



SAMEN
GRENZEN
VERLEGGEN

Management of Liver trauma

BSHBPS Post-graduate course 23/9/2022

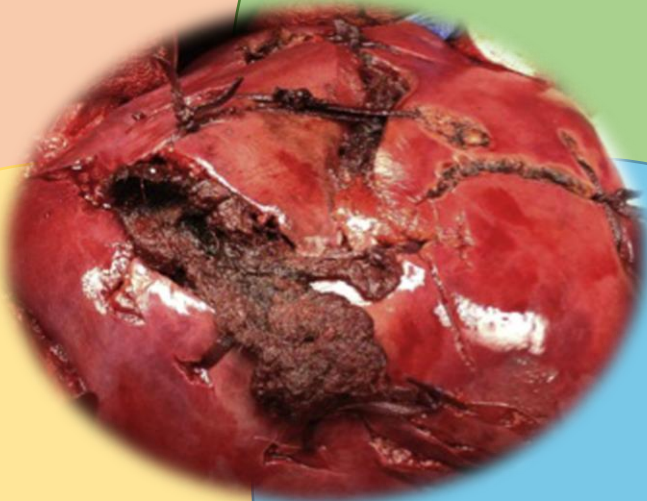
Joris Jaekers, HPB surgery UZ Leuven

Liver Trauma



Blunt Vs Penetrating

High vs Low velocity



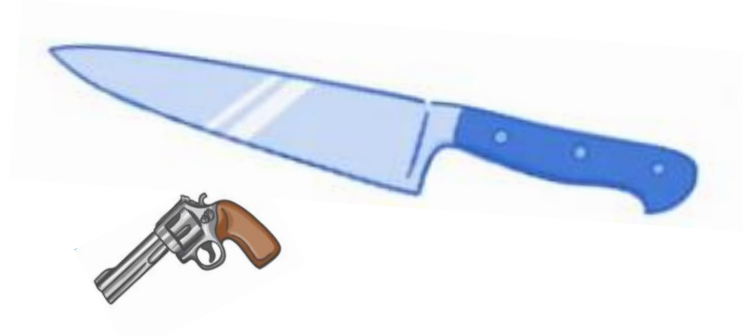
Child vs Adult

Isolated vs polytrauma



Liver trauma

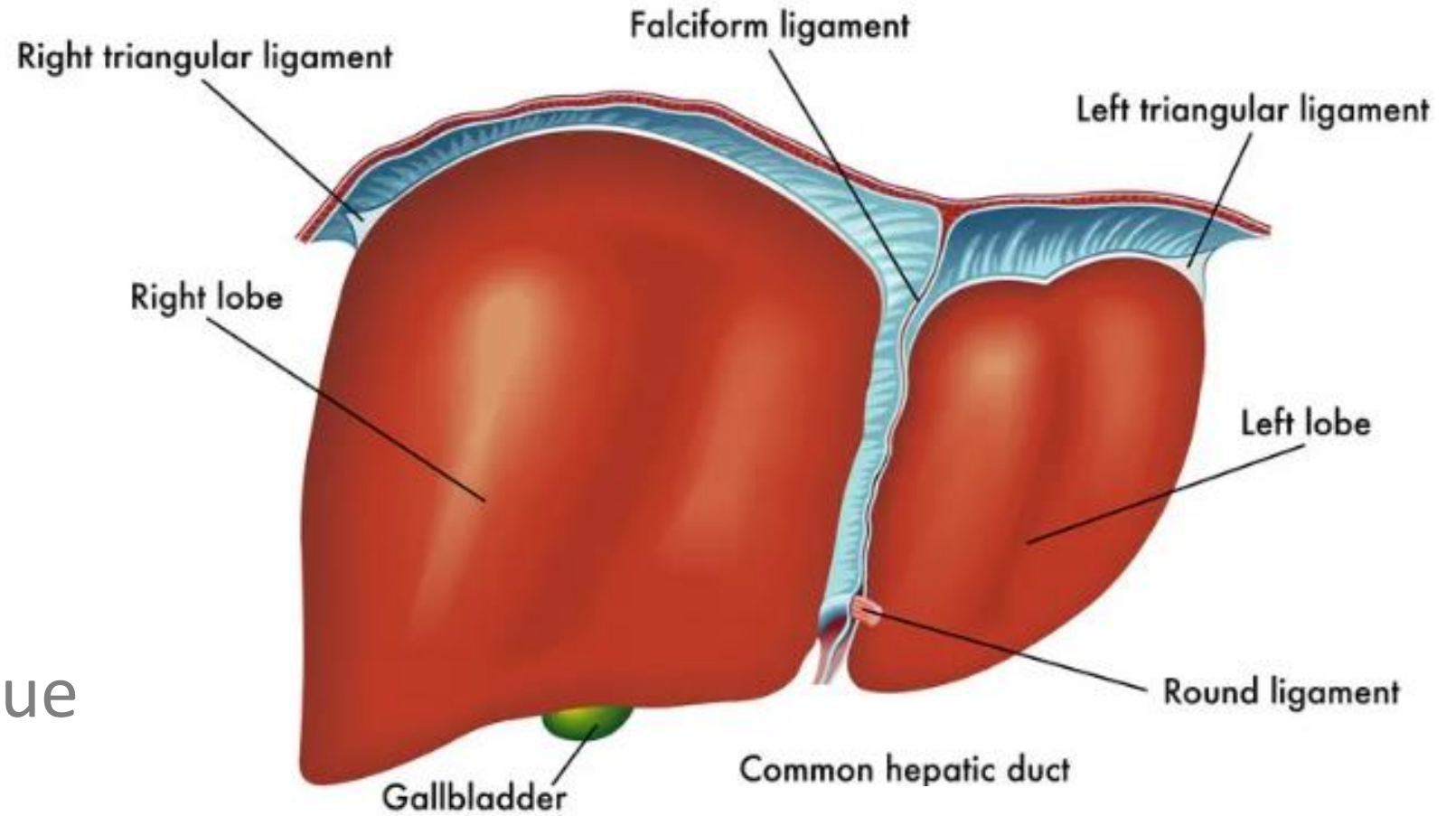
- Isolated liver injury <50% of cases
- Blunt abdominal trauma: **most** commonly injured organ
 - > traffic injury / motor vehicle injury
 - > spleen involved ~ 45%
- Penetrating trauma: **2nd** most injured abdominal organ
 - Bowel most frequent
 - stab wounds > gunshot



Liver trauma

Why Liver?

- Big organ
- fixed position
- soft / friable tissue
- thin capsule
- very well vascularised



Livertrauma – Case 1

26j – male

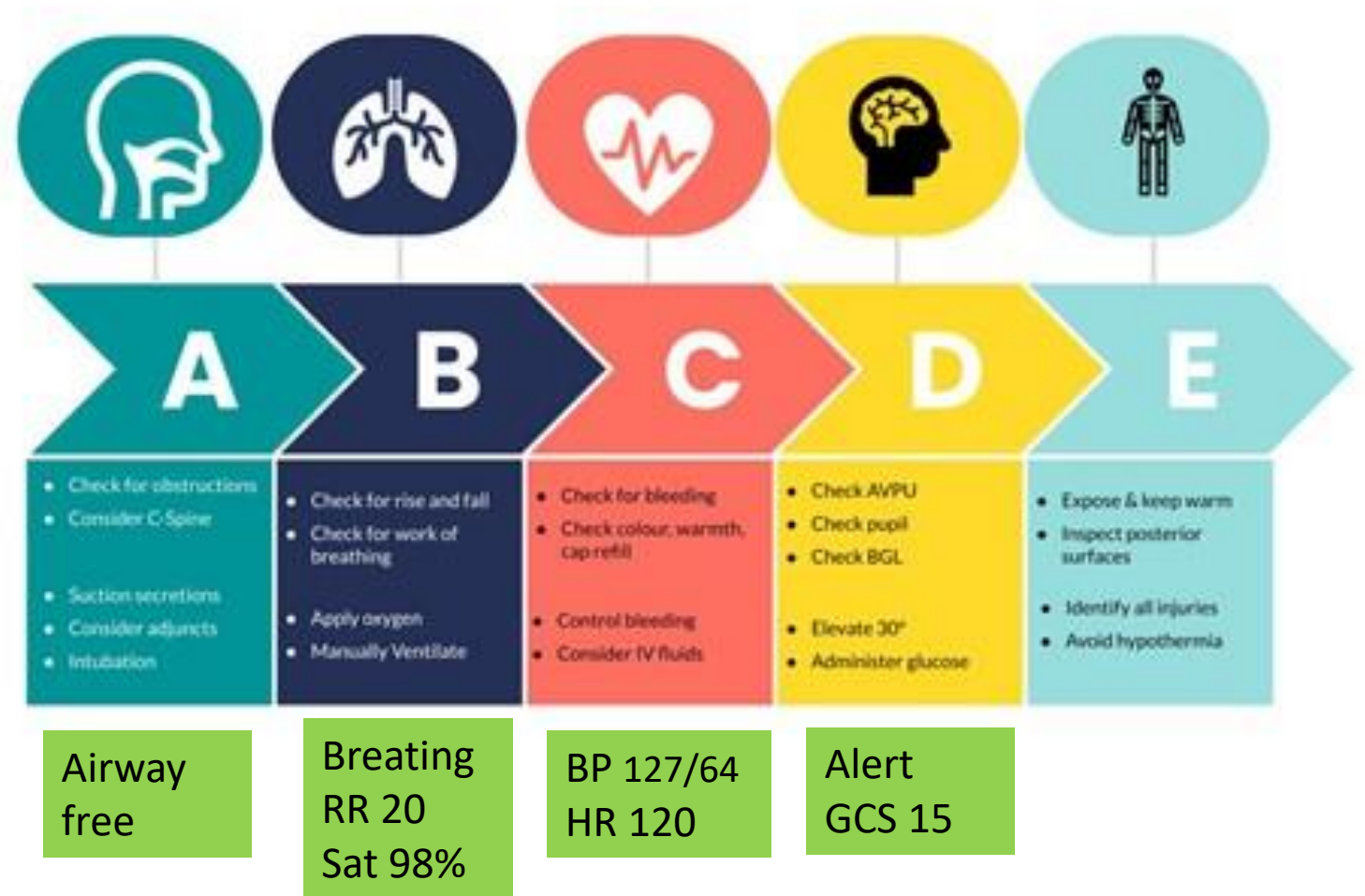
Road traffic accident



Admission through emergencies -> Trauma protocol

Liver trauma

Trauma protocol



Liver Trauma

Clinical examination

- Head / neck: normal
- Thorax / Lungs
 - Tender lower right rib cage
 - bruised thoraco-abdominal right side
 - Normal breathing sounds
 - Pain on inspiration
- Abdomen:
 - Not distended
 - Painfull on palpation – no obvious peritoneal signs
- Extremities: painfull wrist right side



