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.

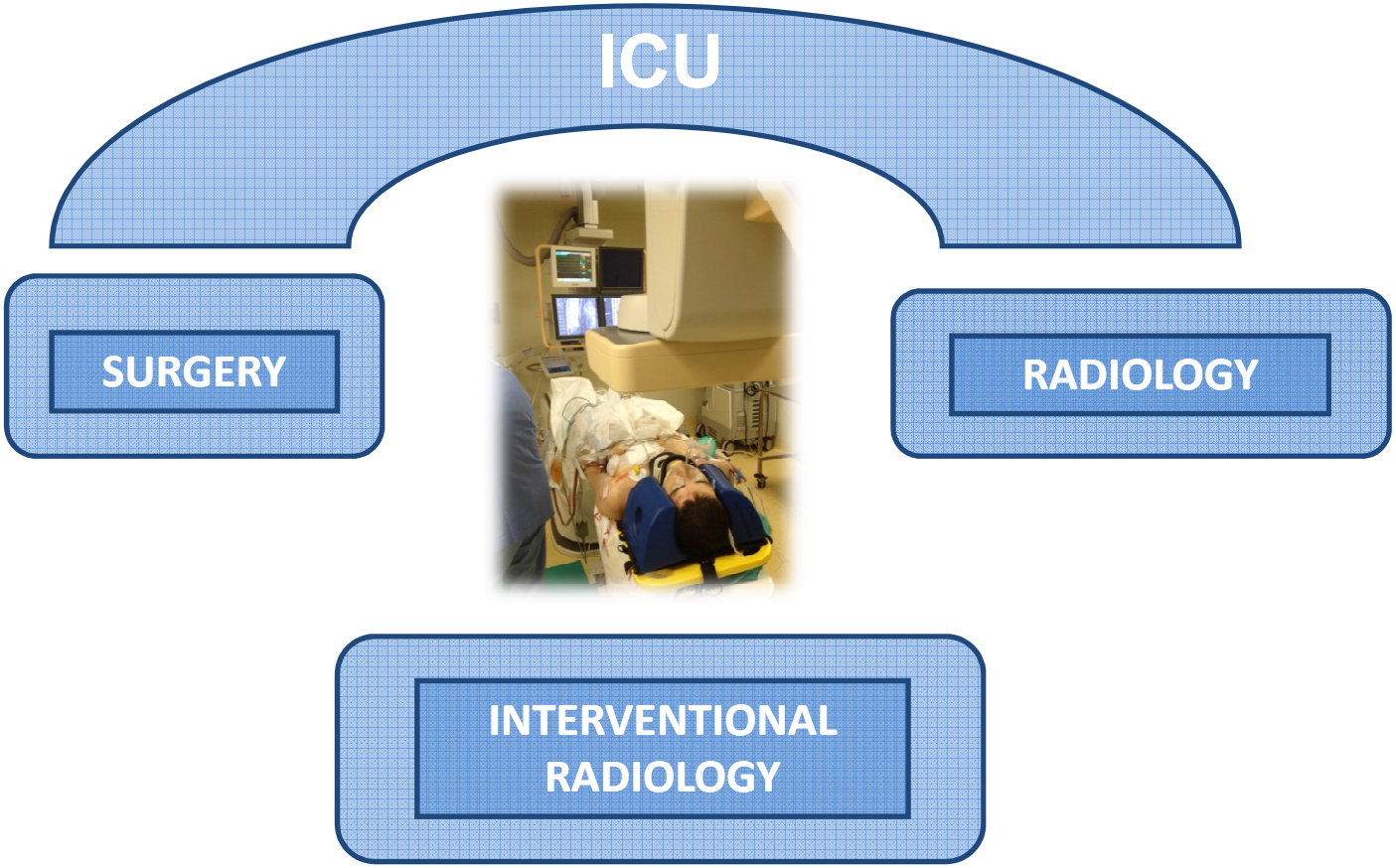
Approach to..

Correct and fast managment 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



NOM

OM

Time

Background

- 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.

