

ORGAN INJURY SCALES – SPLEEN, LIVER, KIDNEY and CAROTID/VERTEBRAL ARTERIES

(2020-03-27 Nordter compilation/ Bertil Leidner)

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Organ injury scaling 2018 update: Spleen, liver, and kidney.

Spleen p 2

Liver p 3

Kidney p 4

Biffi BCVI scale

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SPLEEN <https://radiopaedia.org/articles/aast-spleen-injury-scale>

AAST Grade	AIS Severity	Imaging Criteria (CT findings)	Operative Criteria	Pathologic Criteria
I	2	<ul style="list-style-type: none"> – Subcapsular hematoma <10% surface area – Parenchymal laceration <1 cm depth – Capsular tear 	<ul style="list-style-type: none"> – Subcapsular hematoma <10% surface area – Parenchymal laceration <1 cm depth – Capsular tear 	<ul style="list-style-type: none"> – Subcapsular hematoma <10% surface area – Parenchymal laceration <1 cm depth – Capsular tear
II	2	<ul style="list-style-type: none"> – Subcapsular hematoma 10–50% surface area; intraparenchymal hematoma <5 cm – Parenchymal laceration 1–3 cm 	<ul style="list-style-type: none"> – Subcapsular hematoma 10–50% surface area; intraparenchymal hematoma <5 cm – Parenchymal laceration 1–3 cm 	<ul style="list-style-type: none"> – Subcapsular hematoma 10–50% surface area; intraparenchymal hematoma <5 cm – Parenchymal laceration 1–3 cm
III	3	<ul style="list-style-type: none"> – Subcapsular hematoma >50% surface area; ruptured subcapsular or intraparenchymal hematoma ≥5 cm – Parenchymal laceration >3 cm depth 	<ul style="list-style-type: none"> – Subcapsular hematoma >50% surface area or expanding; ruptured subcapsular or intraparenchymal hematoma ≥5 cm – Parenchymal laceration >3 cm depth 	<ul style="list-style-type: none"> – Subcapsular hematoma >50% surface area; ruptured subcapsular or intraparenchymal hematoma ≥5 cm – Parenchymal laceration >3 cm depth
IV	4	<ul style="list-style-type: none"> – Any injury in the presence of a splenic vascular injury or active bleeding confined within splenic capsule – Parenchymal laceration involving segmental or hilar vessels producing >25% devascularization 	<ul style="list-style-type: none"> – Parenchymal laceration involving segmental or hilar vessels producing >25% devascularization 	<ul style="list-style-type: none"> – Parenchymal laceration involving segmental or hilar vessels producing >25% devascularization
V	5	<ul style="list-style-type: none"> – Any injury in the presence of splenic vascular injury with active bleeding extending beyond the spleen into the peritoneum – Shattered spleen 	<ul style="list-style-type: none"> – Hilar vascular injury which devascularizes the spleen – Shattered spleen 	<ul style="list-style-type: none"> – Hilar vascular injury which devascularizes the spleen – Shattered spleen

Vascular injury is defined as a pseudoaneurysm or arteriovenous fistula and appears as a focal collection of vascular contrast that decreases in attenuation with delayed imaging. Active bleeding from a vascular injury presents as vascular contrast, focal or diffuse, that increases in size or attenuation in delayed phase. Vascular thrombosis can lead to organ infarction.

Grade based on highest grade assessment made on imaging, at operation or on pathologic specimen.

More than one grade of splenic injury may be present and should be classified by the higher grade of injury.

Advance one grade for multiple injuries up to a grade III.

