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Complex hepatic injury involving a liver transplant recipient: A case report and review of literature



Sanjiv Gray (MD)*, Fariha Shiek (MD), Joseph Shiber (MD)

3rd Floor, Faculty Clinic, 653 West 8th Street, FC12, Jacksonville, FL 32209, United States

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1. Introduction

Mortality remain high for patients with complex hepatic injuries grades IV and V however numerous studies have shown improved outcomes with a multidisciplinary approach using a combination of angioembolization, perihepatic packing and resection. Patients with a transplanted liver allograft pose an additional challenge as this is a rare occurrence only reported once in the literature. We report a case of complex hepatic injury to a recently transplanted liver in conjunction with a review of the literature to aid in identification of the potential pitfalls in management of this subset of patients.

2. Case report

A 55 years old woman was brought to the trauma center as a pedestrian struck by a minivan. Primary and secondary survey was significant for heart rate in the 120's and focused abdominal sonogram for trauma positive for free fluid. Computed tomography (CT) was significant a grade IV hepatic laceration with active extravasation and moderate hemoperitoneum with evidence of splenorenal varices, right 1,4,5,6,7 rib fractures with pneumothorax and hemothorax, right clavicular fracture, comminuted right superior and inferior pubic rami fracture, right sacroiliac fracture involving the right S1-S3 neural foramina, left zone 3 sacral frac-

ture. Further medical history was obtained revealing the patient had a past medical history of hepatocellular carcinoma, hepatitis C with cirrhosis, and a cadaveric liver transplant 2 months prior. A right chest tube was placed and a celiac angiogram done which showed multifocal areas of contrast extravasation from the tertiary branches of the right hepatic artery. Selective angioembolization was done and post embolization arteriography revealed no active contrast extravasation. Pelvic angiography showed no evidence of arterial injury. The patient was brought to the surgical intensive care unit (SICU) in stable condition but two hours later became hypotensive with a HGB of 6.5 g/dL and platelets of 57×10^3 /mCL, this prompted an emergent laparotomy. At laparotomy significant hemoperitoneum was noted. Packing was difficult due to the recent liver transplant and adhesions between the liver and the abdominal wall and the intestines. Bleeding was noted from a prior biopsy site and at the dome of the right lobe of the liver. Due to the amount of bleeding and the difficulty with mobilization of the liver, perihepatic packing was done and the abdomen was left open with negative pressure wound therapy. A repeat arteriogram revealed severe vasospasm and compression of the hepatic artery branches. It also revealed multifocal areas of arterial bleeding within the hepatic dome. Angioembolization of two tertiary branches of the right hepatic artery was done. Due to ongoing blood loss the patient was transferred back to the operating room for further exploration. A 5.5 mm Fogarty balloon was left inflated in the common hepatic artery. To control the bleeding, attempts were made with both cauterization and liver sutures. Perihepatic packing was carried out and the abdomen was again temporarily closed with negative pressure wound therapy dressing (Figs. 1 and 2).

The patient was then transferred to the SICU intubated where resuscitation was continued with massive transfusion protocol,

* Corresponding author. Permanent address – 3604 71st Street E, Palmetto, FL 34221, United States.

E-mail addresses: sanjivfg@gmail.com (S. Gray), Fariha.Sheikh@hitchcock.org (F. Shiek), Joseph.Shiber@jax.ufl.edu (J. Shiber).

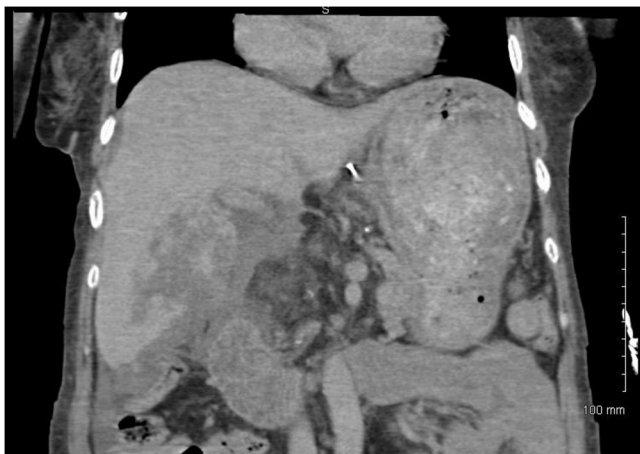


Fig. 1. Grade IV liver injury. Shows large laceration of the right hepatic lobe with moderate hemoperitoneum.

