



Original Research Article

Perihepatic Packing: A Life Saving Procedure in Liver Trauma

Authors

Dr Anant S. Ramani¹, Dr Vishal Sardesai²

¹Associate Professor of Surgery, Goa Medical College, Bambolim- Goa, India

²Lecturer in Surgery, Goa Medical College, Bambolim- Goa, India

Corresponding Author

Dr Anant S. Ramani

Associate Professor of Surgery, Dept. of Surgery, Goa Medical College, Bambolim Goa Pin: 403 502

Abstract

Objective: Liver is one of the most common organ injured in Blunt and penetrating abdominal trauma and is the 2nd most common cause of mortality in these patients. The main objective of this study is to analyse the role and success rate of perihepatic packing in liver trauma

Materials & Methods: This is a prospective study conducted on 200 patients of Liver trauma admitted in a tertiary care hospital over 2 year period with 3 months postoperative followup. Most of the High Grade liver injuries with uncontrolled venous bleeding were subjected to perihepatic Packing. The patient were shifted to ICU postoperatively and reexplored after 48 hours for pack removal.

Results: 30 patients were subjected to Perihepatic packing with success rate of 80% in achieving haemostasis. 24 cases were due to blunt while 6 due to penetrating trauma. Commonly seen in younger age group with male dominance. Majority of the injuries were AAST Grade III and IV type.

Discussion: In Liver trauma the prime goal is Life Saving by control of Haemorrhage. Various advanced procedures are performed for the same, however it may not be possible to carry out all these in an emergency setting of Haemodynamically unstable patients. In these selected cases, Perihepatic packing is the Gold standard to achieve haemostasis as damage control or Definitive procedure.

Conclusion: Perihepatic Packing is a highly recommended procedure in selected cases of High Grade liver injuries mainly for control of venous bleeding. Good postoperative ICU ventilator support under Broad spectrum Antibiotic cover is mandatory to minimize morbidity and mortality associated with the procedure.

Keywords: Liver trauma, Perihepatic Packing, Blunt abdominal trauma, Reexploration.

Introduction

Liver is the most commonly injured organ in abdominal trauma. 45% of Blunt and 40% of penetrating abdominal injuries damage the liver

^[1]. This is due to the fact that liver is a large highly vascular organ with fragile parenchyma covered with a thin easily disrupted capsule ⁽¹⁾. It is placed superficially, partly protected by the rib cage only

on its superior aspect which makes it highly vulnerable for trauma [2]. Peri hepatic Liver packing was introduced by W.S.HALSTED in 1913 as a main treatment for high Grade Liver injuries but was accompanied with high mortality and morbidity. Initially it started as Intrahepatic Packing which later on was modified to Perihepatic type.

The Grading of Liver trauma Grade I-V is made as per AAST (American Association of Surgery for Trauma) criteria. Grade I & II are minor injuries comprising 80-85% of the cases while the rest 15% are High Grade (Grade III and IV) injuries most of which require surgical intervention in form of a laparotomy [3]. Right lobe is commonly injured than the left due to its large size and its proximity to rib cage. In liver trauma it is of paramount importance to control bleeding, thus timely intervention is the rule for better survival. Apart from liver Packing, various procedures are also being performed like Hepatorrhaphy, debridement and resection of liver tissues, selective vascular ligation and now recently added is Angioembolisation in stabilised low grade bleeding hepatic injuries all done for achieving haemostasis [4]. Perihepatic packing is performed mainly in cases of Grade III-V injuries as Damage Control or Definitive procedure. In Damage Control Perihepatic Packing achieves emergency haemostasis and later patient undergoes definitive procedure in a higher trauma Centre or same centre once stabilized. Packing has a success rate of 90% in control of haemorrhage but is not free from major life threatening complications like Rebleeding and Infections. The procedure is followed by Reexploration for pack removal, good postoperative ICU ventilatory support under Broad spectrum Antibiotic cover for better outcome which has drastically reduced the morbidity and mortality associated with the procedure from initial 90% to presently around 10%.

