



Queensland  
Trauma Education

## ABDOMINAL TRAUMA

# Blunt hepatic trauma

## Case discussion

Participant resource kit

**CSDS**



Clinical Skills Development Service

Metro North  
Health



Queensland  
Government

**Developed by**

Dr Frances Williamson  
Emergency Staff Specialist - Metro North Hospital and Health Service

Kimberly Ballinger  
Simulation Educator - Clinical Skills Development Service

**Reviewed by**

Education Working Group, Statewide Trauma Clinical Network - Clinical Excellence Queensland

**Designed by**

Rebecca Launder  
Product Designer - Clinical Skills Development Service

**Queensland Trauma Education****Abdominal Trauma - Blunt hepatic trauma: Case discussion - Participant resource kit****Version 1.0**

Published by the Clinical Skills Development Service

Herston, Queensland, Australia

[csds.qld.edu.au/qte](https://csds.qld.edu.au/qte)

Phone +61 7 3646 6500

Email [CSDS-Courses@health.qld.gov.au](mailto:CSDS-Courses@health.qld.gov.au)

© Metro North Hospital and Health Service through the Clinical Skills Development Service (CSDS) 2003 - 2021.  
All rights reserved.

**Disclaimer:** The content presented in this publication is distributed by the Queensland Government as an information source only. The State of Queensland makes no statements, representations or warranties about the accuracy, completeness or reliability of any information contained in this publication. The State of Queensland disclaims all responsibility and all liability (including without limitation for liability in negligence) for all expenses, losses, damages and costs you might incur as a result of the information being inaccurate or incomplete in any way, and for any reason reliance was placed on such information.

## Queensland Trauma Education

The resources developed for Queensland Trauma Education are designed for use in any Queensland Health facility that cares for patients who have been injured as a result of trauma. Each resource can be modified by the facilitator and scaled to the learners needs as well as the environment in which the education is being delivered, from tertiary to rural and remote facilities.

## National Safety and Quality Health Service (NSQHS) Standards



## About this training resource kit

This resource kit provides healthcare workers with an understanding of the diagnostic and therapeutic methods utilised for the optimal management of blunt hepatic trauma.

### Learning objectives

By the end of this session the participant will be able to:

- Understand the diagnostic methods and therapeutic interventions implemented in blunt hepatic trauma.
- Demonstrate knowledge of evidenced-based guidelines used to determine the severity of hepatic injury to support management decisions in liver trauma, including both operative and non-operative management.

### Supporting resources

- WSES liver trauma classification.
- AAST liver trauma classification.
- Statements summary.

# Overview of blunt hepatic trauma

The liver when injured in blunt abdominal trauma represents one of the most life-threatening injuries in trauma patients due to the highly vascular nature of the liver itself.

The optimal management of blunt hepatic trauma requires consideration of the patients' haemodynamic status, associated injuries and the anatomical liver injury grade to determine whether patients require operative or non-operative management.

The World Society of Emergency Surgery (WSES) provides guidelines for management of traumatic injuries and can aid in the successful diagnosis and therapeutic interventions in the trauma patient. The WSES classification (Table 1) divides liver injuries into four classes considering the American Association for Surgery of Trauma – Organ Injury Scale (AAST-OIS classification (Table 2) and hemodynamic status (Table 3):

## Minor hepatic injuries:

- WSES grade I includes AAST-OIS grade I–II hemodynamically stable lesions.

## Moderate hepatic injuries:

- WSES grade II includes AAST-OIS grade III hemodynamically stable lesions.

## Severe hepatic injuries:

- WSES grade III includes AAST-OIS grade IV–V hemodynamically stable lesions.
- WSES grade IV includes AAST-OIS grade I–VI hemodynamically unstable lesions.

