Trattamento delle emorragie (traumatiche e non traumatiche)

EMORRAGIE EPATICHE

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Varese-IT
Hepatic Haemorrhage

- Traumatic
- Non-Traumatic (iatrogenic, spontaneous)

It is an **acute surgical emergency** as it results in intra-abdominal bleeding that, if untreated, will progress to **haemorrhagic shock and death**.
Correct and fast management of the patient is mandatory to improve outcomes.

Anamnesis, Clinical examination, Evaluation of vital signs are on the basis of a correct diagnosis.

Multidisciplinary approach.
Multidisciplinary Workup

Background

ICU

SURGERY

RADIOLOGY

INTERVENTIONAL RADIOLGY
The total time from patient injury to stopping hemorrhage is crucial in affecting outcome.

Controlling bleeding will only be achieved if coagulopathy is minimized by appropriate blood product support and drug therapy.

NOM is preferred if possible, but many cases require DCR, IR techniques, or a combination of the two.

IR and DCR are complementary techniques.
Why TIME?

- In injured patients an acute coagulopathy of trauma shock (ACoTS) is present in 25% of cases, it occurs very early (regardless of resuscitation) and it’s lethal.
- The main driving force for this early coagulopathy is shock.
- Damage Control Resuscitation (DCR) has a fundamental role in the management of the exsanguinating patient.

*Semin Interv Radiol 2010*
Damage Control Resuscitation

DCR is composed of three basic components:

- **Permissive hypotension** (palpable distal pulses in an awake patient)
- Minimizing crystalloid-based resuscitation strategies (**Prevention of hypothermia**)
- The immediate **release and administration of predefined blood products** (packed red blood cells, plasma, and platelets) in ratios (1:1:1)

This aggressive approach directly attacks the entire lethal triad of hypothermia, coagulopathy, and acidosis, to attempt of life-saving

*Semin Interv Radiol 2010*
Traumatic Patient

Trauma Center Categorization

<table>
<thead>
<tr>
<th>Difference in Standards Based on Physician Availability and Dedicated Resources</th>
<th>PANCE Level I</th>
<th>Level II</th>
<th>Level III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attending surgeon who is fellowship trained and is in the hospital at all times</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Dedicated facilities (Resuscitation Unit, Operating Room, and Intensive Care Unit) available at all times</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Trauma Surgeon available in the hospital at all times</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>On-call Trauma Surgeon available within 30 minutes of call</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Anesthesiologist in the hospital at all times and dedicated to trauma care</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Orthopedic Surgeon in the hospital at all times and dedicated to trauma care</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Neurosurgeon in the hospital at all times and dedicated to trauma care</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Orthopedic Surgeon available within 30 minutes of call</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Neurosurgeon available within 30 minutes of call</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Fellowship-trained/credentialed surgical director of the Intensive Care Unit</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Physician with privileges in critical care on duty in the Intensive Care Unit 24 hours</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Comprehensive Trauma Research Program</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Education—Fellowship Training in Trauma</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Surgical Residency Program</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Outreach Professional Education</td>
<td>X</td>
<td>X</td>
<td>X X X X</td>
</tr>
</tbody>
</table>

Revised Trauma Score (RTS):
- Glasgow Coma Scale (GCS),
- Systolic blood pressure (SBP),
- Respiratory rate (RR)

◆ RTS score 12: delayed
◆ RTS score 11: urgent
◆ RTS score 10–3: immediate

Eur Radiol 2015;25(7):1854-64
World J Hepatol 2016; 8(15): 644-48
The Advanced Trauma Life Support (ATLS) definition considers as “unstable” the patient with:

- blood pressure <90 mmHg
- heart rate >120 bpm,
- with evidence of skin vasoconstriction (cool, clammy, decreased capillary refill),
- altered level of consciousness
- and/or shortness of breath.

Traumatic Patient with liver injury

Outcome analysis of management of liver trauma: A 10-year experience at a trauma center

injury severity score (ISS): score 0-75

physical examination,
results of investigation,
findings in operation.

NOM was adopted for hemodynamically stable patients whose abdominal examination showed no peritoneal signs and whose imaging scans showed no intraperitoneal, retro-peritoneal or extra-abdominal injuries requiring OM. OM was indicated otherwise and when NOM failed.