Materials and Methods

This was a prospective study conducted in a tertiary care Teaching Hospital from October 2018 to September 2020 with a minimum 3 months postoperative follow up. The study was conducted after due approval from Institutional Ethics Committee. Out of 200 cases of Liver trauma admitted and treated at our Centre, 30 cases (15%) underwent Perihepatic Liver packing. Patients younger than 12 years and older than 75 years, HIV patients or those on Immunosuppressive therapy and cases with associated life threatening injuries were excluded from the study to avoid bias. The indications for laparotomy being patients admitted in Shock, those with signs of hemoperitoneum or penetrating liver injuries. Most of these patients underwent perihepatic packing as a Definitive procedure. In our study, variables studied were Incidence, demographics in terms of Age and Sex, the nature of trauma, success rate along with mortality and morbidity associated with the procedure.

After initial resuscitation, the trauma victims were subjected to careful physical examination to decide future plan of treatment. The patients underwent X ray Chest, Abdomen Ultrasound and Contrast CT scan studies except in a few cases who presented in severe shock or where abdominal tap was positive for Blood were immediately shifted to the Operation theatre after initial resuscitation. The patients were resuscitated with IV crystalloids and Blood. On exploration after blood evacuation, the liver was examined after being fully mobilized. The rest of viscera was also examined with pressure compression on the bleeding liver. Later on with Pringle manoeuvre, the arterial bleeding areas were detected and sutured ligated. The damaged fragments of liver tissue were debrided wherever possible. In case venous oozing continued, perihepatic Packing was performed. The procedure was accomplished with 6 gauze packs placed around the liver, superior, lateral and

inferior. Wide Bilateral abdominal Drains were inserted. The patient was later shifted to ICU for ventilatory support. The patient received IV Broad spectrum Antibiotics with Blood and FFPs to correct coagulopathy. Hypothermia was corrected. After patient was stabilized within next 48 hrs,

Patient was reexplored for Pack removal .Gauze packs were removed after thorough soaking with Normal saline to prevent rebleeding and Wide drainage of the abdomen continued .Patient were again reshifted to ICU till stabilized and later on managed in the trauma Wards.



