

Summary of recommendations

All recommendations are newly drafted by the Thoraco-Abdominal SAG, unless indicated otherwise.

I. INITIAL ASSESSMENT AND MANAGEMENT

1. Initial resuscitation and management of the patient with blunt abdominal trauma should follow the Advanced Trauma and Life Support (ATLS) principles.
2. The general surgeon at the local hospital must be consulted promptly when liver injury is suspected or proven. If no general surgeon is available on site, the general surgeon and TTL on call at the identified HLOC referral centre should be contacted through PTN to assist with management planning. [New recommendation]

II. OPERATIVE MANAGEMENT

1. In centres with general surgical capability, urgent laparotomy for management of liver injury is indicated in hemodynamically unstable non-responders to appropriate resuscitation where control of liver hemorrhage is considered necessary for hemodynamic stabilization and is recommended prior to transfer to higher LOC in consultation with the receiving general or trauma surgeon/TTL. [New recommendation]
2. Grade or severity of liver injury is not, in and of itself, an indication for surgical management of the injured liver. The decision to proceed to surgery should be based on the clinical presentation of the patient and situational context*. [New recommendation]
*Situational context refers to the capabilities of the site, resources available, transport availability, transfer related issues.
3. A general surgeon should be involved in early assessment and decision-making for suspected or proven liver injury. Tele-conferencing through PTN with a general surgeon and TTL on call at the HLOC trauma referral centre to discuss optimal management (i.e. transport vs laparotomy) for the patient with suspected or proven liver injury is encouraged. [New recommendation]
If no general surgeon is available on site, the general surgeon and TTL on call at the identified HLOC referral centre should be contacted through PTN to assist with management planning. [New recommendation]

III. NON-OPERATIVE MANAGEMENT

1. A trial of non-operative management (NOM) for liver injury is indicated in patients with proven liver injury who are hemodynamically stable or who were hemodynamically unstable and responded to appropriate resuscitation. There are no absolute contraindications to a trial of NOM of known liver injury in the hemodynamically stable or stabilized patient. [New recommendation]
2. Hemodynamically stable patients with a negligible risk of ongoing or delayed hemorrhage (CT-confirmed Grade 1–2 liver injuries without evidence of active haemorrhage or pseudoaneurysm, anticoagulated patient, or limited physiologic reserve) may be safely managed in a rural/remote facility provided at least 2 units of packed red blood cells are available. This management plan should be reviewed with a general surgeon or with a general surgeon and TTL on call at the HLOC trauma referral centre
3. NOM of Grade 4, 5 liver injury or Grade 3 with contrast blush, should only be considered in a hospital that has capabilities for physiologic monitoring, serial clinical evaluations by a general surgeon, the ability to transfuse 4 or more units of blood, CT imaging, and 24-7 operating room access. Access to 24-7 interventional radiology for angiography/angioembolization is recommended. It is recommended that this management plan be reviewed with a general surgeon and TTL on call at the HLOC trauma referral centre. For transfer indications, see **V. TRANSFER TO HIGHER LEVEL OF CARE.**

IV. ANGIOGRAPHY/ANGIOEMBOLIZATION (AG/AE)

1. Emergent angiography/angioembolization is indicated in hemodynamically unstable patients who have responded to appropriate resuscitation and demonstrate active vascular extravasation on contrast CT. [Adopted from WSES]
2. Emergent angiography/angioembolization is indicated in hemodynamically stable patients with major or active extravasation not likely to abate. [New recommendation]
3. Patients with liver injury demonstrating contrast blush on CT are at an elevated risk for failing NOM. The consulting surgeon and interventional radiologist should communicate once initial imaging is completed and collaborate on a management plan. [New recommendation]
4. Angiography/angioembolization should be considered in patients with liver injury demonstrating delayed or repeat bleed. [Adopted from WSES]
5. Post-operative AG/AE should be considered in patients with initial operative hemostasis and a blush on CT, or as adjunct in suspected arterial bleeding despite laparotomy and hemostasis attempt. [Adopted from WSES]
6. Consider a hybrid OR for management of high grade liver injuries requiring operative management. [New recommendation]