Cochrane Database of Systematic Reviews 2015

Background

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

Trauma Center Categorization

Differences in Standards Based on Physician Availability and Dedicated Resources	PARC	Level I	Level II	Level III
Attending surgeon who is fellowship-trained and is in the hospital at all times	X			
Dedicated facilities (Resuscitation Unit, Operating Room, and Intensive Care Unit) 24 hours	X			
Facilities (Resuscitation Unit, Operating Room, and Intensive Care Unit) available at all times	X	X	X	X
Trauma Surgeon available in the hospital at all times		X	X	
On-call Trauma Surgeon available within 30 minutes of call				X
Anesthesiologist in the hospital at all times and dedicated to trauma care	X			
Anesthesiologist in the hospital at all times but shared with other services		X	X	
On-call Anesthesiologist with CRNA who is in the hospital				X
Orthopedic Surgeon in the hospital at all times and dedicated to trauma care	X			
Orthopedic Surgeon in the hospital at all times but shared with other services		X		
On-call Orthopedic Surgeon available within 30 minutes of call			X	X
Neurosurgeon in the hospital at all times and dedicated to trauma care	X			
Neurosurgeon in the hospital at all times but shared with other services		X		
On-call Neurosurgeon available within 30 minutes of call			X	X
Fellowship-trained/board-certified surgical director of the Intensive Care Unit	X	X		
Physician with privileges in critical care on duty in the Intensive Care Unit 24 hrs/day	X	X	X	
Comprehensive Trauma Research Program	X	X		
Education—Fellowship Training in Trauma	X			
Surgical Residency Program	X	X		
Outreach Professional Education	X	X	X	

- **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

Traumatic Patient

Trauma

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.

American College of Surgeons. Advanced trauma life support for doctors (ATLS) student manual. 8th ed. 2008.

World Journal of Hepatology

Submit a Manuscript: http://www.wjgnet.com/esps/
Help Desk: http://www.wjgnet.com/esps/helpdesk.aspx
DOI: 10.4254/wjh.v8.i15.644

World J Hepatol 2016 May 28; 8(15): 644-648
ISSN 1948-5182 (online)

Trauma

Traumatic Patient with liver injury

Retrospective Study

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.

Table 2 Multivariate analysis of risk factors for mortality

Dependent factor			
Mortality			
Variables put into the system for model selection			
ISS			
Location of injury (0: Liver only; 1: Liver and outside the liver)			
Hemodynamics (0: Stable; 1: Unstable)			
Variable remaining in the final logistic regression model			
Factor	*P*	Hazard ratio	95%CI
ISS			

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

Grade	Injury type	Injury description
I	Haematoma	Subcapsular <10 % surface
	Laceration	Capsular tear <1 cm parenchymal depth
II	Haematoma	Subcapsular 10–50 % surface area; intraprenchymal, <10 cm diameter
	Laceration	1–3 cm parenchymal depth, <10 cm in length
III	Haematoma	Subcapsular >50 % surface area or expanding, ruptured subcapsular or parenchymal haematoma. Intraprenchymal haematoma >10 cm
	Laceration	>3 cm parenchymal depth
IV	Laceration	Parenchymal disruption 25–75 % of hepatic lobe
	Vascular	Juxtavenous hepatic injuries i.e. retrohepatic vena cava/centrl major hepatic veins
VI	Vascular	Hepatic avulsion

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

J Trauma 1995;38: 323–4

Liver Trauma

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

Trauma

WSES classification and guidelines for liver trauma

Federico Coccolini[1*], Fausto Catena[2], Ernest E. Moore[3], Rao Ivatury[4], Walter Biffl[5], Andrew Peitzman[6], Raul Coimbra[7], Sandro Rizoli[8], Yoram Kluger[9], Fikri M. Abu-Zidan[10], Marco Ceresoli[1], Giulia Montori[1], Massimo Sartelli[11], Dieter Weber[12], Gustavo Fraga[13], Noel Naidoo[14], Frederick A. Moore[15], Nicola Zanini[16] and Luca Ansaloni[1]

Table 2 WSES Liver Trauma Classification

	WSES grade	Blunt/Penetrating (Stab/Guns)	AAST	Haemodynamic	CT-scan	First-line Treatment
MINOR	WSES grade I	B/P SW/GSW	I-II	Stable		
MODERATE	WSES grade II	B/P SW/GSW	III	Stable	Yes + Local Exploration in SW#	NOM* + Serial Clinical/Laboratory/ Radiological Evaluation
SEVERE	WSES grade III	B/P SW/GSW	IV-V	Stable		
	WSES grade IV	B/P SW/GSW	I-VI	Unstable	No	OM

(*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)

World Journal of Emergency Surgery (2016) 11:50

Trauma

Outline indicating how decision making might be influenced by nature of injuries

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

Cardiovasc Intervent Radiol (2012) 35:472–482

CT?