Fig 1 : Showing operative photograph of Liver Packs in liver trauma

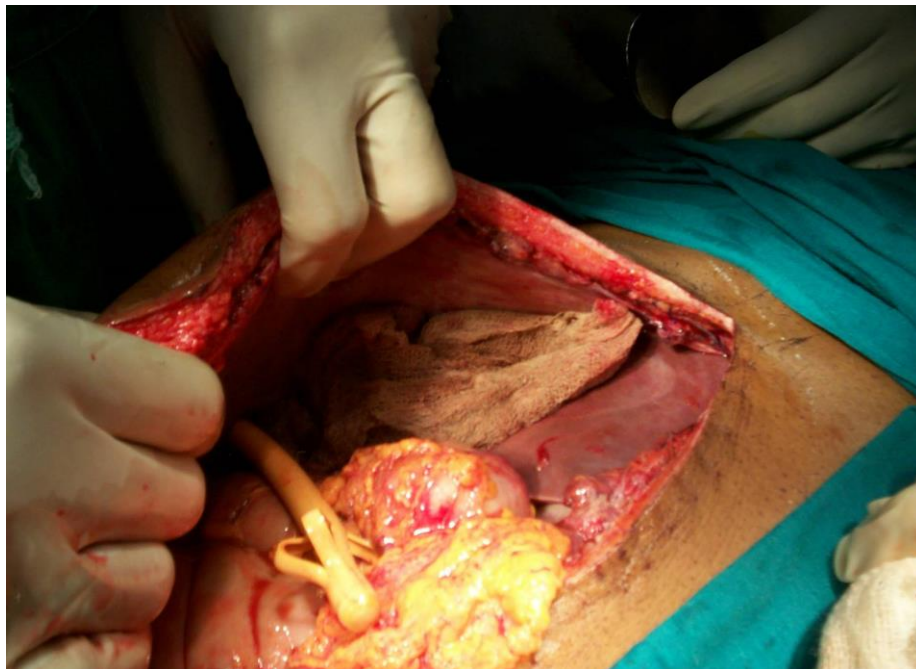


Fig 2

Results

Out of Total 200 patients of Liver trauma, 30 (15%) patients underwent perihepatic liver packing. Males outnumbered females. Males were 26 (87%) and females consisted of 4 (13%) of the cases. Considering the mechanism of trauma, 24

(80%) cases were due to Blunt Injury whereas the remaining 6 (20%) were due to penetrating trauma comprising of stabs, Bull horn and Gunshot injuries in 2 cases (7%) each. Motor Vehicular Accidents was the main aetiology in 19 cases with 63% incidence.

Table 1: showing the Incidence of Mode of Injury

MODE OF INJURY	NUMBERS	INCIDENCE
FALL FROM HEIGHT	05	17%
MOTOR VEHICLE ACCIDENT	19	63%
BULL HORN INJURY	02	7%
GUN SHOT INJURY	02	7%
STAB INJURY	02	7%

Considering the Age, Younger Age group (20-49 years) were the main casualty. Majority of the cases were in age Group (30-39), (N=9,30%) incidence, followed by 8 (26%) cases each in age Group of (20-29) and (40-49) years. Associated Injuries were also observed. Only 6 Cases had

isolated Liver trauma, whereas the remainder had associated Bone fractures, Bowel and mesenteric injury or Haemo and Pneumothorax. High Grade injuries were subjected to Packing of which (N=13, 43%) were Grade III, (N=14, 47%) were Grade IV and (N=3, 10%) had Grade V Injuries.

Table 2: showing Grades of Liver Injury

GRADE OF INJURY	NUMBERS	INCIDENCE
GRADE III	13	43%
GRADE IV	14	47%
GRADE V	03	10%

29 Cases underwent Abdomen Ultrasound while only 17 patients were subjected for Contrast CT Scan. Overall postoperative complication were 57%. Biliomas were seen in (N=3, 15%), Sepsis (N=2, 10%), Rebleeding (N=4, 20%) cases. Subphrenic Collection in (N=5, 25%) patients,

Liver abscess (N=4, 20%) and Pneumonia (N=2, 10%) cases respectively. 26 (87%) patients fully recovered and were discharged from Hospital whereas 4 patients died with a Mortality rate of 13%.

Table 3: Showing the Incidence of Postoperative Complications

COMPLICATIONS	NUMBERS	INCIDENCE
BILIOMAS	03	15%
SEPSIS	02	10%
REBLEED	04	20%
SUBPHRENIC COLLECTION	05	25%
LIVER ABSCESS	04	20%
PNEUMONIA	02	10%

Discussion

Liver is the most common injured organ and the 2nd most common cause of mortality in abdominal trauma [4]. Liver Packing was introduced by W.S. Halsted in 1913, however the procedure was not popular due to high morbidity of around 90% associated with it mainly due to postoperative Infections. The techniques for control of Hepatic haemorrhage improved during World War II and Vietnam Conflict. The introduction of newer techniques as Hepatorrhaphy, selective Vascular ligation, debridement with Resection of Liver and Angioembolisation have been introduced in management of Liver trauma. However still a small subset of patients continue to have venous ooze from exposed or sutured areas while some continue to be in shock with severe high grade injuries wherein perihepatic packing becomes a lifesaving procedure. This study was conducted in a tertiary care medical institution mainly to study the role of perihepatic Packing in high grade liver injuries. The variables studied were the Incidence, Age and sex Demographics, Nature of trauma and the morbidity and mortality associated with the technique. The procedure was done as a lifesaving operation either as Damage control or Definitive procedure for control of bleeding.

