tomodensitometry changes (Figures 1 D,E).

In the course of hospitalization, during a clinical examination of the abdomen, was discovered a 350mm cutaneous necrosis.

On the 24th day from the first hepatectomy, the necrotic area is removed and after debridement is observed to be limited supraaponeurotic (Figure 3A).

Later, following the excision of the necrotic area, resulted in a 70mm dehiscence in the abdominal wall muscles (Figure 3B) with bowel exposure for which, on day 51 from the injury, a secondary suture is performed.

After 65 days of hospitalization and multiple surgeries, the patient is discharged with a good healthy status.

Currently (Figure 3C), the patient is employed, fully reintegrated into the socioeconomic environment of the community, and leads a normal life.

Figure 3. A-Abdominal wall necrosis at the confluence area of the two incisions. B-Wound resulting from dehiscence process, prior to the secondary suture. C-Post-interventional scar 2 years after the event, without functional limitations.

Discussions

Previous protocols involving liver resection in the case of liver trauma did not offer favourable outcomes, with mortality rates being higher than 50%, which led to a depreciation of the procedure.

Resurfacing perihepatic packing, temporary hemostatic techniques along with modern diagnostic and therapeutic equipment have led to new non-operative management options that can be successfully applied in over 80% of cases [5].

Improvements in computed tomography, the applicability of interventional radiology through angioembolization techniques, and endoscopic retrograde cholangiopancreatography (ERCP) stenting have dropped mortality rates for these types of injuries.

However, voices in the medical world argue that the easy embrace of this type of non-operative management led to increased mortality in high-grade liver injuries.

Recent guidelines recommend nonoperative management as the first treatment choice for all hemodynamically stable liver injuries, disregarding AAST grade and in the absence of other internal injuries requiring surgical intervention [6].

The patient was brought by ambulance in our ER, mainly due to lack of facilities in the previous institution and the process of becoming COVID support hospital.

The efficacious cooperation between our institutions was overshadowed by the inevitable delays due to extra protective measures, transport and transfer formalities, and led to surgical management with poorer outcome than expected.

In the first 24 hours after his arrival in our ER, specific surgical and non-surgical manoeuvres were performed to him, followed by a conservative atypical right hepatectomy.

While being in the ICU, massive hemodynamic instability prompted the surgical team to transfer the patient to a tertiary institution dedicated to liver trauma.

Once there he underwent an anatomic resection (controlled right hepatectomy) by a team of surgeons specialized in liver transplant, later, when the patient's condition was stable, he was re-transferred to our institution for continuing postoperative care.

As medicine has evolved, so has our understanding of liver anatomy and physiology.

Advances in intensive care plus the emergence of surgical teams specialized in liver transplants and complex liver resections have increased the rate of successful surgeries in countless centers around the world.

Although operative mortality for high-grade liver trauma is still high, according to the literature, several documents from centers with surgical teams specialized in liver transplantation and liver trauma concluded the opposite.

Strong et al. reported mortality rates after liver resection of 11.1% with liver morbidity of 19% and emphasized the use of simple methods to successfully treat injuries, and the resection, when necessary, to be performed only by an experienced team [7].

Tsugawa et al. reported a larger number of patients, 100, with a mortality rate of 24% [8].

The study presented the differences in injury mechanism, AAST grade, and complications in the elderly and young people.

Noting the high survival rate in the elderly, resection could be framed as a suitable option for this subpopulation.

Polanco et al. reported 56 patients with liver trauma AAST grades III-V, predominantly blunt aetiology and a mortality rate of 9%, and concluded that resection can be performed per primam intentionem or secondary in the management plan [9].

Several risk factors were associated with mortality, liver injury grade being one of them.

Doklestic et al. studied 121 patients with liver injury, grades III-IV AAST, and demonstrated that deaths occurred in patients who had high-grade injuries on admission, elevated transaminase levels, increased injury severity score, hypotension, and low Glasgow score [10].

Also, was noted the high number of transfusions in the first 24 hours, and they concluded that prolonged hemorrhages and a high number of transfusions are statistically significant factors of mortality in high-grade liver trauma.

Uribe et al. showed that a low Revised Trauma Score with associated intra-abdominal injuries are significant risk factor [11].

Tarchouli et al. reported mortality following the surgery of 5 cases (19.2%), 3 deaths were due to massive uncontrollable hemorrhage in complex liver injuries (grades IV-V), one death was due to multiple organ failure in abdominal compartment syndrome, and one death was due to septic shock cause of severe nosocomial pneumonia, all from a group of 26 patients who needed hepatic surgery.

Non-operative management is preferred for hemodynamically stable patients with low mortality and morbidity [2].

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Main hepatectomy advantages: high efficiency in treating hemorrhage, removal of devitalized tissues, and decreased morbidity related to bile extravasation in complex liver injuries.

Velasco et al. demonstrated in their study that hemodynamic stability is the most important criterion in treatment choice and in case of clinical deterioration or signs of peritoneal irritation, they recommend laparotomy.

Perihepatic packing and temporary hemostatic manoeuvres are used especially in hospitals with less experience in liver surgery, as they ensure rapid stabilization before patient transfer to a specialized institution.

Patients with high-grade injuries who underwent perihepatic packing subsequently required surgery [3].

In our institution, as in most centers, we manage blunt low-grade liver injuries nonoperatively and operatively for high-grade or hemodynamically unstable.

To detect the presence of intraperitoneal fluid, we use non-invasive operator-dependent FAST examination.

The golden standard in liver trauma is represented by computed tomography, [12,13] with which we manage to identify type and grade injury, quantify the volume of hemoperitoneum, detect other intra-abdominal injuries, and perhaps most important role, detect active extravasation of contrast material, thus indicating active bleeding.

Hemodynamic instability and its menaces associated with specific signs and symptoms of liver injury guide the therapeutic approach to angiographic embolization making nonoperative management feasible and more successful, [14,15,16,17] and/or towards classic operating management.

In patients requiring laparotomy, the first step is to stop the liver bleeding using devices and temporary hemostatic techniques, in case of success, but the patient is still hemodynamically unstable, we search and suppress active bleeding abdominal sites.

In case of hepatic hemostasis failure, hepatectomy, and hemostasis are performed according to anatomical data.

For our patient, although the epidemiological risk caused by the COVID pandemic was of biblical proportions, all protocol standards were followed, but without success.

Time elapsed from the accident until entering the operating room multiplied the injuries effect and accelerated his health deterioration.

In our department, the surgical approach was as liver conservative as possible, finally needing a surgical reintervention (right hepatectomy) in a liver transplant center with very good results.

In conclusion, blunt liver injury management is dependent on their grade and/or hemodynamic status.

Low-grade ones, due to the high regenerative capacity of the liver and hemodynamic status do not need operative management, whereas high-grade ones and hemodynamically unstable ones require a different approach.

Therefore, in complex liver injuries, anatomical liver resection is the best option only if the institution's facilities meet all the criteria necessary to manage and treat such cases.

Conflict of interests

None to declare

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