Liver Trauma

- Pt lined up (Arterial / CVC) + IV Running
- Blood samples taken / HB on ABG = 11 g/dl

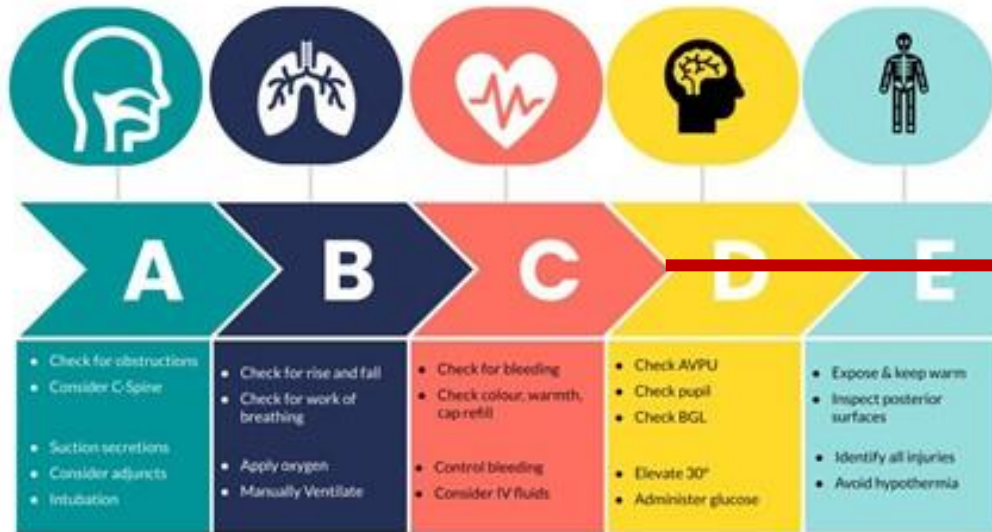
What now?

Liver Trauma

In the E.D.: E-FAST, Thoracic and Pelvic X-ray,
High flow venous vascular access

Hemodynamically Stable

Hemodynamically Unstable
or transient responder



- Normal Systolic (BP \geq 90?)
- Heart rate 100-120
- Signs of shock?
 - > Skin Vasoconstriction?
 - > altered consciousness?
 - > shortness of breath?
- No need for fluid boluses / vasopressor?
- No transfusion requirement $>4PC$ in 8h

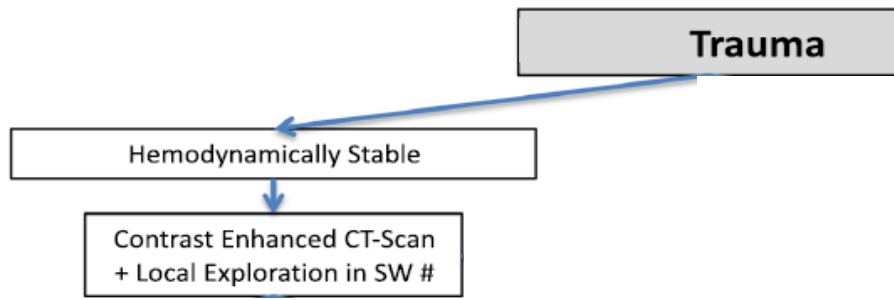
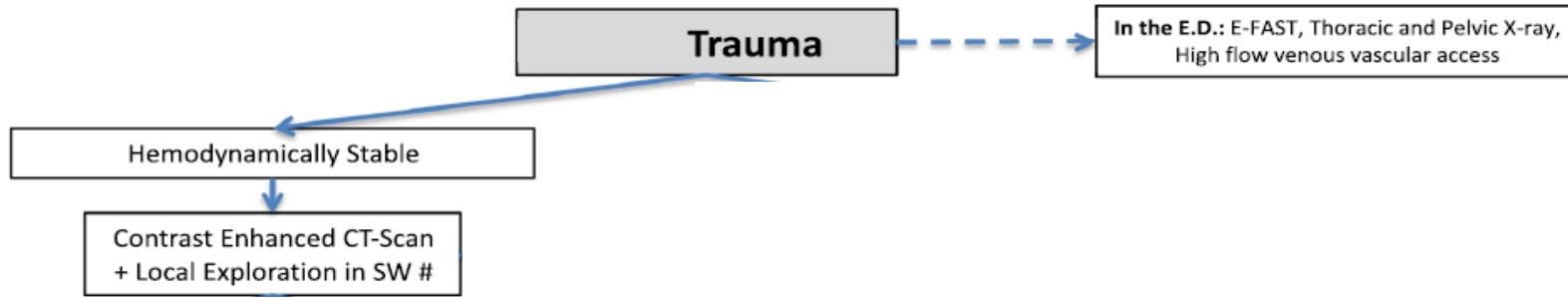


Fig. 1 Liver trauma management algorithm (SW: stab wound. Number sign indicates wound exploration near the inferior costal margin should be avoided if not strictly necessary. Asterisk indicates angioembolization should be always considered for adults, only in selected patients and in selected centers for pediatrics)