Of 200 patients of Liver trauma only 30 (15%) underwent perihepatic packing. The reason being that low grade and some moderate grade injuries were managed conservatively. Most of High Grade (Grade IV & V) were treated by Perihepatic

Packing. The incidence of Perihepatic Packing varied in different series to 4% incidence of Liver packing, 17.2% [5] and 48.6% as per [3]. Overall 5.3% of liver trauma cases underwent Packing while 77.2% of Penetrating Liver trauma required Perihepatic Packing. This procedure gives satisfactory control of haemorrhage in 90% of cases. The main contraindications being Bleeding from Large Intrahepatic or Retrohepatic veins, Hepatic veins or Vena cava and Intrahepatic branches of Hepatic artery.

Regarding the demographics of Age, Our study had majority of the cases in age groups varying from 20-49 years with maximum (n=9, 30%) in age group of 30-39 years and others two groups (30-39) and (40-49) with 8 cases each comprising of 26% cases. Young patients are mainly affected as reported in the literature since they are more exposed to Vehicular accidents and violence. Majority of liver trauma cases in mean age 36+16 yrs. Average age of 23.4 years as reported by [5] while [3] reported mean age group 48.26+16.8 years. Males were majority in our study in a ratio of 26:4 with 87% incidence, the reason being Males are more outgoing and so more exposed to trauma, accidents or violence. S Buci [5] reported a study of liver trauma with male incidence of 82.8%, Considering the mechanism of trauma that led to liver injuries, Blunt abdominal trauma superseded penetrating injuries in our study. We had (n=24,80%) cases of Blunt trauma, whereas 6 (20%) cases were due to penetrating injuries. The

higher incidence of Blunt trauma is consistent with most of the studies from Europe. In Europe the incidence of Blunt trauma is 80-90% while in South Africa and North America Penetrating liver injuries are more common with incidence of 66% and 88% respectively. This variation could be due to easy availability of firearms and violence incidence in the area. Majority of our patients with Blunt trauma were due to motor vehicular accidents (n=19,63%) followed by Fall from height (n=5,17%) whereas penetrating trauma in form of Bull horn, Gun shot and stab wounds constituted 2 cases each with 6% Incidence. Mehrdad et al^[7] reported all his 20 liver trauma cases due to blunt injuries, of which vehicular accidents comprised of (n=8,40%) patients, (n=8,40%) of the cases due to fall from height while the remaining 4 cases due to pedestrian struck. He surprisingly had no cases of penetrating injuries which may be due to small sample size^[3] reported 60% cases due to motor vehicle accidents while 23 cases due to penetrating injuries mainly 15 stabs and remaining 8 gunshot wounds whereas Asemisio et al^[8] had 80 out of 103 patients (79%) with gunshot injuries while blunt trauma was confined to only 23 (21%) cases. Similar results were also reported by^[4] in his study of 66 patients with liver trauma consisting mainly of 49 (74.2%) penetrating trauma of which gunshot wounds accounted for 80% cases. 173 cases reported injuries attributable to blunt trauma in (n=129,74.6%) and penetrating trauma in 44 (25.4%) patients^[5]. We had isolated Liver trauma in only 6 cases while remaining had associated Rib (35%), limb (14%) and pelvis fracture in 14% of the cases respectively. Small bowel and mesenteric injuries were reported in 11 cases. Cases wherein packing was done were Grade III (n=13,43%), Grade IV (n=14,47%) and Grade V (n=3,10%) cases respectively. No patient was found in Grade VI Injury as these patients might not have survived to reach the hospital^[3] reported Grade III (34.5%), Grade IV (43.8%) and Grade V (21.5%) liver injury incidence in his study .In