LIVER <https://radiopaedia.org/articles/aast-liver-injury-scale>

AAST Grade	AIS Severity	Imaging Criteria (CT Findings)	Operative Criteria	Pathologic Criteria
I	2	<ul style="list-style-type: none"> – Subcapsular hematoma <10% surface area – Parenchymal laceration <1 cm in depth 	<ul style="list-style-type: none"> – Subcapsular hematoma <10% surface area – Parenchymal laceration <1 cm in depth – Capsular tear 	<ul style="list-style-type: none"> – Subcapsular hematoma <10% surface area – Parenchymal laceration <1 cm – Capsular tear
II	2	<ul style="list-style-type: none"> – Subcapsular hematoma 10–50% surface area; intraparenchymal hematoma <10 cm in diameter – Laceration 1–3 cm in depth and ≤ 10 cm length 	<ul style="list-style-type: none"> – Subcapsular hematoma 10–50% surface area; intraparenchymal hematoma <10 cm in diameter – Laceration 1–3 cm in depth and ≤ 10 cm length 	<ul style="list-style-type: none"> – Subcapsular hematoma 10–50% surface area; intraparenchymal hematoma <10 cm in diameter – Laceration 1–3 cm depth and ≤ 10 cm length
III	3	<ul style="list-style-type: none"> – Subcapsular hematoma >50% surface area; ruptured subcapsular or parenchymal hematoma – Intraparenchymal hematoma >10 cm – Laceration >3 cm depth – Any injury in the presence of a liver vascular injury or active bleeding contained within liver parenchyma 	<ul style="list-style-type: none"> – Subcapsular hematoma >50% surface area or expanding; ruptured subcapsular or parenchymal hematoma – Intraparenchymal hematoma >10 cm – Laceration >3 cm in depth 	<ul style="list-style-type: none"> – Subcapsular hematoma >50%-surface area; ruptured subcapsular or intraparenchymal hematoma – Intraparenchymal hematoma >10 cm – Laceration >3 cm in depth
IV	4	<ul style="list-style-type: none"> – Parenchymal disruption involving 25–75% of a hepatic lobe – Active bleeding extending beyond the liver parenchyma into the peritoneum 	<ul style="list-style-type: none"> – Parenchymal disruption involving 25–75% of a hepatic lobe 	<ul style="list-style-type: none"> – Parenchymal disruption involving 25–75% of a hepatic lobe
V	5	<ul style="list-style-type: none"> – Parenchymal disruption >75% of hepatic lobe – Juxtahepatic venous injury to include retrohepatic vena cava and central major hepatic veins 	<ul style="list-style-type: none"> – Parenchymal disruption >75% of hepatic lobe – Juxtahepatic venous injury to include retrohepatic vena cava and central major hepatic veins 	<ul style="list-style-type: none"> – Parenchymal disruption >75% of hepatic lobe – Juxtahepatic venous injury to include retrohepatic vena cava and central major hepatic veins

Vascular injury is defined as a pseudoaneurysm or arteriovenous fistula and appears as a focal collection of vascular contrast that decreases in attenuation with delayed imaging. Active bleeding from a vascular injury presents as vascular contrast, focal or diffuse, that increases in size or attenuation in delayed phase. Vascular thrombosis can lead to organ infarction.

Grade based on highest grade assessment made on imaging, at operation or on pathologic specimen.

More than one grade of liver injury may be present and should be classified by the higher grade of injury.

Advance one grade for multiple injuries up to a grade III.