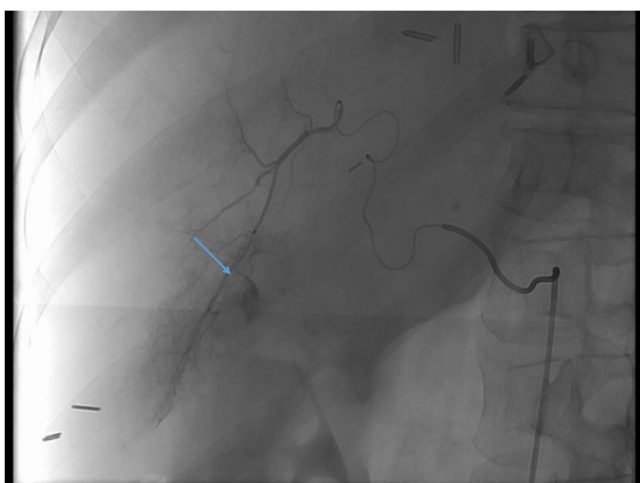


Fig. 2. Angiogram showing extravasation from the tertiary branches of the right hepatic artery after selective angiography of the right hepatic artery. Arrows shows area of extravasation.

hydrocortisone drip, perioperative cefazolin, cryoprecipitate, factor VIIa and Tranexamic acid. Due a white blood cell count of 0.7×10^9 per liter (L) and known immunosuppression in the setting of the recent transplant, the patient was placed on neutropenic precautions and started on prophylactic bactrim and ganciclovir. The patient developed multiorgan dysfunction syndrome with ARDS, anuria, cardiac failure and hypoglycemia. The patient’s family was updated on her imminent demise and made the patient do not resuscitate status. The patient unfortunately passed away soon afterward (Table 1).

3. Discussion

The liver is the most commonly injured organ in blunt abdominal trauma and the severity of liver injuries are graded according to the American Association for the Surgery of Trauma Organ Injury Scale (AAST-OIS) [1] Complex hepatic injuries grades IV and V on the AAST-OIS are associated with high mortality rate 46–80% with uncontrolled hemorrhage being the leading cause of death [2]. Asensio et al. showed in a 6 year retrospective study that sur-

Table 1

American Association for the Surgery of Trauma Organ Injury Scale Grading for Liver Injury.

Grade	Injury type	Injury description
I	Hematoma	Subcapsular < 10 % surface
	Laceration	Capsular tear < 1 cm parenchymal depth
II	Hematoma	Subcapsular 10–50 % surface area; intraparenchymal, <10 cm diameter
	Laceration	1–3 cm parenchymal depth, <10 cm in length
III	Hematoma	Subcapsular > 50 % surface area or expanding, ruptured subcapsular or parenchymal haematoma.
	Laceration	Intraparenchymal hematoma > 10 cm > 3 cm parenchymal depth
IV	Laceration	Parenchymal disruption 25–75 % of hepatic lobe
	Laceration	Parenchymal disruption involving > 75 % of hepatic lobe
V	Vascular	Juxtavenous hepatic injuries i.e., retrohepatic vena cav/central major hepatic veins
	Vascular	Hepatic avulsion

vival can be improved with aggressive multifaceted management including surgery, early packing, angioembolization, endoscopic retrograde cholangiopancreatography (ERCP) and stenting of biliary leaks and drainage of hepatic abscesses with overall hepatic mortality rate of 9% and mortality rate of 8% for grade IV hepatic injury and 22% for grade V injuries [3]. Standard operative approaches include hepatorrhaphy and vessel ligation, hepato-tomy, hepatic resection and direct approach to the retrohepatic cava. The Pringle maneuver is used both for diagnosis and therapy as failure of bleeding to slow down may indicate a retrohepatic source or aberrant arterial anatomy. Asensio and colleagues in a follow up study described the operative management of complex grade IV and V hepatic injuries including hepatectomy, non-anatomic resection, and direct retrohepatic repair. Early perihepatic packing was associated with a 59% survival rate versus 5.5% when done out of desperation. The study also highlighted the statistically significant role of angioembolization in the management Mohr et al. reported the hepatic morbidity of angioembolization to be 58% and overall mortality of 27% in patients with grades III–V injuries with higher grades being predictive of complications [4,5]. Patients who undergo selective embolization of the right hepatic injury require close follow up for possible gallbladder infarction. Patients undergoing early angioembolization have fewer blood transfusions and hepatic infectious complications [6].