Associated injuries outside the liver usually account for morbidity and mortality.
# AAST LIVER TRAUMA CLASSIFICATION

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury type</th>
<th>Injury description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Haematoma</td>
<td>Subcapsular &lt;10 % surface</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Laceration Capsular tear &lt;1 cm parenchymal depth</td>
</tr>
<tr>
<td>II</td>
<td>Haematoma</td>
<td>Subcapsular 10–50 % surface area; intraparenchymal, &lt;10 cm diameter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Laceration 1–3 cm parenchymal depth, &lt;10 cm in length</td>
</tr>
<tr>
<td>III</td>
<td>Haematoma</td>
<td>Subcapsular &gt;50 % surface area or expanding, ruptured subcapsular or parenchymal haematoma. Intraparenchymal haematoma &gt;10 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Laceration &gt;3 cm parenchymal depth</td>
</tr>
<tr>
<td>IV</td>
<td>Laceration</td>
<td>Parenchymal disruption 25–75 % of hepatic lobe</td>
</tr>
<tr>
<td></td>
<td>Vascular</td>
<td>Juxtavenous hepatic injuries i.e. retrohepatic vena cava/central major hepatic veins</td>
</tr>
<tr>
<td>VI</td>
<td>Vascular</td>
<td>Hepatic avulsion</td>
</tr>
</tbody>
</table>

Advance one grade for multiple injuries up to grade III
AAST liver injury scale (1994 revision)

*J Trauma* 1995;38: 323–4
Liver Trauma

- Grade I, II or III are successfully treated with NOM.

- Grade IV or V injuries require laparotomy (OM).

- However in many cases there is no correlation between AAST grade and patient physiologic status.

- The AAST classification should be supplemented by hemodynamic status and associated injuries.

- In clinical practice the decision whether patients need to be managed operatively or undergo NOM is based mainly on the clinical conditions and the associated injuries, and less on the AAST liver injury grade.

*Surg Clin N Am. 2010;90:775–85*
### WSES Liver Trauma Classification

<table>
<thead>
<tr>
<th>WSES grade</th>
<th>Blunt/Penetrating (Stab/Guns)</th>
<th>AAST</th>
<th>Haemodynamic</th>
<th>CT-scan</th>
<th>First-line Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINOR</td>
<td>WSES grade I B/P SW/GSW</td>
<td>I-II</td>
<td>Stable</td>
<td></td>
<td>NOM*</td>
</tr>
<tr>
<td></td>
<td>WSES grade II B/P SW/GSW</td>
<td>III</td>
<td>Stable</td>
<td>Yes</td>
<td>+ Serial Clinical/Laboratory/Radiological Evaluation</td>
</tr>
<tr>
<td></td>
<td>WSES grade III B/P SW/GSW</td>
<td>IV-V</td>
<td>Stable</td>
<td>No</td>
<td>OM</td>
</tr>
<tr>
<td></td>
<td>WSES grade IV B/P SW/GSW</td>
<td>I-VI</td>
<td>Unstable</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

(SW Stab Wound, GSW Gun Shot Wound; OM: Operative Management; NOM: Non Operative Management; *NOM should only be attempted in centers capable of a precise diagnosis of the severity of liver injuries and capable of intensive management close clinical observation and haemodynamic monitoring in a high dependency/intensive care environment, including serial clinical examination and laboratory assay, with immediate access to diagnostics, interventional radiology and surgery and immediately available access to blood and blood products; # wound exploration near the inferior costal margin should be avoided if not strictly necessary because of the high risk to damage the intercostal vessels)
Outline indicating how decision making might be influenced by nature of injuries

<table>
<thead>
<tr>
<th>Site</th>
<th>Nonoperative management</th>
<th>Interventional radiology</th>
<th>Damage control surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoracic aorta</td>
<td>No role except in small partial thickness tears (4, C)</td>
<td>Stent graft for suitable lesions (2, B)</td>
<td>Ascending aortic injury or arch injury involving great vessels (4, C)</td>
</tr>
<tr>
<td>Abdominal aorta</td>
<td>No role</td>
<td>Occlusion balloon, stent graft for suitable lesions (4, C)</td>
<td>Injury requiring visceral revascularization or untreatable by endovascular therapy (4, C)</td>
</tr>
<tr>
<td>Peripheral or branch artery</td>
<td>No role</td>
<td>Occlusion balloon, stent, stent graft or embolization (4, C)</td>
<td>Any lesion that cannot rapidly be controlled or that will require other revascularization (4, C)</td>
</tr>
<tr>
<td>Kidney</td>
<td>Subcapsular or retroperitoneal hematoma without active arterial bleeding (3, C)</td>
<td>Active arterial bleeding, embolization or stent graft (4, C); arterial occlusion &lt; 6 h, stent/stent graft</td>
<td>Renal injury in association with multiple other bleeding sites, or other injuries requiring urgent surgical repair</td>
</tr>
<tr>
<td>Spleen</td>
<td>Lacerations, hematoma</td>
<td>Active arterial bleeding or false arterial bleeding</td>
<td>Packing or splenectomy for active arterial bleeding</td>
</tr>
<tr>
<td>Liver</td>
<td>Subcapsular or intraperitoneal hematoma, lacerations without active arterial bleeding (3, C)</td>
<td>Active focal arterial bleeding; focal embolization if possible; nonselective embolization if multiple bleeding sites as long as portal vein patent (3, C)</td>
<td>Packing if emergency laparotomy is needed, with subsequent repeat CT and embolization if required</td>
</tr>
<tr>
<td>Pelvis</td>
<td>Minor injury with no active bleeding</td>
<td>Focal embolization for arterial injury (bleeding, false aneurysm or cutoff) (3, C)</td>
<td>External compression and subsequent fixation if bleeding from veins or bones</td>
</tr>
</tbody>
</table>
CT?

