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Hemostatic Control in Liver Injury, A Practical Review

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ABSTRACT

The liver is the most usually damaged organ following blunt trauma, which can occur as a result of blunt, thoracic, or abdominal trauma. Penetrating liver damage is accompanied with potentially fatal lesions of key neighboring tissues (e.g., vena cava, aorta). (The size and depth of the liver hematoma and/or laceration as discovered on computed tomography (CT) or at the time of surgery are used to classify liver damage (I through VI). Injury severity correlates with greater morbidity and death. Exploratory laparotomy for trauma involves of first controlling bleeding using abdominal tamponade in all four quadrants, then inspecting the intra-abdominal organs and, if necessary, exploring the retroperitoneum. Before treating gastrointestinal damage, active bleeding is addressed.

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INTRODUCTION

The most often damaged abdominal organ is the liver. Most liver lesions are small and heal on their own with conservative therapy that includes surveillance and the use of arteriography and embolization if needed. However, roughly 14% of people suffering from liver impairment will require surgical intervention.[1]

When surgery is required, a methodical technique to controlling bleeding while conserving the liver parenchyma is performed; liver resection is reserved for serious injuries. The use of damage control measures, notably perihepatic tamponade, during the first laparotomy minimizes the amount of following surgical operations. [2]

SURGICAL MANAGEMENT APPROACH

Because of the liver's complicated architecture, size, vascularization, dual blood supply, and difficult-to-reach venous drainage, surgical care of liver lesions can be difficult even for experienced surgeons. The purpose of surgery is to reduce liver bleeding, which may need simple or complex surgical treatments depending on the degree of the lesion. [3]

Surgical therapy of traumatic injuries is often used in one of two scenarios. The injury's diagnosis (and perhaps severity) may have been established prior to laparotomy, or the surgeon discovers the damage during traumatic laparotomy due to shock, peritonitis, or penetrating injury. The degree of injury from the American Association for Trauma Surgery (AAST) plays a modest effect in surgical decision-making about liver injury, regardless of how the diagnosis was acquired. [4]

Whenever a liver damage necessitates surgical intervention, a thorough exploratory laparotomy should be conducted. Damage control techniques are followed, with the goal of first reducing bleeding and subsequently any gastrointestinal contamination. Damage control allows anesthesia personnel to revive the patient. In hemodynamically stable patients, definitive therapy of liver damage might be conducted promptly, or late after stabilization of lesions and subsequent resuscitation in the critical care unit. Arteriography with embolization is occasionally used in conjunction with monitoring. [5]

Compression, topical hemostatic medicines, electrosurgical methods, or tamponade may be used to treat superficial liver lacerations. [6] Direct ligation or clipping of bleeding vessels, enhanced with suture plication and liver tamponade as needed, is frequently required for profuse lacerations, big open tract lacerations, and larger parenchymal avulsions. A balloon tamponadement approach may be employed when bleeding is observed from inside a deep projectile passage into the liver and the overlying hepatic material is intact. Serious lesions necessitate more extensive bleeding control measures, such as hepatic artery ligation and excision debridement, followed by suturing of the open margins of the liver or temporary hepatic tamponade, with or without topical hemostatic drugs. [7]

The focus in the care of liver damage is bleeding control. After the hemoperitoneum has been rapidly evacuated, laparotomy pads are methodically put in all four quadrants of the abdomen, along the pericolic gutters, and in the pelvis. These packets are then eliminated one by one when other

sources of bleeding are investigated. While the liver is being treated, a coexisting splenic lesion is routinely treated with quick splenectomy for severe lesions or left upper quadrant tamponade for smaller lesions. [8]

Hepatic hemorrhage is controlled in stages, beginning with modest procedures and increasing to more aggressive techniques as needed. Manual compression, portal impingement, or perihepathic tamponade are used to stop the initial bleeding. Continuous mild to moderate parenchymal hemorrhage can be managed using topical hemostatic medications, electrosurgical methods, and parenchymal vascular ligation. Hepatic suturing procedures or hepatic artery ligation may be required for more serious damage. If these methods fail, the liver section may have to be removed. [6, 7]

In patients with severe liver damage affecting the glissonian pedicles around the hepatic hilum, glissonian pedicle transection followed by anatomical resection has also been documented as a life-saving management strategy. This method is not commonly seen in the orthopedic surgeon's surgical arsenal, but it can be beneficial in the hands of a hepatobiliary and skilled surgeon.. [9]

In the past, liver lesions were treated by encircling the affected hygia with a huge piece of absorbable mesh. However, the procedure is not suitable or successful for all forms of liver damage, and competence with the technique is required to accurately and rapidly implant the mesh and secure it. For the treatment of severe liver infections, this approach has mainly been supplanted by perihepatic packing.[10]

Manual compression of the liver with both hands can aid in the plugging of bleeding from bare liver surfaces. The liver parenchyma is pulled together by placing hands on each side of the liver fracture. This procedure controls hepatic bleeding in a short period of time, giving enough time for resuscitation. It is not meant to be a long-term treatment for hepatic bleeding. Liver compression can be restored as needed throughout the process or as needed. [11]