V. TRANSFER TO HIGHER LEVEL OF CARE**Immediate Transfer (< 24 hours):**

1. All hepatic trauma patients with major injuries to multiple systems and/or multiple solid viscus injuries should be discussed with receiving TTL and general surgeon and considered for transfer to a HLOC. [New recommendation]
2. Patients who are hemodynamically stable with associated injuries requiring urgent higher level of care (e.g. TBI,) should be transferred promptly. [Adopted from WSES]
3. In centres without general surgery capability, hemodynamically stable patients with an **ISOLATED** liver injury and a negligible risk of ongoing or delayed hemorrhage (CT-confirmed Grade 1–2 liver injuries without evidence of active haemorrhage or pseudoaneurysm, anticoagulated patient, or limited physiologic reserve) may be safely managed in a rural/remote facility provided at least 2 units of packed red blood cells are available. This management plan should be reviewed with a general surgeon or with a general surgeon and TTL on call at the HLOC trauma referral centre. [New recommendation]
4. Patients with Grade 3–5 liver injury, contrast blush, or associated major injury should be transferred to an appropriate trauma referral centre. Centres receiving these patients should have 24-7 IR capability to facilitate angioembolization if needed. A general surgeon must be actively involved in the transfer process and the ongoing care of transferred patients. [New recommendation]
5. Initiate PTN transfer process and communication to accepting HLOC prior to undergoing emergent surgical management and subsequent transfer to HLOC. Arrangements for transfer through PTN should be made as early as possible, preferably pre-operatively or intraoperatively to avoid delay. [New recommendation]

Delayed Transfer (> 24 hours):

1. Development of late complications (biliary complications, abscess, necrosis) should be considered for transfer to HLOC with interventional and surgical hepatobiliary expertise.

VI. ACUTE HOSPITAL CARE

1. Patients with Grade 1–2 liver injury can be monitored in a SURGICAL ward. The patient should have adequate IV access (16–18g IVs) and frequent vital signs. [New recommendation]
2. Patients with Grade 3–5 liver injuries undergoing NOM should be observed initially in a monitored intermediate care unit. Appropriate initial monitoring includes the capacity to provide hourly vital signs, cardiac, oxygen saturation and urine output monitoring. Serial examination by a general surgeon is essential. Hemoglobin should be monitored at regular intervals until stabilized, either q4, q6 or q8 hours depending on patient status. Any changes in clinical status should prompt urgent investigations and/or CT if the patient status permits. [Adopted from WSES, EAST]
3. There is no need to restrict mobilization in patients with liver injury and early mobilization is encouraged. Patients with high risk injuries should remain supervised until assessed as safe to ambulate independently off unit. [Adopted from WSES, EAST]

VII. VENOUS THROMBOEMBOLISM (VTE) PROPHYLAXIS

1. Pharmacologic prophylaxis to prevent venous thromboembolism (VTE) can be used for patients with isolated blunt liver injuries without increasing the failure rate of non-operative management. Although the optimal timing of safe initiation has not been determined, DVT prophylaxis may be started as soon as possible after trauma and within 12 hours for every grade of liver injury (e.g. 36 hours for Grade 3 injury) or sooner if the hemoglobin is stable. [Adopted from EAST and WSES]
2. Mechanical prophylaxis is safe and should be considered in all patients without absolute contraindication to its use, except in patients with lower extremity trauma in which case mechanical prophylaxis is not efficacious. [Adopted from WSES]

VIII. POST HOSPITAL CARE

1. Post-discharge, patients with Grades 2 injuries should avoid contact sports or rigorous activities for at least 2–3 months. [New recommendation]
2. Grade 3–5 liver injuries should have repeat imaging at 2–3 months post-injury to document extent of healing. Patient should have imaging prior to resuming a high risk activity. Abdominal triphasic CT is the preferred modality. [New recommendation]
3. Patients should have clinical re-assessment 4–8 weeks to assess for signs of complications including persistent pain, jaundice, fever, or other signs of potential liver or biliary dysfunction. [New recommendation]
4. If a pseudoaneurym is noted on follow-up imaging, discussion with interventional radiology is recommended for determine best management. Non-vascular complications should have follow-up or referral with a surgeon with hepatopancreaticobiliary (HPB) expertise. [New recommendation]