• CECT improves outcome, and can shorten the criterion time and indicate whether hemostatic control is best achieved by NOM, IR, or damage control surgery (DCS).

  Recommendation 3 Whole body MDCT (head to mid-thighs/knees) should be the default first-line imaging in severely injured patients who respond at least partially to resuscitation. MDCT should be available within 30 min of requests and should be performed before angiography or surgery. Other investigations should not delay CT. In very unstable patients, CT should follow immediate surgery or balloon occlusion to control bleeding. (Recommendation B, level 2 evidence.)

Cardiovasc Intervent Radiol 2012; 35:472–482
Br J Radiol 2016: 89: 20150952
NOM-OM

• Over the past three decades, NOM has become the primary treatment modality for the vast majority of patients, with significant improvements in outcome.

• Patients who are hemodynamically stable and have active extravasation of intravenous contrast on CT are appropriate candidates for angiography.

• Active extravasation of contrast on CT predicts the need for embolization, with embolization rates of 60–80 % at angiography.

NOM: everywhere?

• Centres providing care for major trauma should aim to offer the full spectrum of NOM, DCS, and IR according to the clinical need of each patient.

• Not every hospital will be able to provide comprehensive care for trauma.

• Patient intensive monitoring, angiography, an immediately available OR and immediate access to blood and blood products represent necessary services.

• In general, severely injured patients should be taken directly to these sites even if this involves a longer transfer.

• Secondary transfer should be avoided.

Successful NOM requires careful patient selection based on the hemodynamic status of the patient, absence of other signs of visceral injury that require surgery, good-quality CT imaging, and the availability of an effective multidisciplinary team with intensive care physicians, experienced surgeons, and interventional radiologists at the ready.

While many factors help predict NOM failure, it is now generally accepted that the most important factor determining successful NOM is the hemodynamic stability of the patient, irrespective of the grade of injury or the volume of hemoperitoneum.

_Eur J Trauma Emerg Surg_ 2015; 41:229–237
traumatic hepatic PSA
traumatic PSA
Penetrating trauma of liver and right kidney
• NOM is contraindicated in case of **CT-scan detection** of:
  
  free intra- or retro-peritoneal air,
  free intra-peritoneal fluid in the absence of solid organ injury,
  localized bowel wall thickening,
  bullet tract close to hollow viscus

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**Recommendations for operative management (OM) in liver trauma (blunt and penetrating)**

- Patients should undergo OM in liver trauma (blunt and penetrating) in case of hemodynamic instability, concomitant internal organs injury requiring surgery, evisceration, impalement (GoR 2 A).

- Primary surgical intention should be to control the hemorrhage, to control bile leak and to institute an intensive resuscitation as soon as possible (GoR 2 B).

- Major hepatic resections should be avoided at first, and considered subsequently (delayed fashion) only in case of large devitalized liver portions and in centers with the necessary expertise (GoR 3 B).

- Angioembolisation is a useful tool in case of persistent arterial bleeding (GoR 2 A).
OM

• Recognition of the patient who should proceed to immediate laparotomy is of utmost importance.

• A systematic and logical approach to the control of hemorrhage is required in the operating room.

• Furthermore, surgeons should have a thorough knowledge of the anatomy and surgical techniques, such as perihepatic packing, effective Pringle maneuver, hepatic mobilization, infrahepatic and suprahepatic control of the IVC, and stapled hepatectomy.

• Hepatic necrosis, gallbladder necrosis, bile leak, and abscess can occur after embolization, with complication rates ranging from 29 to 80%.

Br J Radiol 2016; 89: 20150866.
TAE after OM

• The exact role of post-operative angio-embolization is still not well defined.