Trauma

- CECT improves outcome, and can shorten the criterion time and indicate whether hemostatic control is best achieved by

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

Trauma

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

Eur J Trauma Emerg Surg (2015) 41:229–237

NOM: everywhere?

Trauma

- 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.

Cardiovasc Intervent Radiol (2012) 35:472–482

NOM

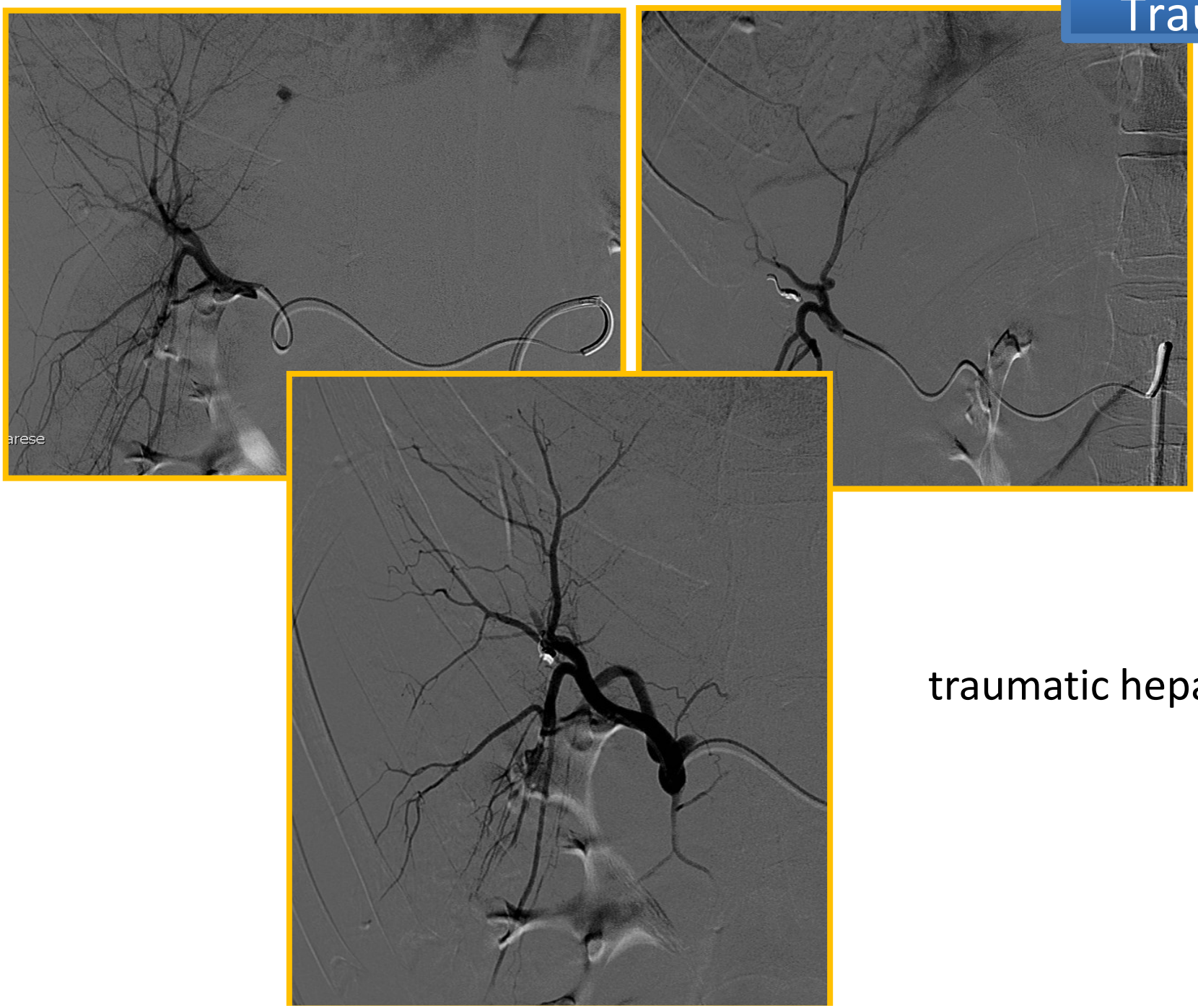
Trauma

- 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.

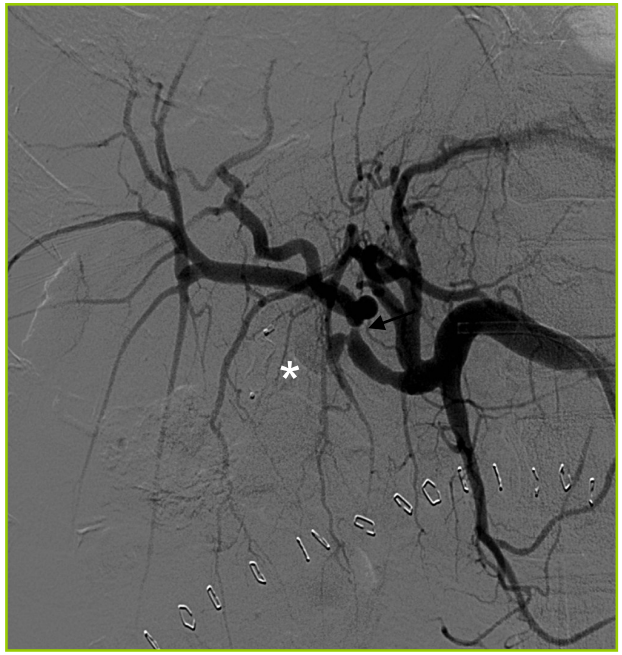
- While many factors help predict NOM failure, it is now generally accepted that the most important factor determining successful NOM is the hemodynamic stability of the patient, irrespective of the grade of injury or the volume of hemoperitoneum