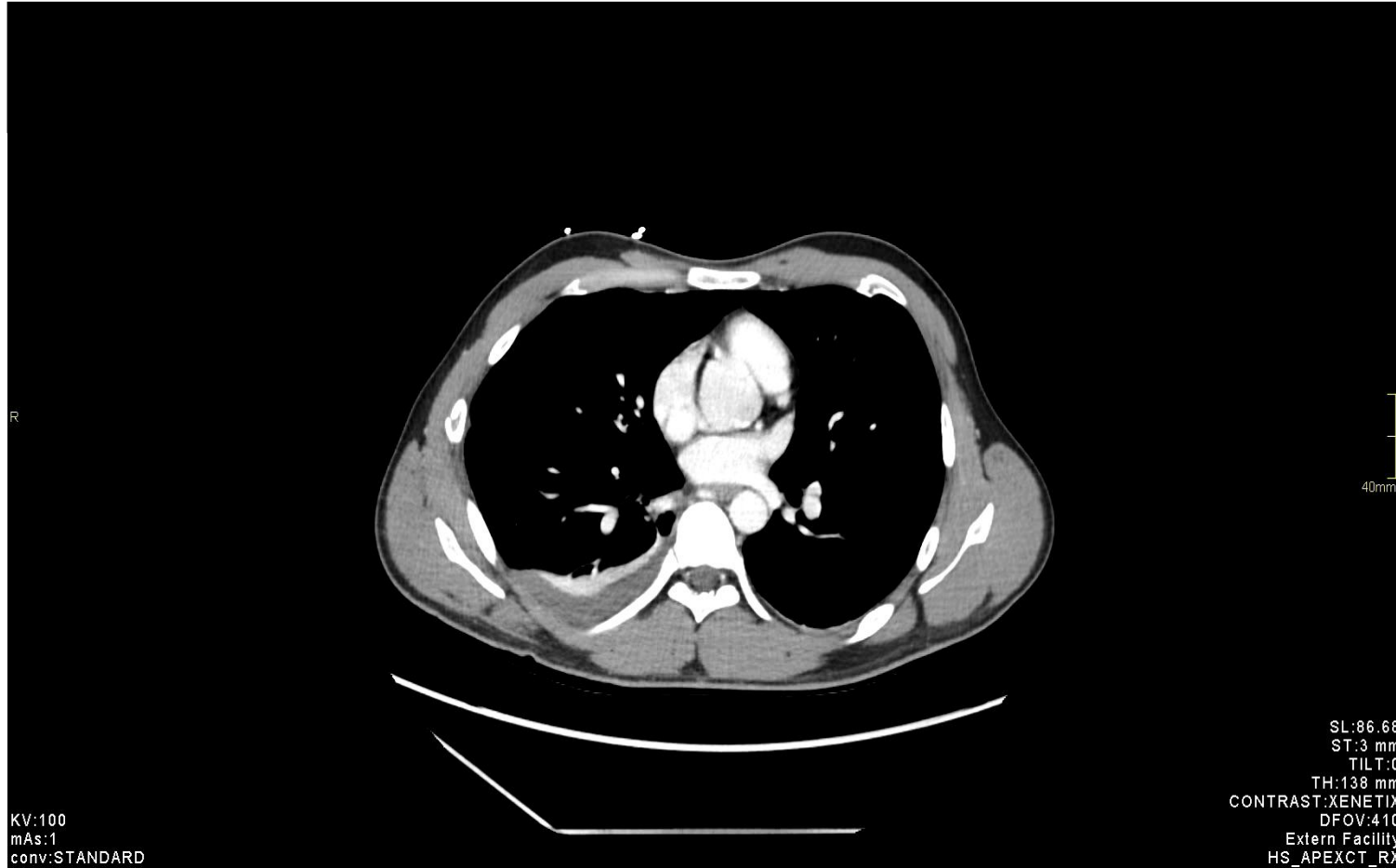


Contrast enhanced CT

- golden standard
- 96-100% sens & spec
- Arterial / venous / late venous phase

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Liver Trauma



Liver Trauma



Liver Trauma

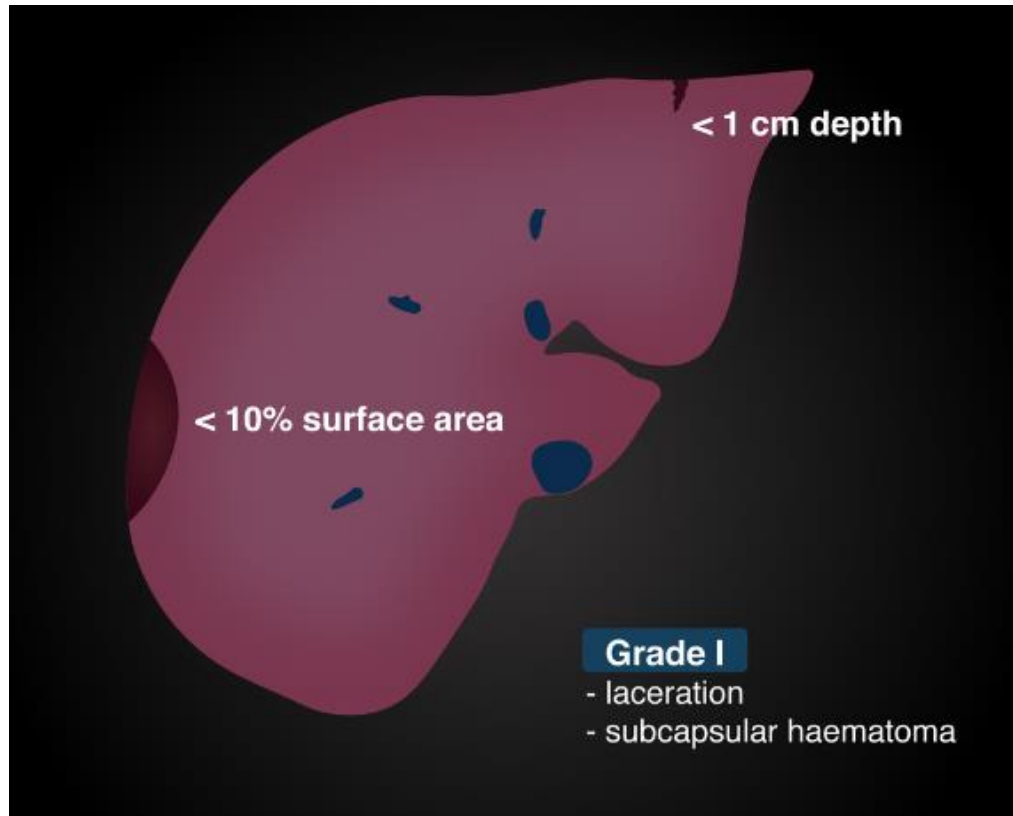


TABLE 2. Liver Injury Scale—2018 Revision

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Liver Trauma

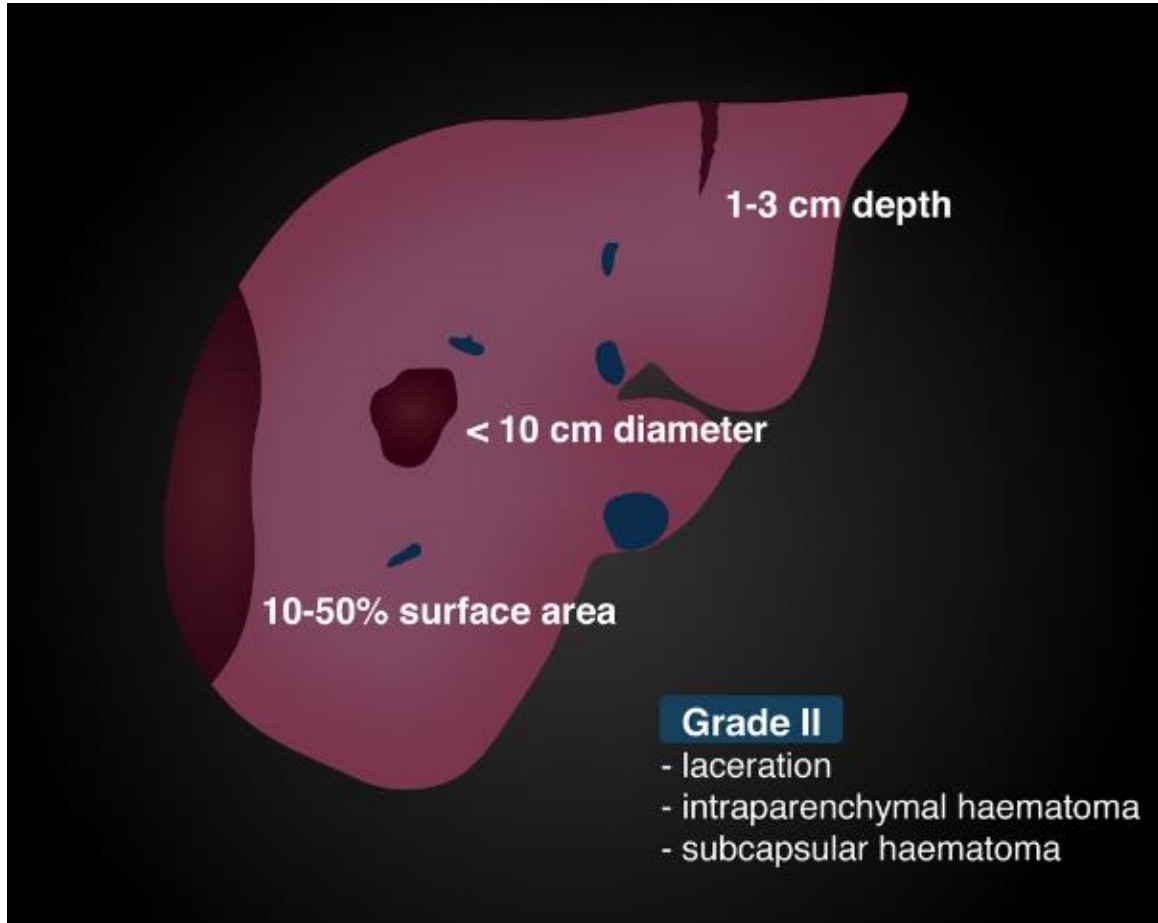


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Liver Trauma