• Two principal indications have been proposed:
  1. after primary operative hemostasis in stable or stabilized patients, with an evidence at contrast enhanced CT-scan of active bleeding,
  2. as adjunctive hemostatic control in patients with uncontrolled suspected arterial bleeding despite emergency laparotomy.

Polytraumatic patient with hepatic bleeding
Follow up during/after NOM

• No standard follow-up and monitoring protocol exist to evaluate patients with NOM liver injuries.

• Serial clinical evaluation and hemoglobin measurement are considered the pillars in evaluating patients undergone to NOM.

J Trauma 2011;70(3):626–9
Complications after NOM

• Approximately one quarter of patients with hepatic injury managed nonoperatively will require an intervention to manage a complication (abscess or bile peritonitis).

• Patients with higher grade injuries are at risk of complications, and higher grade injury alone has been shown to independently predict the need for surgical intervention.

• Hepatic necrosis, gallbladder necrosis, bile leak, and abscess can occur after embolization, with complication rates ranging from 29 to 80 %

Spontaneous hepatic haemorrhage (SHH)

- Rare condition; sometimes poorly recognized and infrequently diagnosed in patients presenting with shock.
- Pathogenesis is unclear and is almost certainly multifactorial: most frequent in patients with connective tissue disease.
- In tumours and tumour-like conditions, the pathogenesis of a haemorrhage has not been established.

*HPB 2015, 17, 872–880*
Spontaneous

- Pediatric
  - emangioma
  - adenoma
  - sarcoma
  - hepatoblastoma
  - HCC
- Pregnancy associated
  - adenoma
  - HCC
  - HELLP
  - acute fatty liver
- Malignant
  - HCC
  - angiosarcoma
  - haemangioendothelioma
  - Mts
  - adenoma
  - FNH
  - Haemangioma
  - Nodular Regenerative Hyperplasia
  - Cystadenoma
  - Angiomyelolipoma
- Benign
  - Haemangioma
  - Nodular Regenerative Hyperplasia
  - Cystadenoma
  - Angiomyelolipoma
- Vascular
  - Peliosis Hepatis
- Connective tissue disease
  - Amyloid
  - SLE
  - Polyarteritis nodosa
- Miscellaneous
  - Vomiting
  - Warfarin Therapy

HPB 2015, 17, 872–880
Treatment practice **emphasizes arterial embolization** to obtain haemostasis.

Hepatectomy reserved for tumour-bearing patients after staging and assessment of liver function.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Year</th>
<th>Conservative (%)</th>
<th>TAE (%)</th>
<th>HAL (%)</th>
<th>Segmental HAL (%)</th>
<th>Packing/Plication (%)</th>
<th>Resection (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chearanai</td>
<td>1983</td>
<td>27 (7) (4) (0)</td>
<td></td>
<td>26 (24) (0) (0)</td>
<td></td>
<td>9 (0) (0) (0)</td>
<td>1 (1) (1) (0)</td>
</tr>
<tr>
<td>Lai</td>
<td>1989</td>
<td>4 (-) (-) (0)</td>
<td>39 (28) (16) (9)</td>
<td>8 (4) (4) (1)</td>
<td>2 (2) (1) (1)</td>
<td>31 (31) (23) (13)</td>
<td>1 (21) (21) (15)</td>
</tr>
<tr>
<td>Miyamoto</td>
<td>1991</td>
<td>14 (4) (4) (0)</td>
<td>57 (40) (40) (17)</td>
<td>10 (10) (4) (0)</td>
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<td>31 (31) (23) (13)</td>
<td>1 (21) (21) (15)</td>
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<td>1991</td>
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<td>4 (4) (0) (0)</td>
<td>12 (8) (3) (0)</td>
<td>8 (6) (2) (0)</td>
<td>11 (5) (4) (0)</td>
<td></td>
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<tr>
<td>Cherqui</td>
<td>1993</td>
<td>1 (0) (0) (0)</td>
<td></td>
<td></td>
<td></td>
<td>4 (3) (1)</td>
<td></td>
</tr>
<tr>
<td>Xu</td>
<td>1994</td>
<td>68 (35) (35) (1)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Chiappa</td>
<td>1999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Liu</td>
<td>2001</td>
<td>67 (44) (-) (-)</td>
<td>42 (35) (25) (0)</td>
<td>23 (23) (-) (-)</td>
<td>8 (8) (-) (-)</td>
<td>2 (2) (-) (-)</td>
<td></td>
</tr>
<tr>
<td>Kirikosho</td>
<td>2009</td>
<td>32 (16) (2) (-)</td>
<td>16 (15) (15) (7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battula</td>
<td>2009</td>
<td>7 (5) (-) (-)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>Battula</td>
<td>2012</td>
<td>44 (32) (32) (30)</td>
<td>4 (4) (-) (-)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>244 (158) (77) (31)</td>
<td>130 (99) (80) (24)</td>
<td>120 (92) (26) (10)</td>
<td>8 (4) (4) (1)</td>
<td>72 (58) (16) (3)</td>
<td>76 (64) (46) (25)</td>
</tr>
</tbody>
</table>