Eur J Trauma Emerg Surg 2015; 41:229–237

Trauma

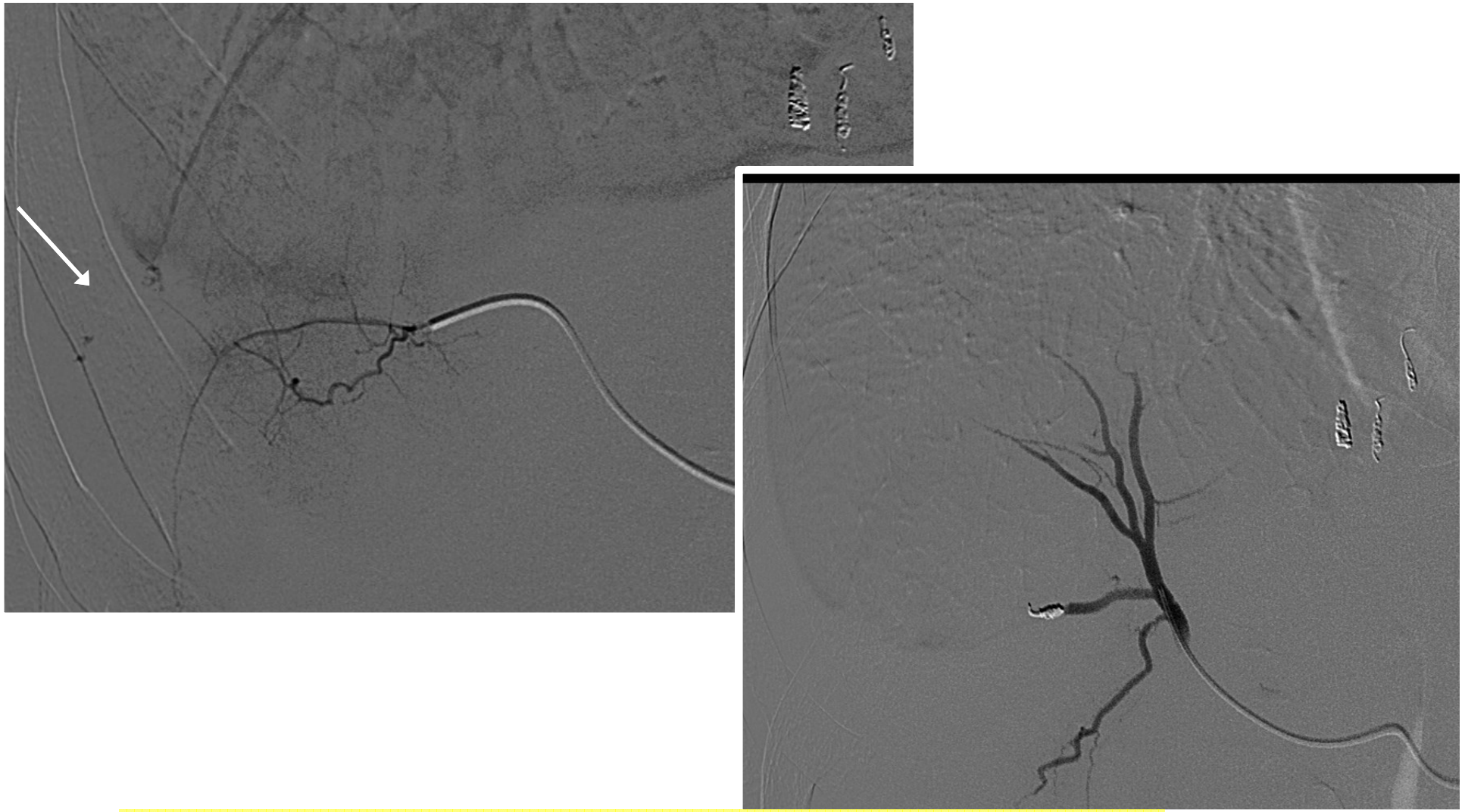


traumatic hepatic PSA



traumatic PSA

Trauma



Penetrating trauma of liver and right kidney

OM

Trauma

- 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 v

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).

Ann Surg. 2006;244(4):620–8
World Journal of Emergency Surgery (2016) 11:50

Trauma

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 %

Am J Surg. 2012;203(4) 448–53.
J Trauma. 2011;70(5):1032– 6.
J Trauma. 2009;67(4):769–73.
Br J Radiol 2016; 89: 20150866.