Polanco et al. in a retrospective study of patients with complex liver injuries grades III–V undergoing liver resection had an overall morbidity of 62.5% and overall mortality of 17.8% with liver related morbidity of 30% and liver related mortality of 9% [7–9]. The incidence of complex hepatic injuries is rare 2–4% and those requiring liver resection is even more rare, therefore experience tends to be lacking for this technically challenging task. The presence of an experienced liver surgeon or senior trauma surgeon is advocated [10].

Patients who continue to deteriorate from either uncontrollable hemorrhage, progressive acute liver failure, severe grade IV or V liver injury, post reperfusion injury or toxic liver syndrome may require liver transplantation [11–13]. This usually a 2 stage procedure with total hepatectomy and portocaval shunt followed by liver transplant when a liver becomes available. Most of the experience with this strategy is limited to case series in experienced liver centers with reported survival of 84% in the last decade.

With the improved outcomes complications can be seen in the perioperative period. These include biliary fistula, intra-abdominal and hepatic abscesses, hemobilia, liver necrosis, liver failure, coagulopathy, and delayed hemorrhage. Biliary fistula can be diagnosed and managed using ERCP with stenting. Intra-abdominal and hep-

atic abscesses can be drained using CT scan guided techniques [5,6]. The patient presented is unique due to history of recent liver transplant. There is one other reported case was found in the literature occurring in a 46 years old male successfully treated with a right hepatectomy at a transplant center [14]. The operative findings were similar to ours with adhesiolysis releasing the previously tamponade bleeding. Catalano et al. cautioned prolonged Pringle's maneuver to limit the risk of injury to the vascular structures and ischemic damage to the residual liver. He also highlighted that in the posttransplant liver the adherence of the parenchyma to the inside of the peritoneal cavity causes succession and traction lacerations of the parenchyma itself. It also limits mobilization and access to major vascular injuries. Early monitoring for intraparenchymal extension is critical as it indicates the need for urgent surgery. The status of the graft is a determining factor in the outcome. Guckelberger et al., [15] in a review identified 24 adult patients in the literature who underwent liver resection after transplantation, only Catalano's patient was due to trauma. Early liver resection before 5 months had a periprocedural mortality of 29% and late resection between 5 and 149 months had a 12% mortality related. Morbidity was 29% and was related to sepsis, liver failure, myocardial infarction, biliary fistula, intra-abdominal abscess. The authors cautioned the risk of adrenal suppression, impaired wound healing, and infections. Barone et al. highlights several issues in the management of the transplant patient who experiences trauma [16]. He advocates consultation with physicians experienced with transplantation and vigilance for fractures, deep vein thrombosis, organ rejection, and subtle anatomic difference, which may affect interventional and surgical approach. Tessier et al., [17] in a retrospective study showed that transplant patients admitted for trauma had no higher incidence of infections and had similar hospital length of stay, ventilator days, and ICU length of stay and recommended avoiding overuse of antibiotics. Scalea et al., [18] with the largest database to date with 50 trauma patients with history of transplantation showed that when compared with the nontransplant group the outcomes were no worse, the WBC counts were lower in the transplant group and the length of stay shorter in the transplant group. Fractures rates were found to be similar and the transplanted grafts were infrequently injured.

4. Conclusion

Complex hepatic injuries are associated with high mortality. Multidisciplinary management is paramount for better outcomes. In patients with a transplanted liver trauma surgeons should be vigilant for intraparenchymal extension and early consultation with a liver or transplanted surgeon is warranted.

Conflicts of interest

All authors report no conflict of interest.

Funding

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Ethical approval

n/a.

Consent

No written consent was obtained as the patient died. The patient's family were visitors from abroad and as to such were not available to give permission. We believe this case report highlights a very rare condition and contributes to the scientific literature.

Author contribution

Sanjiv Gray, Fariha Shiek and Joseph Shiber contributed to the data collection, data analysis and writing the paper.

Guarantor

Sanjiv Gray.

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