another study conducted by [8] out of 103 patients, Grade IV (n=51,47%) and Grade V (n=52,53%) injuries were reported respectively. Our patients presented with liver injuries of different degrees of severity. In the majority of our cases, Packing was done as Definitive procedure while in only 2 (7%) cases as Damage Control to control massive venous bleeding and later on during Reexploration underwent liver resection. We had definite indications for exploration viz: patients admitted with shock and later revived, patients who continued to be in shock, those with signs of Haemoperitoneum or CT scan suggestive of Grade IV or V liver injuries with or without other viscera injury requiring laparotomy. The remaining 170 patients were either managed conservatively or some with suturing of liver tears. Some studies have conducted selective Artery ligation or major hepatic resections upfront, We do not have experience with such procedures. Kristina Dokles et al^[3] reported suturing in 55.7% cases, Liver resections in 14.3% , Selective Hepatic artery ligation (5.5%) and Perihepatic packing in 48% of his patients. It is pertinent to note that our Primary intention was to save Life of the patient by controlling Bleeding and to refrain from any advanced techniques unless patient was stable and fit enough to undergo such procedures.

In our series ,we had a good success rate in control of haemorrhage in 26 (86%) cases, wherein arterial bleeding was first controlled by suture ligation and later on perihepatic packing performed for arresting Venous bleed. Only 4 cases experienced Rebleeding after second exploration and had to undergo Repacking, of which 2 patients died due to uncontrolled haemorrhage. In our study patients were subjected to X ray Chest, Abdomen Ultrasound and Contrast CT Scan. 29 cases out of 30 underwent Abdomen Ultrasound while 17 were subjected for contrast CT Scan. Ultrasound has sensitivity of 80% and specificity of 97-100% while contrast CT is considered as the Gold Standard in liver Trauma

^[4] .MRI scan has a limited role in liver injuries. It has no advantage over CT Scanning ^[6] . The role of MRI Scan is limited to MRCP (Magnetic Resonance Cholangio Pancreatiography) whenever a biliary or pancreatic duct injury is suspected .It may be indicated in Pregnancy due to concerns of radiation exposure of CT Scan, in cases with renal failure or in patients with allergy to radiological contrast.

We had morbidity in various forms post Packing in form of Bilomas (n=3, 15%), Sepsis (n=2,10%), Rebleeding (n=4,20%), Subphrenic collections (n=5,25%), Liver abscess (n=4,20%) and Pneumonia (n=2,10%) . 26 (87%) patients fully recovered and were discharged whereas 4(13%) died with a mortality of 13%.^[3] reported 33% mortality with bile leak of (17.7%) , Biliomas (9.9%),Liver Abscess(1.6%), Rebled (14%) and Liver Failure in 8% of his cases.The incidence of his complications are close to ours.^[5] had Repacking done in 7% cases due to rebleed while ^[4] had Hepatic abscesses in 7%, Haemobilia due to pseudoaneurysm rupture in 3% cases. ^[3] reported Bilomas (7%), liver failure (4.3%), Liver abscess (1.4%) sepsis (17.1%) and ARDS in 14.3% cases in his series of 70 patients but these were overall postoperative Liver trauma cases complications and not specific for perihepatic packings. Our 4 patients died with mortality rate of 13%. 33% mortality rate was seen by Kristina et al ^[3] while 40% was reported by Shapiro MB et al ^[10] and 13.2% by S Bucci ^[5] . Mortality has seen a decreasing trend over a period of time .During World War I, Mortality was 66%, in World War II reduced to 20% and presently it is around 10-15% ^[6] .The improving trend in survival is due to availability of good postoperative ICU ventilator support and Broad spectrum antibiotics which has reduced both Mortality and Morbidity rates.

Conclusion

Perihepatic Packing in Liver trauma is a highly recommended procedure to be performed as

Damage Control as well as Definitive procedure in selected cases of High Grade Liver injuries mainly for control of venous bleed in haemodynamically unstable patients. The procedure should be followed by good ICU ventilatory support with Broad spectrum Antibiotic cover to minimize mortality and morbidity associated with the procedure.

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