( ), not reported; TAE, transarterial embolization; HAL, hepatic artery ligation.
Spontaneous bleeding of an HCC
Iatrogenic Hepatic Haemorrhage (IHH)

• The incidence of IHHs is more than the incidence of traumatic hepatic arterial injuries.
• Percutaneous interventions seem to have a higher incidence of IHHs than surgery.
• Etiologies:
  – percutaneous transhepatic biliary drainage,
  – percutaneous liver biopsy,
  – liver surgery (pancreaticoduodenectomy, laparoscopic cholecystectomy, and mass excision),
  – transcatheter chemoembolization,
  – transcatheter radioembolization,
  – and endoscopic retrograde cholangiopancreatography
• Mean latency period between the intervention and the diagnosis of IHHs varies. The symptoms are hemorrhage, hemobilia, and pain.
• CTA findings and hemodynamic status of the patients are considered to determine the indication for angiography.
Emergency percutaneous treatment in iatrogenic hepatic arterial injuries

Gianpaolo Carrafiello · Domenico Laganà · Massimiliano Dizonno · Elisa Cotta · Andrea Ianniello · Carlo Fugazzola

endovascular treatment currently represents a valid option in emergency settings, as it enables diagnosis and treatment of IHAI in a single session.
...after cholecistectomy

Iatrogenic
Bleeding after hepatic biopsy
hepatic arterial bleeding after percutaneous biliary drainage

iatrogenic
Bleeding after percutaneous MWA
TAE: embolic agents

• The ideal embolic agent:
  – inexpensive,
  – easy to use,
  – permanent,
  – capable of occluding the injured artery with maximum preservation of hepatic arterial flow.

• Active bleeding due to a lesion of a small distal vessel responds well to embolization using particles such as those of PVA (150–300 µm), embospheres (300–500 µm), or gelfoam in small segments (1 mm). Gelfoam is inexpensive and easy to use; however, it is not permanent and rebleeding may occur.

TAE: embolic agents

- Superselective catheterization with a coaxial microcatheter of the bleeding vessel is the most important step of embolization to obtain the best results and to avoid many complications.

- In the case of arterial lesions associated with arterioportal shunt (the commonest cause is percutaneous liver biopsy), embolization must be performed at exactly the point or nexus of the arterioportal connection.

- In cases such as pseudoaneurysms or fissurations, to obtain complete hemostasis, microcoils have to be placed both distally and proximally to the pseudoaneurysm.

TAE: embolic agents

• A covered stent placement can be used to treat a PSA located at the level of large extrahepatic vessels, especially in patients who have not developed collateral pathways, conserving the continuity of the vascular artery axis;

• In selected cases, such as large pseudoaneurysms, the percutaneous puncturing of the pseudoaneurysm can be performed with thrombin injection.

PSA after bilio-hepatic surgery
TAE: embolic agents

- It must be stressed that while 70% of hepatic blood comes from the portal vein, the vitality of the bile ducts depends exclusively on the arterial system.

- In rare cases, the embolization of arterial branches that irrigate these ducts may provoke wall necrosis with stenosis or leakage as complications.

- Fistulas of necrotic ducts may provoke bilomas or severe peritonitis.

Usefulness of Cone-Beam Computed Tomography and Automatic Vessel Detection Software in Emergency Transarterial Embolization

Gianpaolo Carrafiello¹ · Anna Maria Ierardi¹ · Ejona Duka¹ · Alessandro Radaelli² · Chiara Floridi¹ · Alessandro Bacuzzi³ · Maximilian de Bucourt⁴ · Giuseppe De Marchi¹

Conclusions  C-arm CBCT and AVD software during TAE of angiographically challenging arterial bleedings is feasible and may facilitate successful embolization. Staff training in CBCT imaging and software manipulation is necessary.
Spontaneous bleeding of an intrahepatic sarcoma

Tools

- Intraprocedural CBCT
- Post-procedural CBCT
IMMEDIATE ASSESSMENT of TREATMENT hepatic bleeding after MWA
Conclusions

• Correct multidisciplinary approach is mandatory to obtain the best outcomes

• Endovascular treatment plays an important role either in NOM than in OM
Thank you