## Further reading

Coccolini, F., Coimbra, R., Ordonez, C., Kluger, Y., Vega, F., Moore, E. E., Biffl, W., Peitzman, A., Horer, T., Abu-Zidan, F. M., Sartelli, M., Fraga, G. P., Cicuttin, E., Ansaloni, L., Parra, M. W., Millán, M., DeAngelis, N., Inaba, K., Velmahos, G., Maier, R., ... WSES expert panel (2020). Liver trauma: WSES 2020 guidelines. *World journal of emergency surgery : WJES*, 15(1), 24. <https://doi.org/10.1186/s13017-020-00302-7>

Alghamdi H. M. (2017). Management of Liver Trauma. *Saudi journal of medicine & medical sciences*, 5(2), 104–109. <https://doi.org/10.4103/1658-631X.204868>

Letoublon, C., Morra, I., Chen, Y., Monnin, V., Voirin, D., & Arvieux, C. (2011). Hepatic arterial embolization in the management of blunt hepatic trauma: indications and complications. *The Journal of trauma*, 70(5), 1032–1037. <https://doi.org/10.1097/TA.0b013e31820e7ca1>

Bala, M., Gazalla, S. A., Faroja, M., Bloom, A. I., Zamir, G., Rivkind, A. I., & Almogy, G. (2012). Complications of high grade liver injuries: management and outcome with focus on bile leaks. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 20, 20. <https://doi.org/10.1186/1757-7241-20-20>

Giannopoulos, G.A., Katsoulis, I.E., Tzanakis, N.E., Patsaouras, P.A., & Digalakis, M.K. (2009). Non-operative management of blunt abdominal trauma. Is it safe and feasible in a district general hospital?. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 17, 22. <https://sitrem.biomedcentral.com/articles/10.1186/1757-7241-17-22>

Parks, N. A., Davis, J. W., Forman, D., & Lemaster, D. (2011). Observation for nonoperative management of blunt liver injuries: how long is long enough?. *The Journal of trauma*, 70(3), 626–629. <https://doi.org/10.1097/TA.0b013e31820d1c69>

Kozar, R. A., Moore, F. A., Moore, E. E., West, M., Cocanour, C. S., Davis, J., Biffl, W. L., & McIntyre, R. C., Jr (2009). Western Trauma Association critical decisions in trauma: nonoperative management of adult blunt hepatic trauma. *The Journal of trauma*, 67(6), 1144–1149.  
<https://doi.org/10.1097/TA.0b013e3181ba361f>