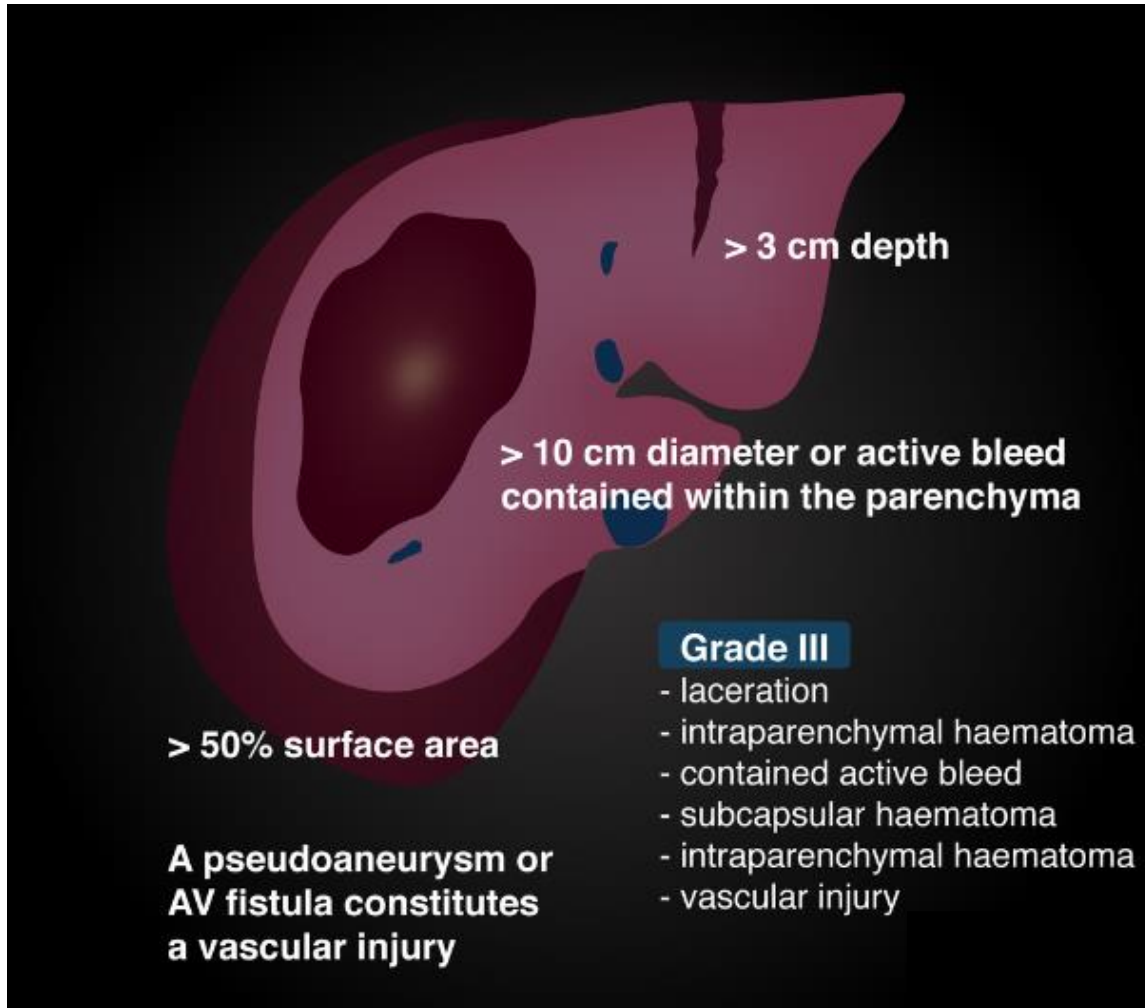


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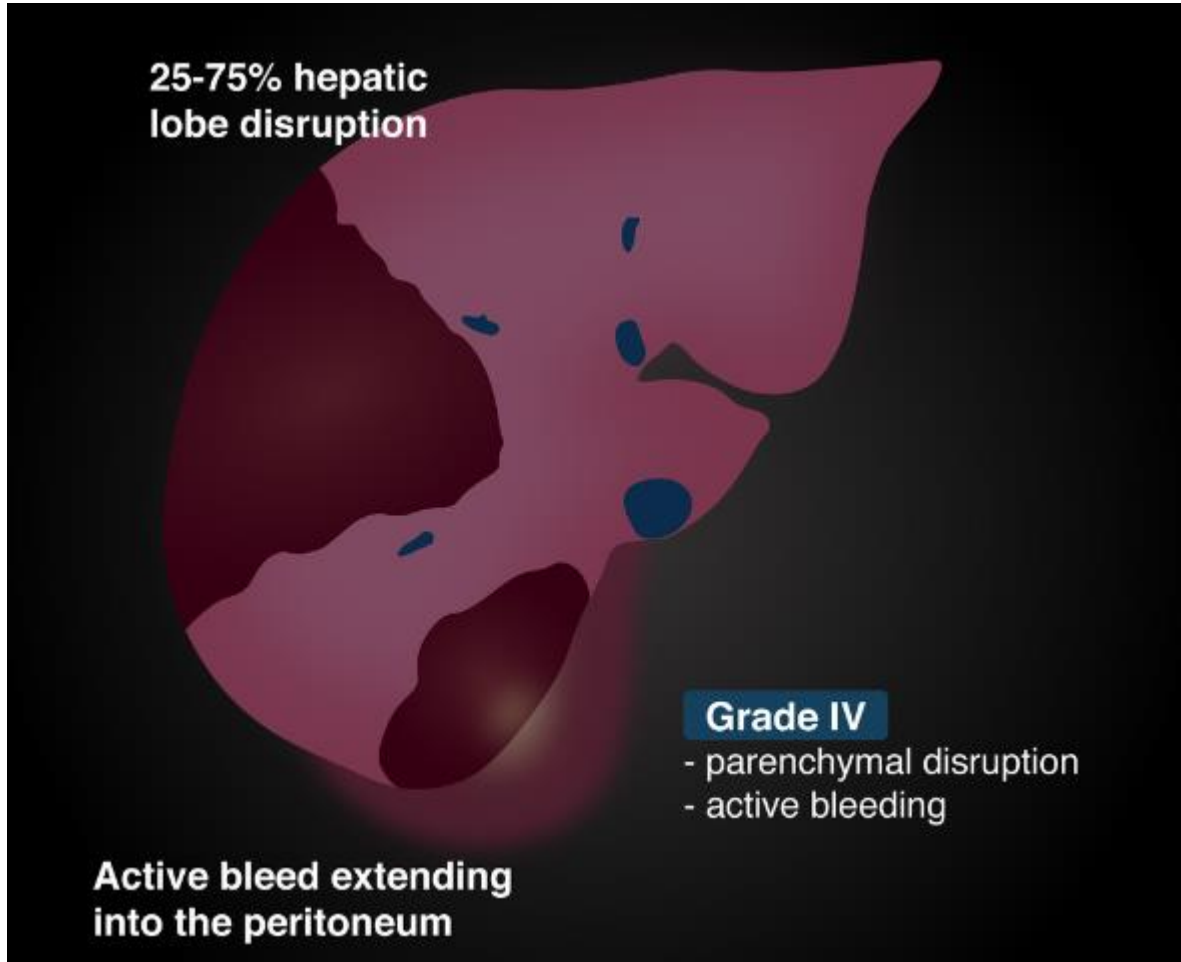


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Liver Trauma

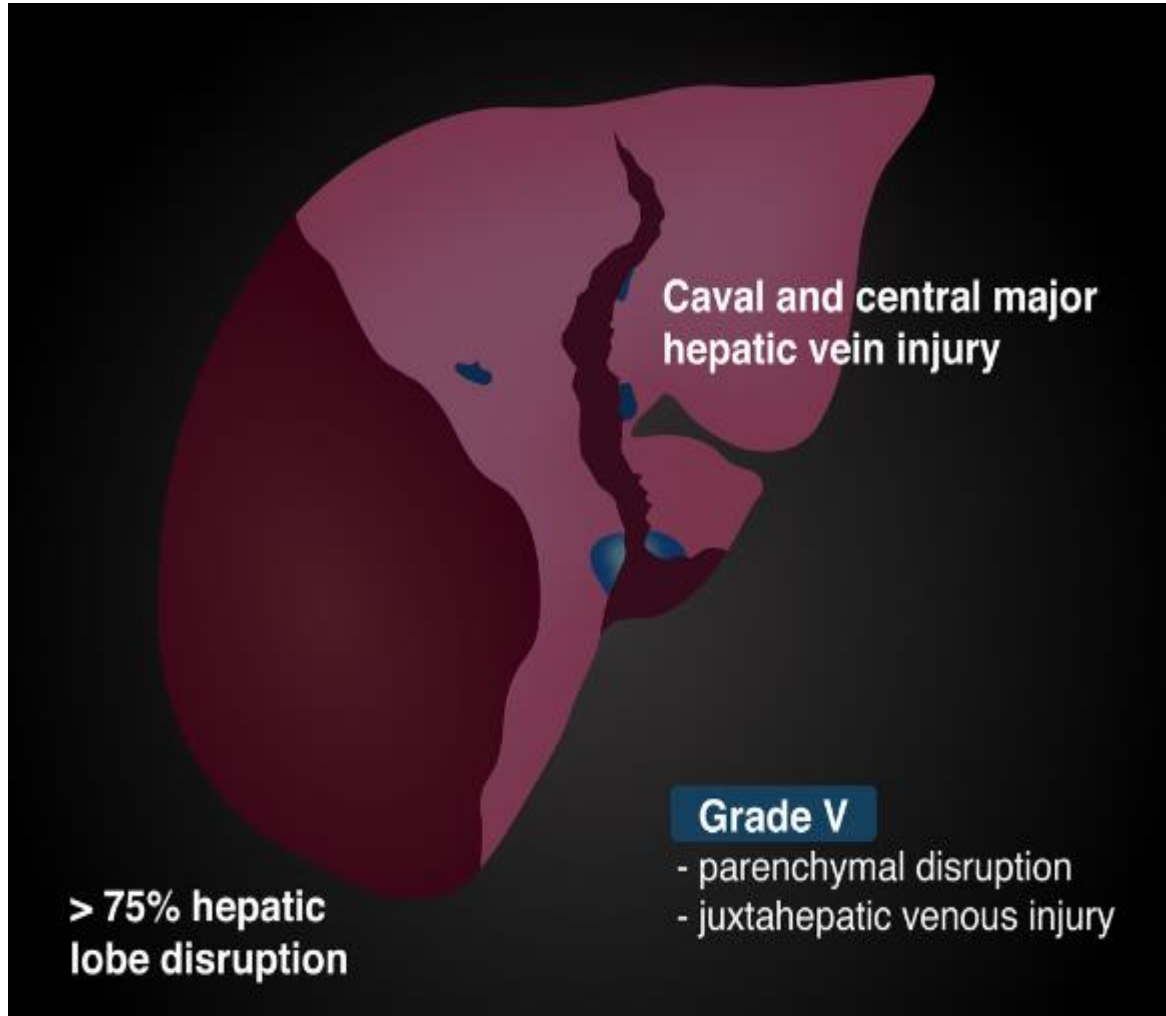


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Table 2 WSES liver trauma classification

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

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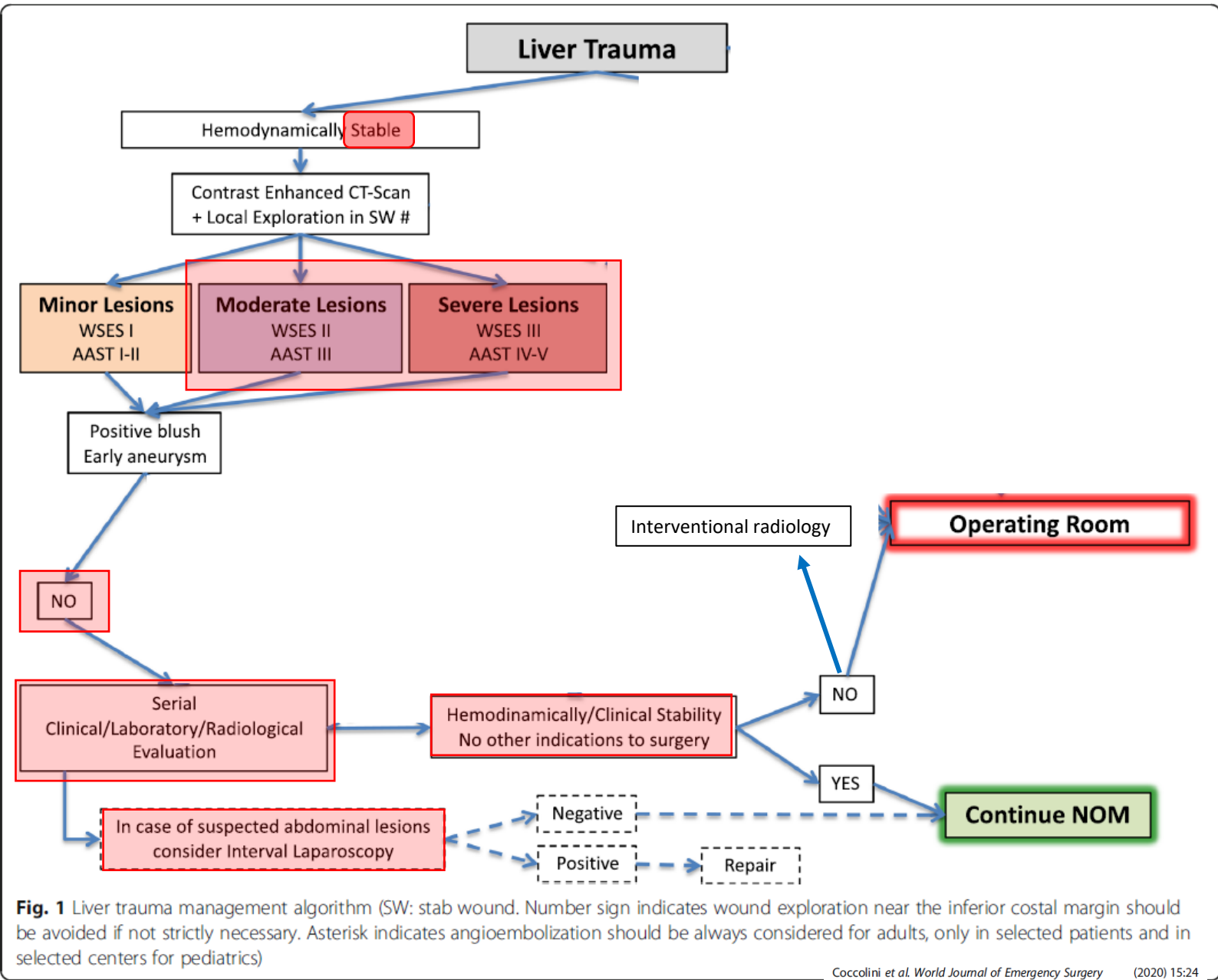