If physical compression of the liver fails to control the bleeding, a non-crushing vascular clamp can be inserted via the hepatic portal structures (Pringle's technique), blocking portal and arterial venous supply to the liver. [12]

When physical compression of the liver is ineffective, portal clamping should be administered as soon as possible. Portal clamping can stop or considerably reduce hepatic bleeding and aids in distinguishing between bleeding from incoming hepatic arteries (hepatic artery, portal vein) and bleeding from outflow vessels (hepatic veins, inferior vena cava). If closing the hepatis portal reduces liver bleeding, the bleeding is associated with hepatic inflow, but continuing bleeding implies a source of hepatic outflow. These two separate causes of hepatic bleeding necessitate various surgical methods. [13]

Tamponade of the perihepatic artery has become a standard method for reducing bleeding from epathic lesions. Although some have questioned its effectiveness, perihepatic tamponade appears to minimize new bleeding rates and death. [14]

To reduce bleeding from the liver's living surface, topical hemostatic medications are frequently utilized in concert with attic perihepal tamponade and electrocautery. There are several topical hemostatic medicines available, each with its own set of benefits and drawbacks. Before sealing the abdominal wall, it is not required to remove absorbable hemostatic agents. The use of topical hemostatic drugs prior to perihepatic tamponade enables for the removal of perihepatic plugs during the initial laparotomy.[6]

Light bleeding from the surface of the liver in the flesh that is not controlled by perihepatic tamponade or topical hemostatic medications may be managed with conventional electrocautery or argon beam coagulation. Cautery is probably only useful for vessels with a diameter of less than 0.5 mm; anything greater should be clipped or tied with sutures. The argon beam coagulator, unlike traditional electrocautery, does not require physical contact with the surface of the liver to produce hemostasis. When the tip of the electrocautery pen is withdrawn from the surface of the liver, it might remove the eschar off the surface, producing more bleeding. [15]

Deeper liver parenchymal lacerations are treated by ligating or severing the arteries and bile radicals that are detected straight through the laceration. This procedure normally necessitates the recurrent use of a portal forceps, which creates a relatively blood-free environment in which tiny arteries and bile ducts may be identified and controlled more readily. [16]

To reach a region of active bleeding, it may be required to split (hepatotomy) an area of intact liver tissue. The simplest way to accomplish this is to use a finger (the finger fracture technique) or the rear end of an empty scalpel holder. After the visible veins and bile ducts have been managed, remaining bleeding from the tiny ducts and vessels coming from the liver's surface can be controlled using topical hemostatic medications, electrocautery, or direct suturing of the liver parenchyma, as discussed in the next section. [17]

After division of the liver parenchyma and closure of the parenchymal veins, or in combination with perihepatic tamponade, the proximity of the margins of the liver in raw flesh can be employed as a major way of achieving hemostasis. Direct hepatic suturing should be done exclusively to manage continuous hepatic parenchymal leaking, not significant hepatic bleeding. The full thickness interrupted ligation method with transhepatic suture (FILTH) is one variant that employs a device or suture route. [18]

The liver's margins are linked together with absorbent sutures (e.g., Teflon) (chromic catgut No. 1 or No. 2) put in the shape of a mattress and inserted with a big blunt-tipped needle. It's vital to remember that the liver capsule is thin and quickly ruptures, so don't put it under too much tension. [19]

Before approaching the liver parenchyma, a topical hemostatic medication may be applied to the damaged location. Alternatively, before connecting the liver margins, the omentum might be mobilized and put into the laceration. Mental tamponade may reduce the risk of ischemia and infectious consequences. [20]

COMPLICATIONS

Complications following surgical treatment of liver lesions are common. Complications become more common as the degree of liver damage increases. Complications arose in 5, 22, and 52 percent of patients with grade III, IV, and V lesions, respectively, in a group of 669 individuals. Complications from lower-grade injuries (grades I, II) are uncommon. Bilileakage occurs at a rate ranging from 0.5% to 21%. Other complications connected with the therapy of liver damage include hepatic artery ligation or angioembolization-related liver necrosis and perihepatic abscess. [21]

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The combination of severe liver damage and ischemia caused by hepatic artery embolization or occlusion may predispose to hepatic necrosis. Major hepatic necrosis is treated with resection debridement, interventional drainage techniques, or hepatectomy. [23]

Laparoscopy may be beneficial in the treatment of patients with intra-abdominal problems following severe liver damage, particularly those who have been managed conservatively before. Laparoscopically guided drainage of residual bile and blood is especially beneficial in the treatment of higher-grade hepatic lesions, and laparoscopic hepatic lobectomy for persisting large post-traumatic biliary leak has been recorded. [24]

CONCLUSION

Manual compression, portal clamping, and perihepatic tamponade are used to control bleeding caused by liver damage at first. If the packing is successful in stopping the bleeding, it might be retained in place as part of a damage control approach or removed. Topical hemostatic medications, coagulation methods, intraparenchymal vascular ligation, and direct hepatic suturing are all effective ways to reduce liver hemorrhage. Conservative hemostasis procedures are typically effective in treating low-grade lesions.

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