**Table 1. WSES liver trauma classification <sup>1</sup>**

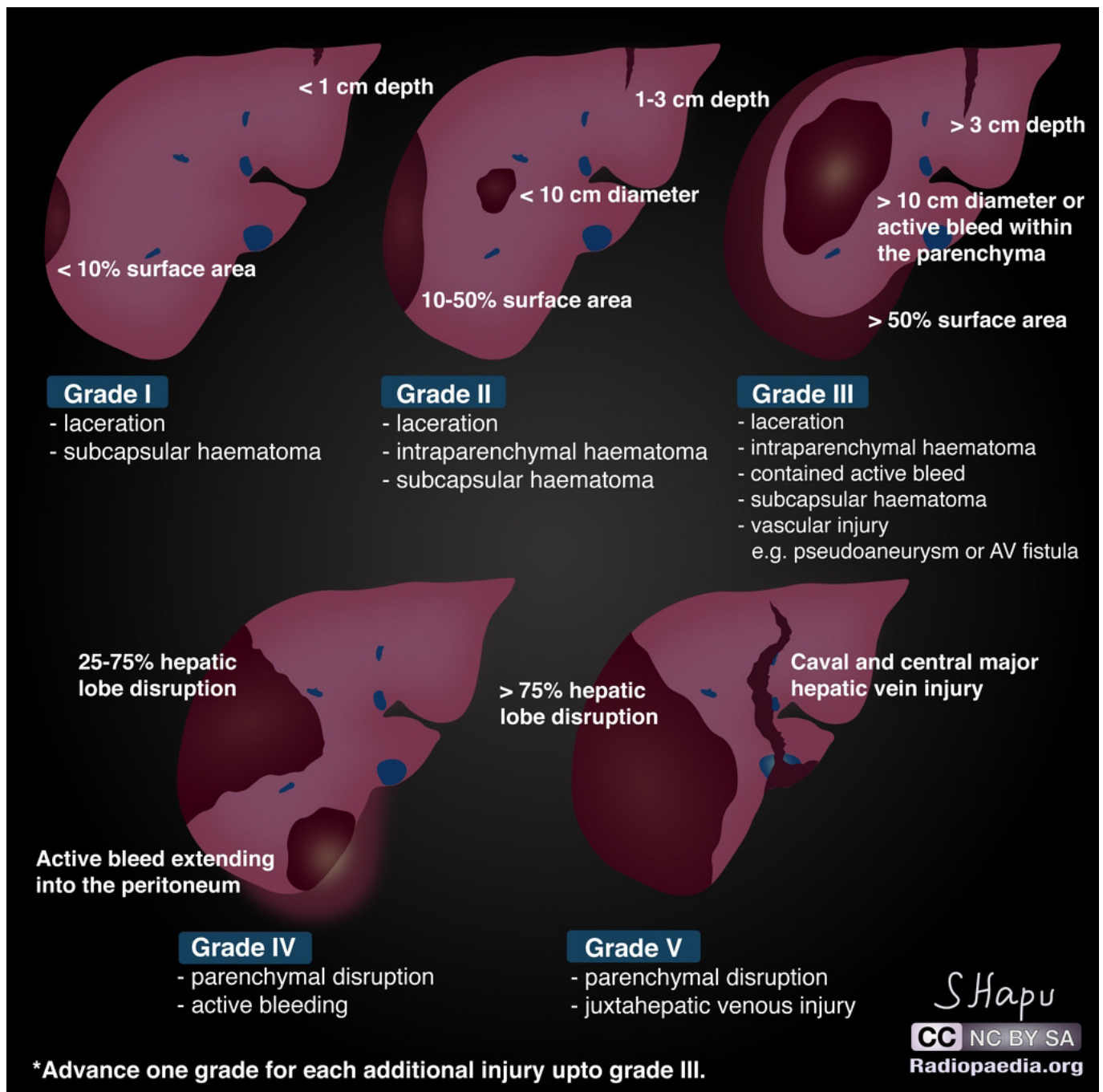
	WSES grade	AAST	Hemodynamic
<b>Minor</b>	WSES grade I	I–II	Stable
<b>Moderate</b>	WSES grade II	III	Stable
<b>Severe</b>	WSES grade III	IV–V	Stable
	WSES grade IV	I–VI	Unstable

**Table 2. AAST liver trauma classification <sup>1</sup>**

Grade	Type of injury	Description of injury
<b>I</b>	Haematoma	Subcapsular < 10% surface
	Laceration	Capsular tear < 1cm parenchymal depth
<b>II</b>	Haematoma	Subcapsular 10-50% surface area; intraparenchymal, < 10cm diameter
	Laceration	1-3cm parenchymal depth, < 10 cm in length
<b>III</b>	Haematoma	Subcapsular > 50% surface area or expanding, ruptured subcapsular or parenchymal haematoma. Intraparenchymal haematoma > 10cm
	Laceration	> 3cm parenchymal depth
<b>IV</b>	Laceration	Parenchymal disruption 25-75% of hepatic lobe
<b>V</b>	Laceration	Parenchymal disruption involving > 75% of hepatic lobe
	Vascular	Juxtavenous hepatic injuries i.e retrohepatic vena cava/central major hepatic veins
<b>VI</b>	Vascular	Hepatic avulsion

Advance one grade for bilateral injuries up to grade III.

## Liver trauma grading diagram



Source: [https://radiopaedia.org/cases/51390/studies/73834?lang=gb&referrer=%2Farticles%2FLiver-trauma%3Flang%3Dgb%23image\\_list\\_item\\_44955209](https://radiopaedia.org/cases/51390/studies/73834?lang=gb&referrer=%2Farticles%2FLiver-trauma%3Flang%3Dgb%23image_list_item_44955209)