Fig. 1 Liver trauma management algorithm (SW: stab wound. Number sign indicates wound exploration near the inferior costal margin should be avoided if not strictly necessary. Asterisk indicates angioembolization should be always considered for adults, only in selected patients and in selected centers for pediatrics)

Admission to monitored bed

- ICU / PICU / MCU
- Centre with access to
 - Immediate surgery if necessary
 - Experienced liver surgeon
 - Acces to interventional radiology



Liver trauma – Case 2

43j – female

Horse kick



Admission through emergencies -> Trauma protocol

Liver Trauma

Hemodynamically **Stable**

Contrast Enhanced CT-Scan
+ Local Exploration in SW #

III

3

- Subcapsular hematoma >50% surface area; ruptured subcapsular or parenchymal hematoma
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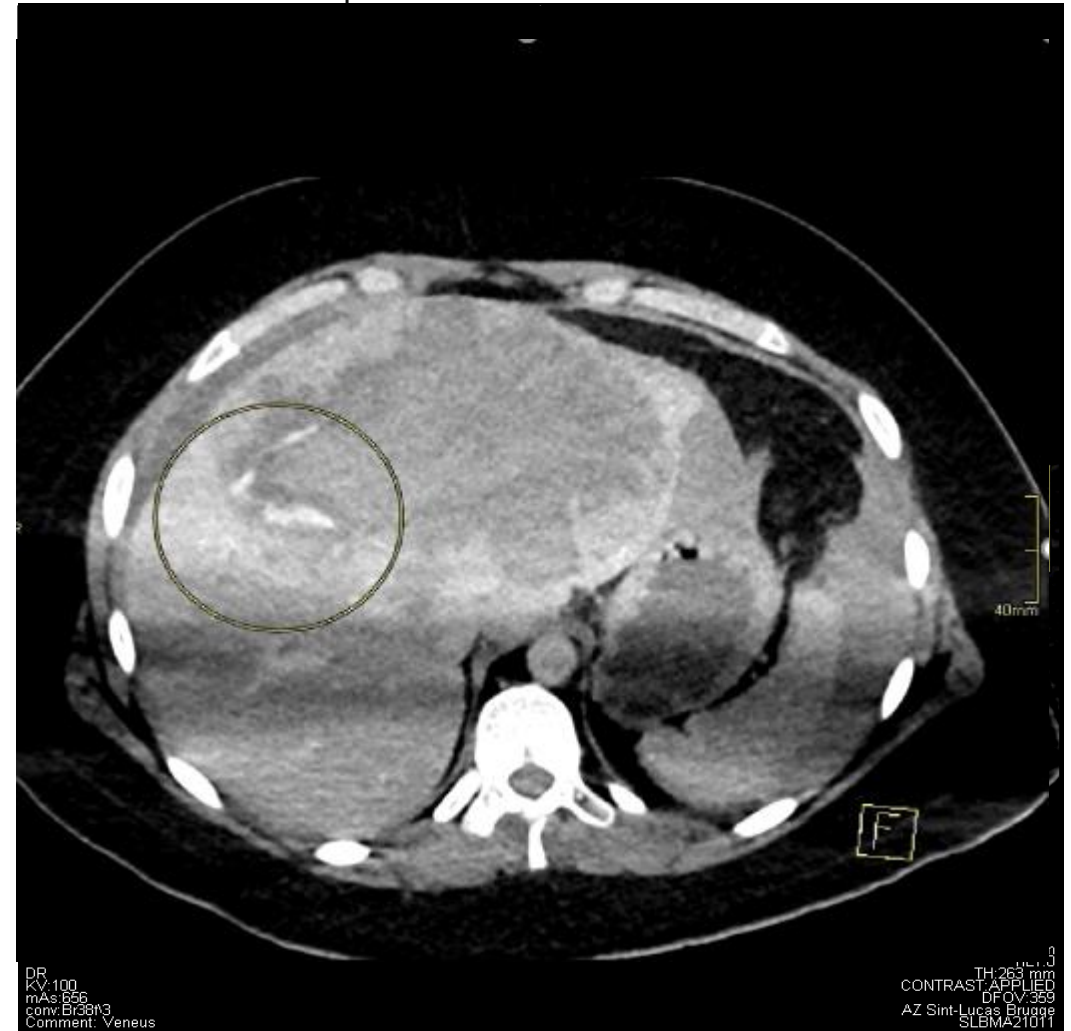
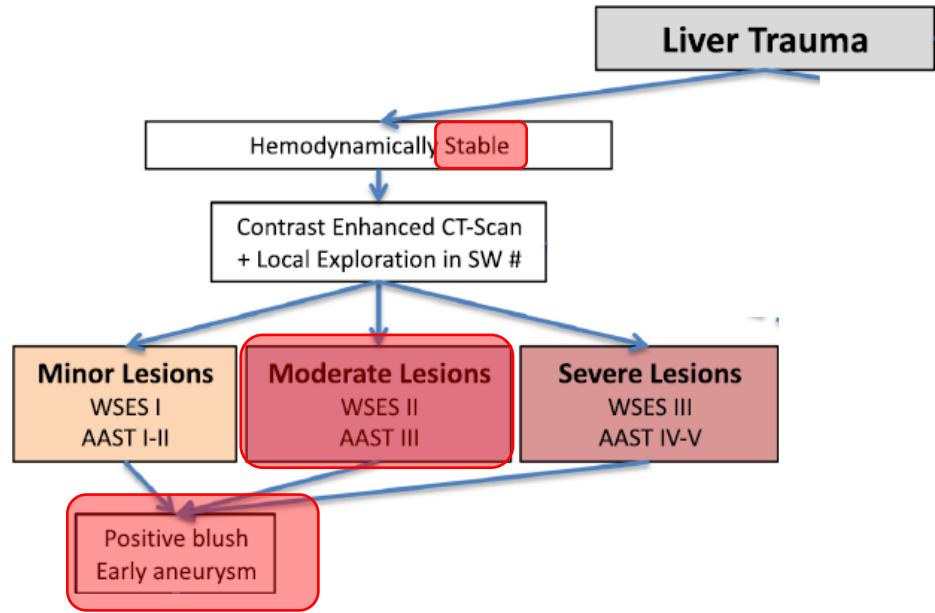


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What now??