TAE after OM

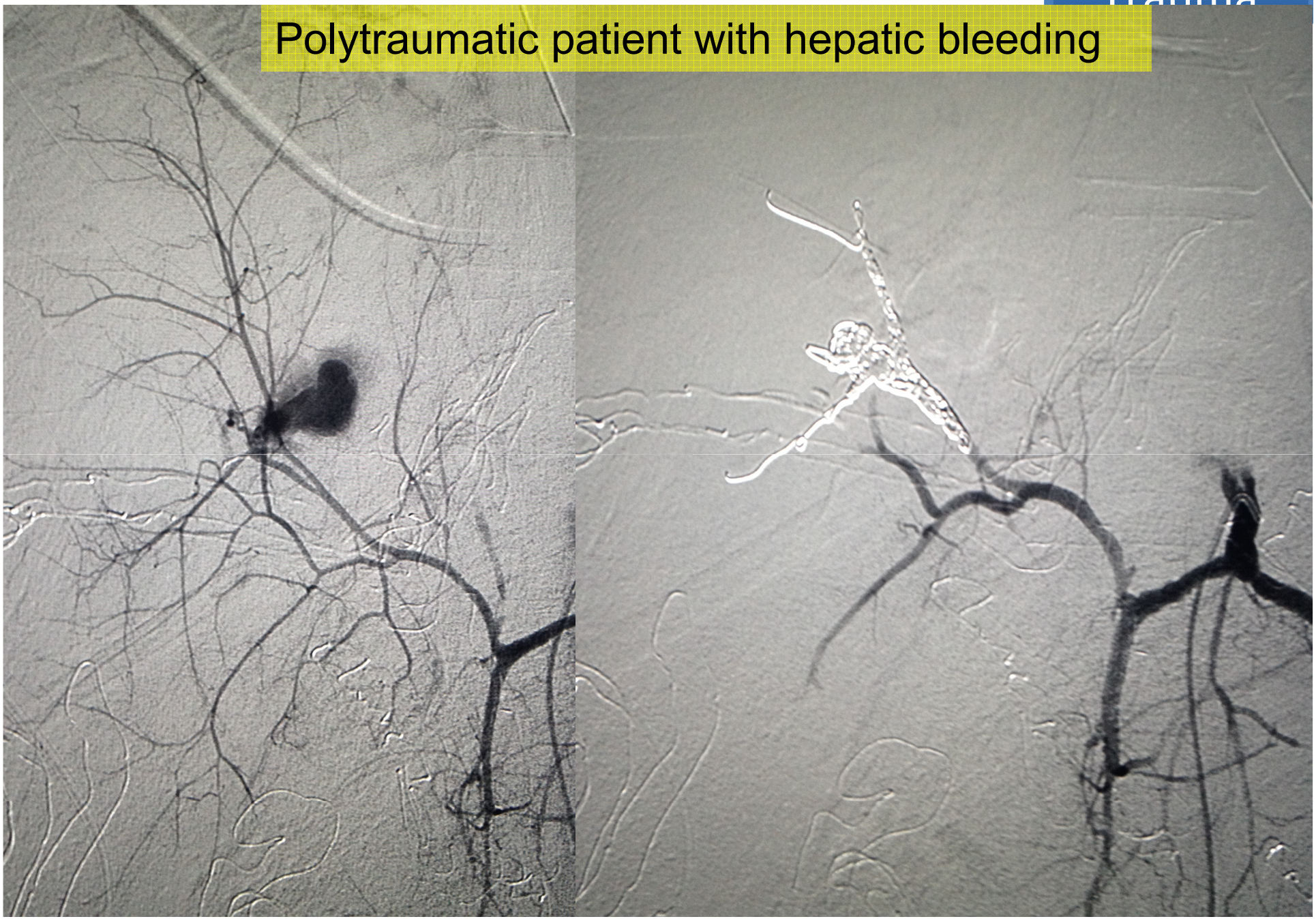
Trauma

- 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.

J Trauma. 2011;70(5):1032–6.
World J Emerg Surg. 2015;10:39

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.

World J Emerg Surg. 2015;10:39
J Trauma 2011;70(3):626–9
World Journal of Emergency Surgery (2016) 11:50

Complications after NOM

Trauma

- 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 %

J Trauma. 2011;70(3):626–9.
Arch Surg. 2006;141(5):451– 8.

Spontaneous hepatic haemorrhage (SHH)

- Rare condition; sometimes poorly recognized and infrequently diagnosed in patients presenting with shock.
- Pathogenesisis 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