**Table 3. Statements summary <sup>1</sup>**

	Statements
<b>Diagnostic procedures</b>	<ul style="list-style-type: none"> <li>• The diagnostic methods on admission are determined by the hemodynamic status (GoR 1A).</li> <li>• E-FAST is rapid in detecting intra-abdominal free fluid (GoR 1A).</li> <li>• CT scan with intravenous contrast is the gold standard in hemodynamically stable trauma patients (GoR 1A).</li> </ul>
<b>Non-operative management (NOM)</b>	<ul style="list-style-type: none"> <li>• NOM should be the treatment of choice for all hemodynamically stable minor (WSES I) (AAST I–II), moderate (WSES II) (AAST III), and severe (WSES III) (AAST IV–V) injuries in the absence of other internal injuries requiring surgery (GoR 2A).</li> <li>• In patients considered transient responders with moderate (WSES II) (AAST III) and severe (WSES III) (AAST IV–V) injuries, NOM should be considered only in selected settings provided the immediate availability of trained surgeons, operating room, continuous monitoring ideally in an ICU or ER setting, access to angiography, angioembolization, blood and blood products, and in locations where a system exists to quickly transfer such patients to higher level of care facilities (GoR 2B).</li> <li>• A CT scan with intravenous contrast should always be performed in patients being considered for NOM (GoR 2A).</li> <li>• AG/AE may be considered as a first-line intervention in hemodynamically stable patients with arterial blush on CT scan (GoR 2B).</li> <li>• In hemodynamically stable children, the presence of contrast blush on CT scan is not an absolute indication for AG/AE (GoR 2B).</li> <li>• Serial clinical evaluations (physical exams and laboratory testing) must be performed to detect a change in clinical status during NOM (GoR 2A).</li> <li>• NOM should be attempted in the setting of concomitant head trauma and/or spinal cord injuries with reliable clinical exam, unless the patient could not achieve specific hemodynamic goals for the neurotrauma and the instability might be due to intra-abdominal bleeding (GoR 2B).</li> <li>• Intensive care unit admission in isolated liver injury may be required only for moderate (WSES II) (AAST III) and severe (WSES III) (AAST IV–V) lesions (GoR 2B).</li> <li>• In selected cases where an intra-abdominal injury is suspected in the days after the initial trauma, interval laparoscopic exploration may be considered as an extension of NOM and a means to plan patient management in a step-up treatment strategy (GoR 2C).</li> <li>• In low-resource settings, NOM could be considered in patients with hemodynamic stability without evidence of associated injuries, with negative serial physical examinations and negative imaging and blood tests (GoR 2C).</li> </ul>

Statements	
<b>Operative management (OM)</b>	<ul style="list-style-type: none"> <li>• Hemodynamically unstable and non-responder patients (WSES IV) should undergo OM (GoR 2A).</li> <li>• Primary surgical intention should be to control the hemorrhage and bile leak and initiation of damage control resuscitation as soon as possible (GoR 2A).</li> <li>• Major hepatic resections should be avoided at first and only considered in subsequent operations, in a resectional debridement fashion in cases of large areas of devitalized liver tissue done by experienced surgeons (GoR 2B).</li> <li>• Angioembolization is a useful tool in case of persistent arterial bleeding after non-hemostatic or damage control procedures (GoR 2A).</li> <li>• Resuscitative endovascular balloon occlusion of the aorta (i.e., REBOA) may be used in hemodynamically unstable patients as a bridge to other more definitive procedures for hemorrhage control (GoR 2B).</li> </ul>
<b>Short and long-term follow-up</b>	<ul style="list-style-type: none"> <li>• Intrahepatic abscesses may be successfully treated with percutaneous drainage (GoR 2A).</li> <li>• Delayed hemorrhage without severe hemodynamic compromise may be managed at first with AG/AE (GoR 2A).</li> <li>• Hepatic artery pseudoaneurysm should be managed with AG/AE to prevent rupture (GoR 2A).</li> <li>• Symptomatic or infected bilomas should be managed with percutaneous drainage (GoR 2A).</li> <li>• Combination of percutaneous drainage and endoscopic techniques may be considered in managing post-traumatic biliary complications not suitable for percutaneous management alone (GoR 2B).</li> <li>• Lavage/drainage and endoscopic stenting may be considered as the first approach in delayed post-traumatic biliary fistula without any other indication for laparotomy (GoR 2B).</li> <li>• Laparoscopy as initial approach should be considered in cases of delayed surgery, so as to minimize the invasiveness of surgical intervention and to tailor the procedure to the lesion (GoR 2B).</li> </ul>
<b>Thrombo-prophylaxis, feeding, and mobilization</b>	<ul style="list-style-type: none"> <li>• Mechanical prophylaxis is safe and should be considered in all patients with no absolute contraindication (GoR 2A).</li> <li>• LMWH-based prophylaxis should be started as soon as possible following trauma and may be safe in selected patients with liver injury treated with NOM (GoR 2B).</li> <li>• In those patients taking anticoagulants, individualization of the risk-benefit balance of anticoagulant reversal is suggested (GoR 1C).</li> <li>• Early mobilization should be achieved in stable patients (GoR 2A).</li> <li>• In the absence of contraindications, enteral feeding should be started as soon as possible (GoR 2A).</li> </ul>