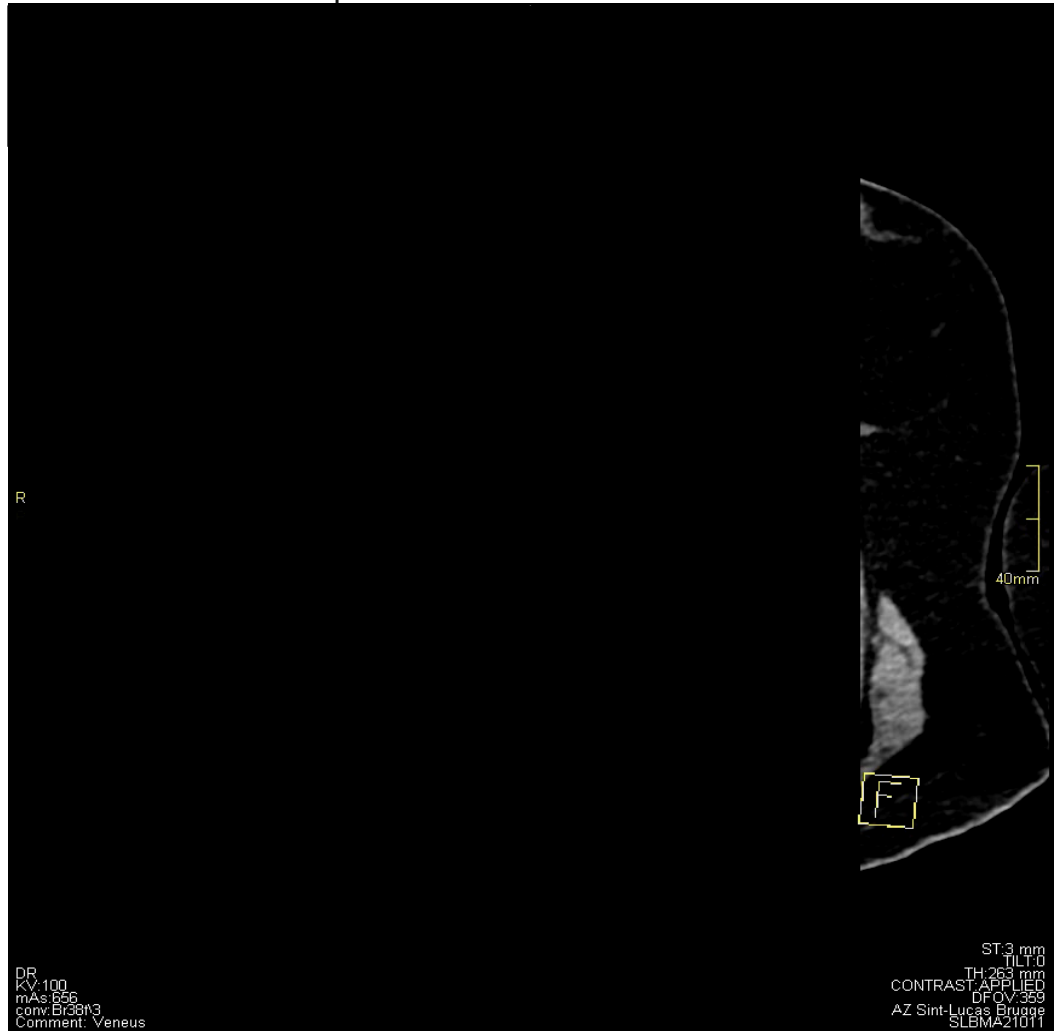


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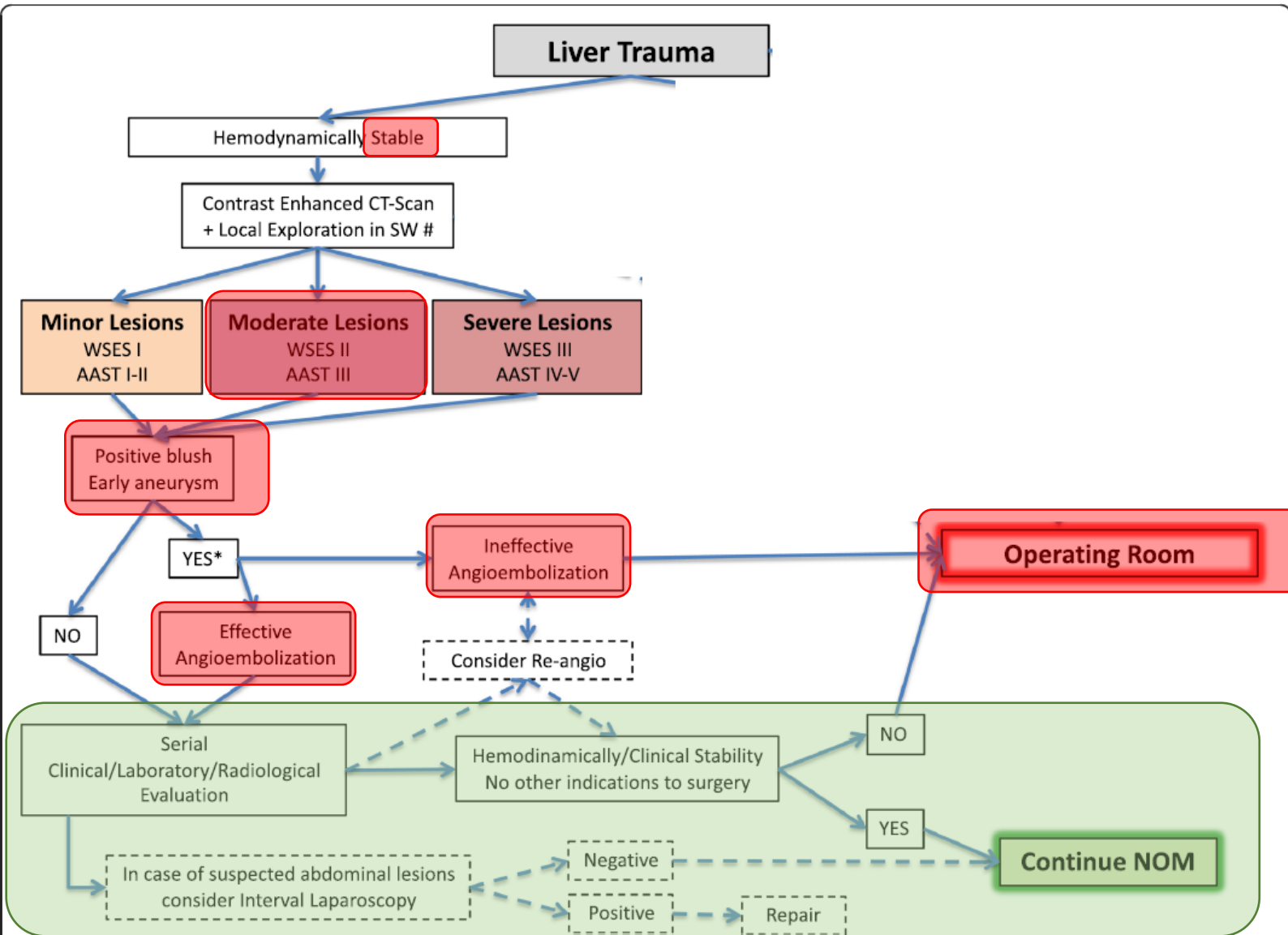


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 - Access to interventional radiology

Liver Trauma – Non Operative Management

- **Clinical assessment = key!**
- Blood samples: LFT / inflamm / Hb
- Routine imaging?
 - clinical / biochemical eval
 - Low threshold if doubt
- Delayed laparoscopic exploration

Liver Trauma – Non Operative Management

- Mobilisation?

- early mobilisation: safe in stable patients (Gentle!)

GoR 2A

- Enteral feeding?

- If no contra-indications -> as soon as feasible

GoR 2A

- LMWH?

- Trauma pt = high risk for DVT +/- PE
- Thromboprophylaxis <48h after trauma safe ~ patient selection!
- >72h 4x higher incidence of DVT

GoR 2B



Liver Trauma – NOM pitfalls:

- Valid for Blunt **and** Penetrating trauma
 - BUT:
 - High index of suspicion in PT!!!
 - High energy PT!!! ~ gunshot wounds
 - Lower threshold for (lap) exploration
- Cave neurotrauma! (brain perfusion pressure)
- Late complications:
 - Late Bleeding!
 - Abscess / bilioma / biliary complications (bilio – vasc fistula!)
 - Pseudo-aneurysm
 - Ischemia / necrosis

Liver trauma – Case 3

60j –male

High energy road traffic accident



Admission through emergencies -> Trauma protocol

Liver Trauma – Operative Management

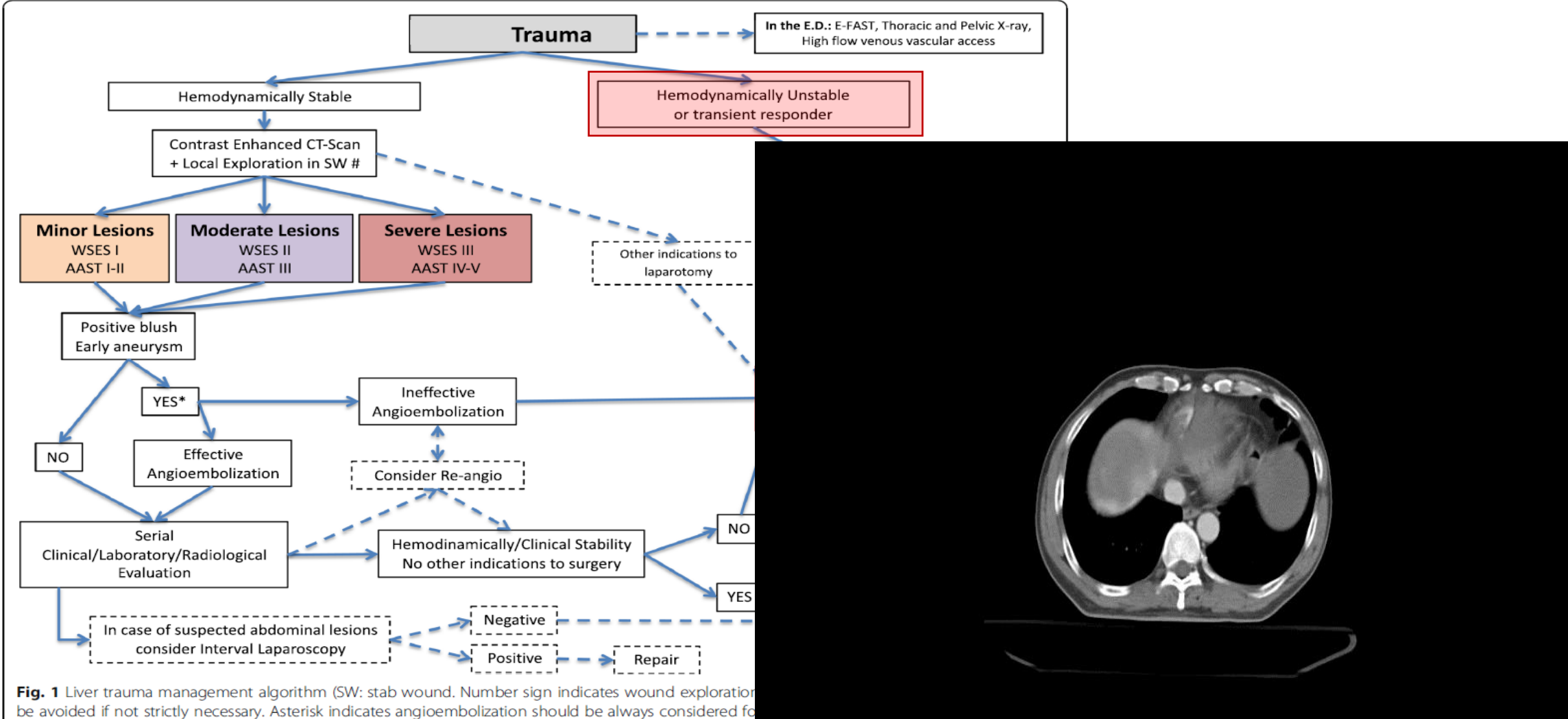


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Liver Trauma – Operative Management