KIDNEY <https://radiopaedia.org/articles/aast-kidney-injury-scale>

AAST Grade	AIS Severity	Imaging Criteria (CT Findings)	Operative Goals	Pathologic Criteria
I	2	<ul style="list-style-type: none"> – Subcapsular hematoma and/or parenchymal contusion without laceration 	<ul style="list-style-type: none"> – Nonexpanding subcapsular hematoma – Parenchymal contusion without laceration 	<ul style="list-style-type: none"> – Subcapsular hematoma or parenchymal contusion without parenchymal laceration
II	2	<ul style="list-style-type: none"> – Perirenal hematoma confined to Gerota fascia 	<ul style="list-style-type: none"> – Nonexpanding perirenal hematoma confined to Gerota fascia 	<ul style="list-style-type: none"> – Perirenal hematoma confined to Gerota fascia
III	3	<ul style="list-style-type: none"> – Renal parenchymal laceration ≤1 cm depth without urinary extravasation – Renal parenchymal laceration >1 cm depth without collecting system rupture or urinary extravasation – Any injury in the presence of a kidney vascular injury or active bleeding contained within Gerota fascia 	<ul style="list-style-type: none"> – Renal parenchymal laceration ≤1 cm depth without urinary extravasation – Renal parenchymal laceration >1 cm depth without collecting system rupture or urinary extravasation – 	<ul style="list-style-type: none"> – Renal parenchymal laceration ≤1 cm depth without urinary extravasation – Renal parenchymal laceration >1 cm depth without collecting system rupture or urinary extravasation
IV	4	<ul style="list-style-type: none"> – Parenchymal laceration extending into urinary collecting system with urinary extravasation – Renal pelvis laceration and/or complete ureteropelvic disruption – Segmental renal vein or artery injury – Active bleeding beyond Gerota fascia into the retroperitoneum or peritoneum – Segmental or complete kidney infarction(s) due to vessel thrombosis without active bleeding 	<ul style="list-style-type: none"> – Parenchymal laceration extending into urinary collecting system with urinary extravasation – Renal pelvis laceration and/or complete ureteropelvic disruption – Segmental renal vein or artery injury – Segmental or complete kidney infarction(s) due to vessel thrombosis without active bleeding 	<ul style="list-style-type: none"> – Parenchymal laceration extending into urinary collecting system – Renal pelvis laceration and/or complete ureteropelvic disruption – Segmental renal vein or artery injury – Segmental or complete kidney infarction(s) due to vessel thrombosis without active bleeding
V	5	<ul style="list-style-type: none"> – Main renal artery or vein laceration or avulsion of hilum – Devascularized kidney with active bleeding – Shattered kidney with loss of identifiable parenchymal renal anatomy 	<ul style="list-style-type: none"> – Main renal artery or vein laceration or avulsion of hilum – Devascularized kidney with active bleeding – Shattered kidney with loss of identifiable parenchymal renal anatomy 	<ul style="list-style-type: none"> – Main renal artery or vein laceration or avulsion of hilum – Devascularized kidney – Shattered kidney with loss of identifiable parenchymal renal anatomy

Vascular injury is defined as a pseudoaneurysm or arteriovenous fistula and appears as a focal collection of vascular contrast that decreases in attenuation with delayed imaging. Active bleeding from a vascular injury presents as vascular contrast, focal or diffuse, that increases in size or attenuation in delayed phase. Vascular thrombosis can lead to organ infarction.

Grade based on highest grade assessment made on imaging, at operation or on pathologic specimen.

More than one grade of kidney injury may be present and should be classified by the higher grade of injury.

Advance one grade for bilateral injuries up to Grade III.

BCVI <https://radiopaedia.org/articles/biffi-scale-for-blunt-cerebrovascular-injury?lang=us>

Biffi scale for blunt cerebrovascular injury

Classification

- **grade I:** mild intimal injury or irregular intima
- **grade II:** dissection with raised intimal flap / intramural hematoma with luminal narrowing >25% / intraluminal thrombosis
- **grade III:** [pseudoaneurysm](#)
- **grade IV:** vessel occlusion/thrombosis
- **grade V:** vessel transection

Treatment and prognosis

This grading system has prognostic and therapeutic implications. Stroke risk increases with injury grade and therefore the lower the grade, the better the prognosis ¹.

- grade I: heals regardless of therapy
 - grade II: 70% of dissections or hematomas with luminal stenosis progress while on heparin therapy
 - grade III: only ~8% of pseudoaneurysms heal with heparin and ~90% resolve after stenting
 - grade IV: occluded carotid arteries do not recanalize in the early post-injury period
 - grade V: transections are lethal and refractory to therapy
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More BCVI information <https://radiopaedia.org/articles/blunt-cerebrovascular-injury>

<https://www.ncbi.nlm.nih.gov/pubmed/32176167> (Update 2020)

EVALUATION AND MANAGEMENT OF BLUNT CEREBROVASCULAR INJURY: A PRACTICE MANAGEMENT GUIDELINE FROM THE EASTERN ASSOCIATION FOR THE SURGERY OF TRAUMA