## Acronyms and abbreviations

<b>AST</b>	aspartate transaminase (liver function test)
<b>ALT</b>	alanine transaminase (liver function test)
<b>APTT</b>	activated partial thromboplastin time
<b>DVT</b>	deep vein thrombosis
<b>PV</b>	portal venous

## References

1. Coccolini, F., Coimbra, R., Ordonez, C., Kluger, Y., Vega, F., Moore, E. E., Biffl, W., Peitzman, A., Horer, T., Abu-Zidan, F. M., Sartelli, M., Fraga, G. P., Cicuttin, E., Ansaloni, L., Parra, M. W., Millán, M., DeAngelis, N., Inaba, K., Velmahos, G., Maier, R., ... WSES expert panel (2020). Liver trauma: WSES 2020 guidelines. *World journal of emergency surgery : WJES*, 15(1), 24.  
<https://doi.org/10.1186/s13017-020-00302-7>
2. Alghamdi H. M. (2017). Management of Liver Trauma. *Saudi journal of medicine & medical sciences*, 5(2), 104–109. <https://doi.org/10.4103/1658-631X.204868>
3. Letoublon, C., Morra, I., Chen, Y., Monnin, V., Voirin, D., & Arvieux, C. (2011). Hepatic arterial embolization in the management of blunt hepatic trauma: indications and complications. *The Journal of trauma*, 70(5), 1032–1037. <https://doi.org/10.1097/TA.0b013e31820e7ca1>
4. Bala, M., Gazalla, S. A., Faroja, M., Bloom, A. I., Zamir, G., Rivkind, A. I., & Almogy, G. (2012). Complications of high grade liver injuries: management and outcome with focus on bile leaks. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 20, 20.  
<https://doi.org/10.1186/1757-7241-20-20>
5. Giannopoulos, G.A., Katsoulis, I.E., Tzanakis, N.E., Patsaouras, P.A., & Digalakis, M.K. (2009). Non-operative management of blunt abdominal trauma. Is it safe and feasible in a district general hospital?. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 17, 22.  
<https://sjtrem.biomedcentral.com/articles/10.1186/1757-7241-17-22>
6. Parks, N. A., Davis, J. W., Forman, D., & Lemaster, D. (2011). Observation for nonoperative management of blunt liver injuries: how long is long enough?. *The Journal of trauma*, 70(3), 626–629.  
<https://doi.org/10.1097/TA.0b013e31820d1c69>
7. Kozar, R. A., Moore, F. A., Moore, E. E., West, M., Cocanour, C. S., Davis, J., Biffl, W. L., & McIntyre, R. C., Jr (2009). Western Trauma Association critical decisions in trauma: nonoperative management of adult blunt hepatic trauma. *The Journal of trauma*, 67(6), 1144–1149.  
<https://doi.org/10.1097/TA.0b013e3181ba361f>

## Share your feedback

**Please complete our survey to help make  
Queensland Trauma Education better.**

The survey should take no more than 5 minutes to complete.

Scan the QR code or visit this link:

<https://www.surveymonkey.com/r/3FWL3ZD>



**Queensland Trauma Education**  
**Abdominal Trauma - Blunt hepatic trauma: Case discussion - Participant resource kit**

Published by the Clinical Skills Development Service  
Herston, Queensland, Australia  
[csds.qld.edu.au/qte](https://csds.qld.edu.au/qte)  
Phone +61 7 3646 6500  
Email [CSDS-Courses@health.qld.gov.au](mailto:CSDS-Courses@health.qld.gov.au)