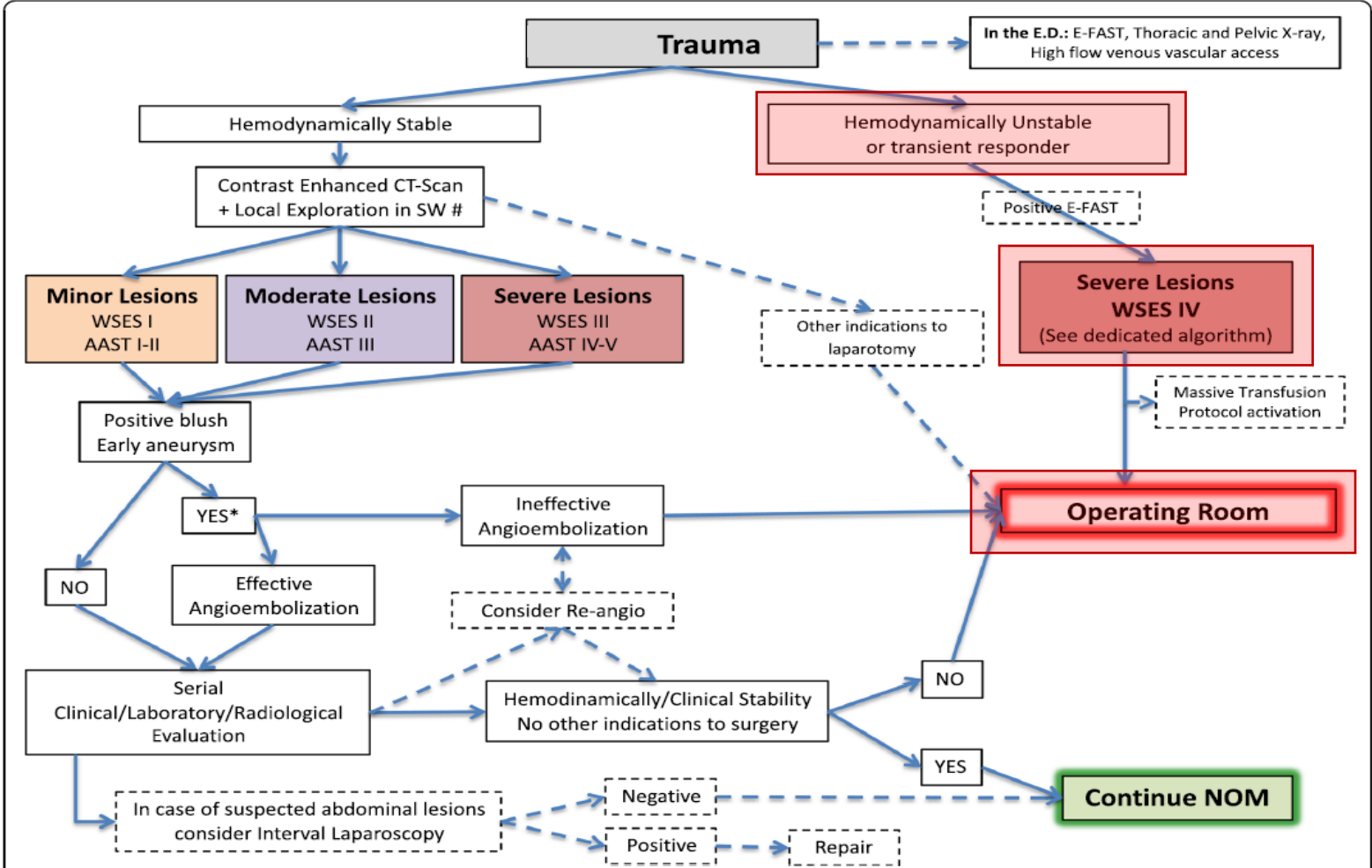


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Liver Trauma – Operative Management

Energy devices / cautery / argon

Compression / packing

Hemostatic agents

Vascular repair / occlusion

Vascular control / Exclusion



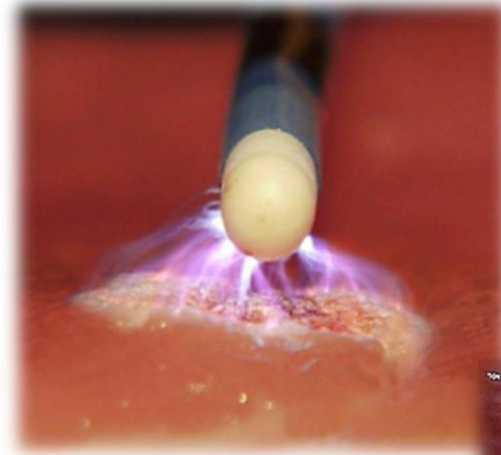
Liver Trauma – Operative Management

Damage control + resuscitation!!!

- Control Hemorrhage / bile leak
- Avoid major (anatomical) resections / complex procedures
- Lethal triad! Ascidosis / hypothermia / coagulopathy

Liver Trauma – Operative Management

- Energy devices / cautery / argon
- Hemostatic agents
 - minor bleeding
 - capsular tears / decapsulation
 - smaller parenchymal defects



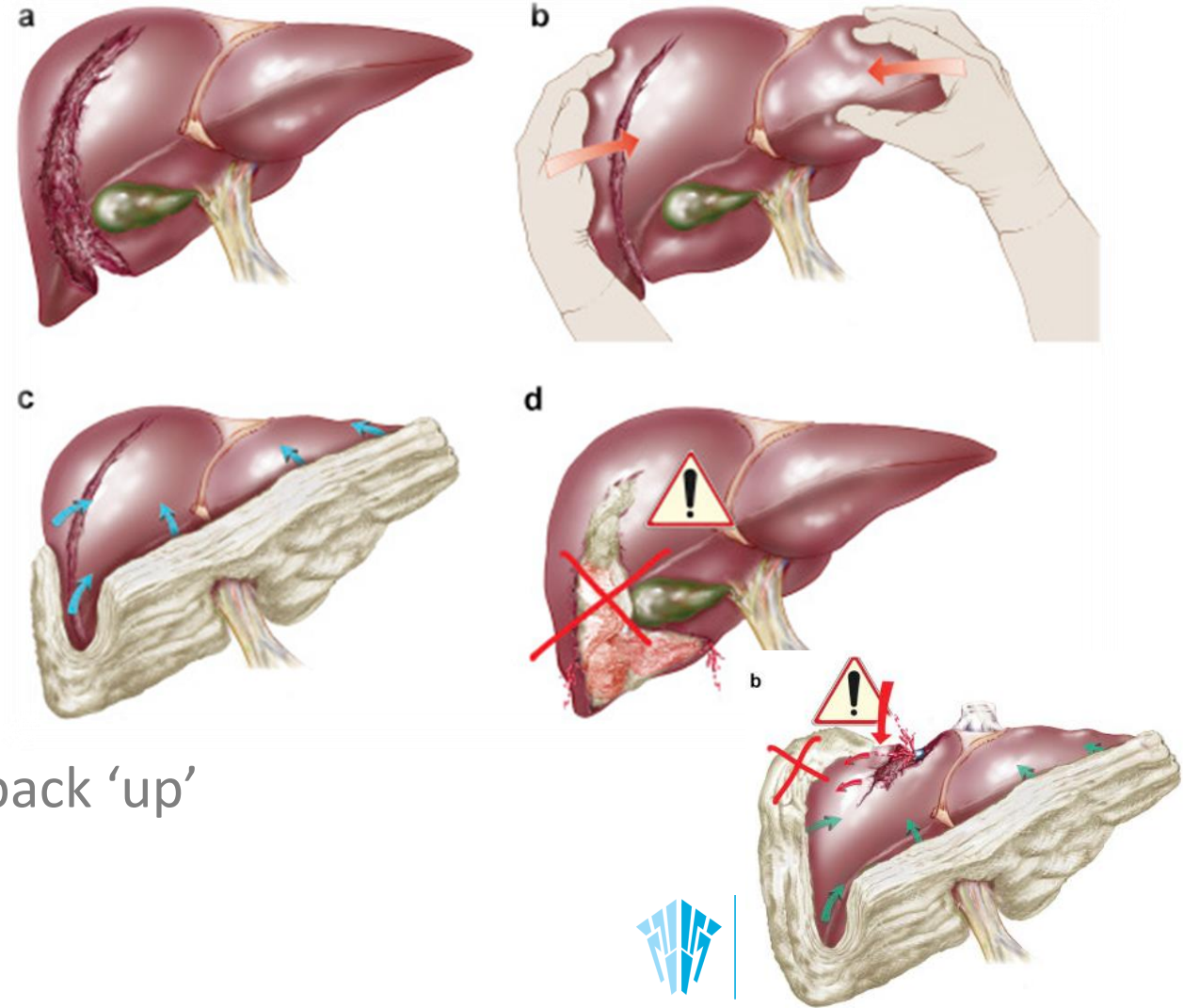
Liver Trauma – Operative Management

- Large tears / major disruptions
- Multifocal
- Profuse (venous) bleeding



PUSH & PACK

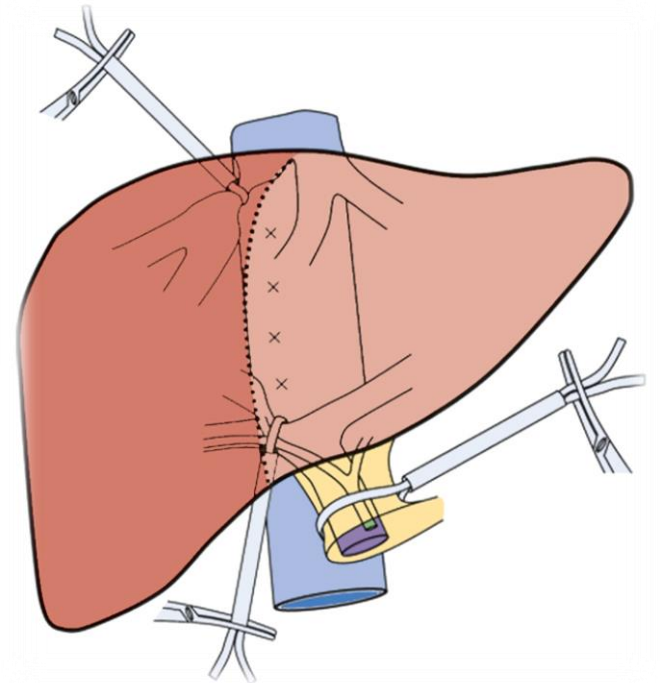
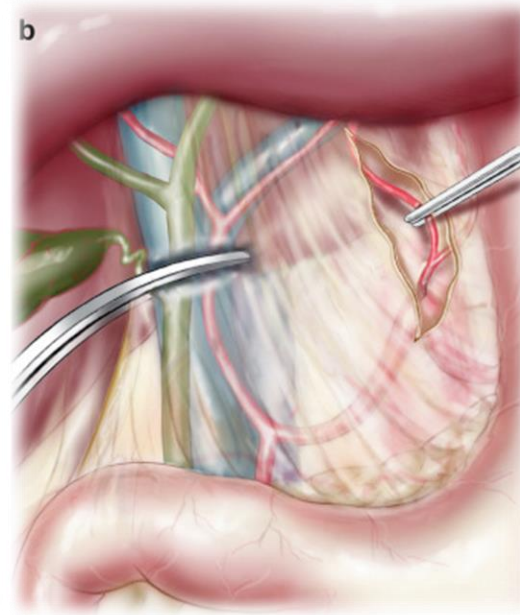
- Compress liver / defect + pack 'up'
- Avoid packing IN defect
- Avoid compressing VCI
- Avoid packing 'down'



Liver Trauma – Operative Management

Vascular control / exclusion

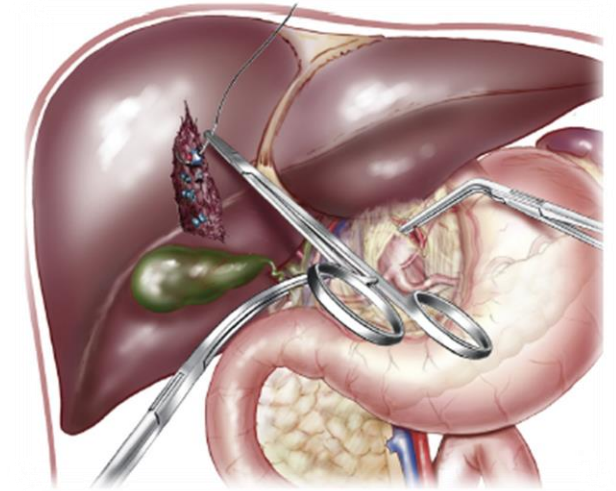
- Pringle -> inflow control!
 - selective?
 - additional left HA!
 - avoid prolonged clamping!
- Outflow control?
 - selective?



Liver Trauma – Operative Management

Vascular repair +/- occlusion

- Intra-parenchymal vessels -> ligate
- Portal vein -> repair / ligate (avoid major branch ligation!)
- Hepatic artery defect
 - Repair vs Selective ligation vs interventional radiology
 - Cave: gallbladder / bile duct ischemia - necrosis!



Liver Trauma – Operative Management

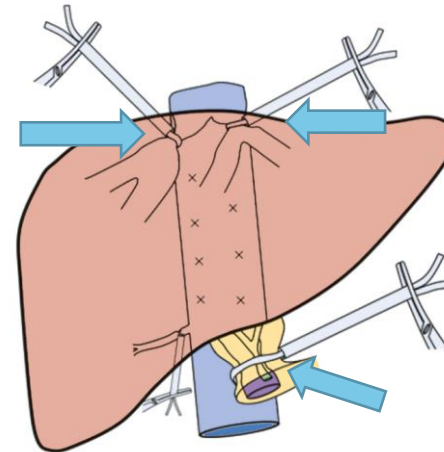
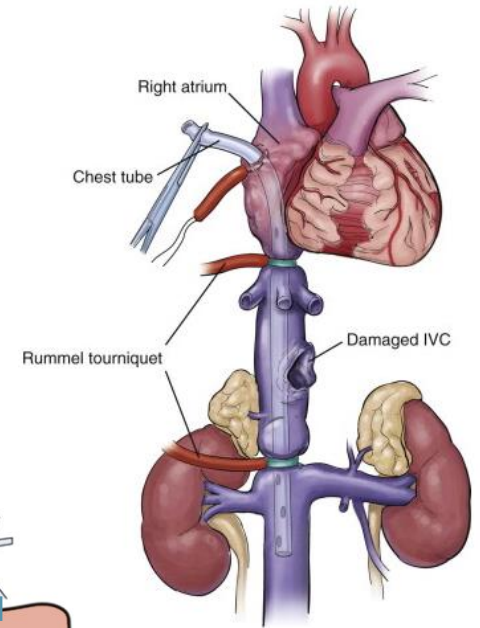
Persistent uncontrolled bleeding?

- Packing + vascular control: ok?
- ? Major venous defect VCI / hepatic vein origin?



Consider

- Total liver vascular exclusion
- Retrohepatic VCI exclusion +/- Shunt
- Reboa? Reboa-C?



Liver Trauma – Operative Management

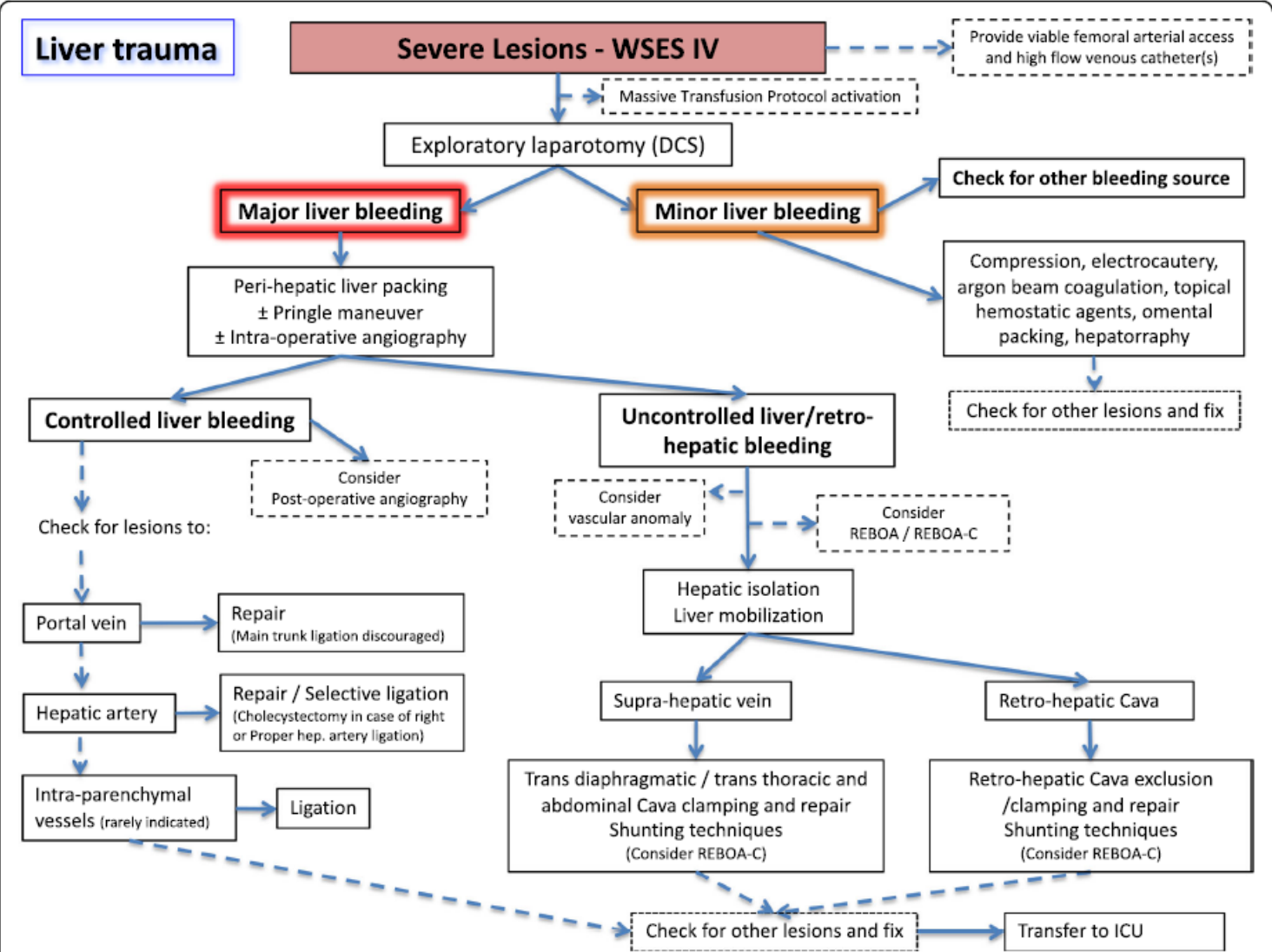


Fig. 2 Hemodynamically unstable liver trauma management algorithm (DCS: damage control surgery, ICU: intensive care unit, REBOA-C: REBOA-cava)

Take home messages

- Majority of Liver trauma = NOM
- Hemodynamics & concomittant injuries VS extent of liver injury
- Place of interventional radiology!
- Acute surgery = Damage control + resuscitation
- Delayed exploration / surgery for definitive treatment