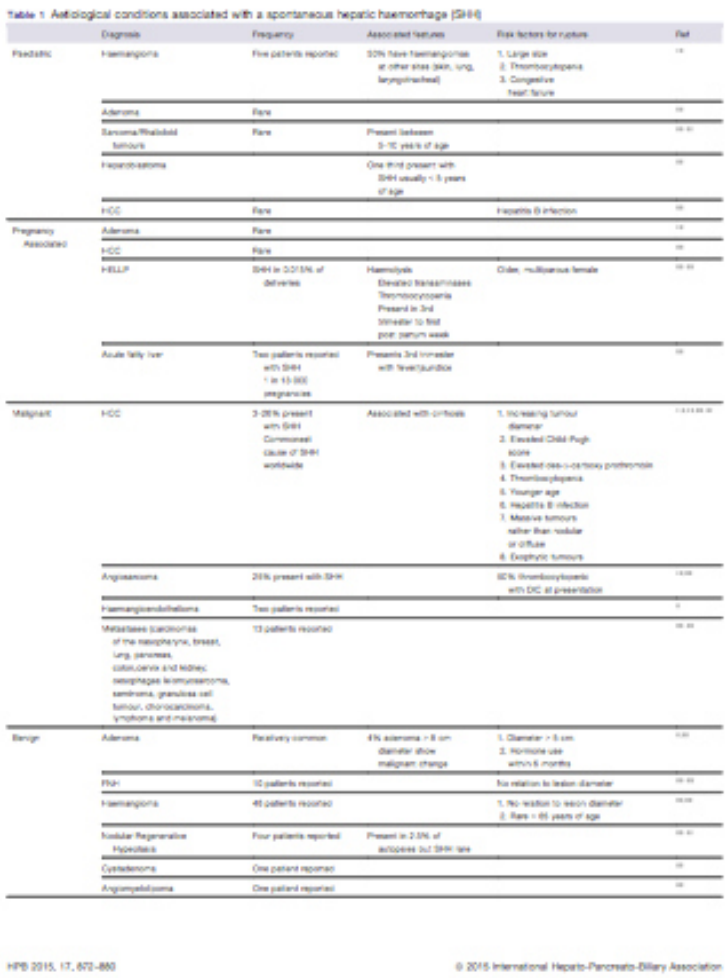
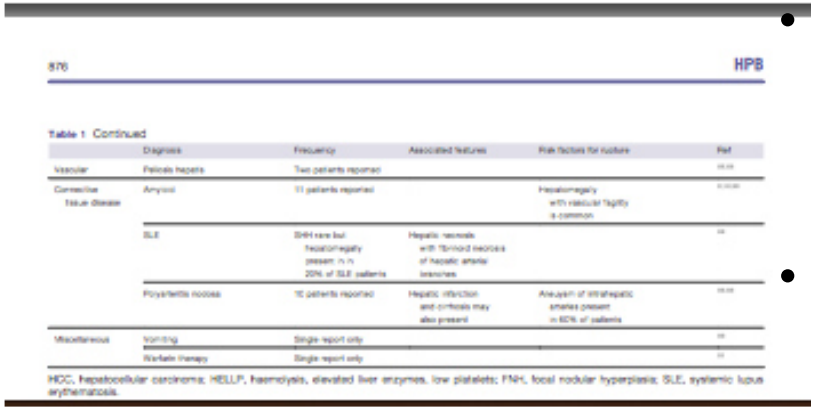


Table 1 Aetiological conditions associated with a spontaneous hepatic haemorrhage (SHH)

	Diagnosis	Frequency	Associated features	Risk factors for rupture	Ref
Paediatric	Haemangioma	Five patients reported	50% have haemangiomas at other sites (skin, lung, laryngotracheal)	1. Large size 2. Thrombocytopenia 3. Congestive heart failure	
	Adenoma	Rare			
	Sarcoma/Rhabdoid tumours	Rare	Present between 0–10 years of age		
	Hepatoblastoma		One third present with SHH usually < 5 years of age		
	HCC	Rare		Hepatitis B infection	
Pregnancy Associated	Adenoma	Rare			
	HCC	Rare			
	HELLP	SHH in 0.01% of deliveries	Haemolysis Elevated transaminases Thrombocytopenia Present in 3rd trimester to first post partum week	Older, multiparous female	
	Acute fatty liver	Two patients reported with SHH < in 15 000 pregnancies	Presents 3rd trimester with fever/jaundice		
Malignant	HCC	3–26% present with SHH Commonest cause of SHH worldwide	Associated with cirrhosis	1. Increasing tumour diameter 2. Elevated Child Pugh score 3. Elevated des-γ-carboxy prothrombin 4. Thrombocytopenia 5. Younger age 6. Hepatitis B infection 7. Massive tumours rather than nodular or diffuse 8. Exophytic tumours	
	Angiosarcoma	25% present with SHH		60% thrombocytopenic with DIC at presentation	
	Haemangioendothelioma	Two patients reported			
	Metastases (carcinomas of the nasopharynx, breast, lung, pancreas, colon, cervix and kidney; oesophageal leiomyosarcoma, seminoma, granulosa cell tumour, choriocarcinoma, lymphoma and melanoma)	13 patients reported			
Benign	Adenoma	Relatively common	4% adenoma > 8 cm diameter show malignant change	1. Diameter > 5 cm 2. Hormone use within 6 months	
	FNH	10 patients reported	No relation to lesion diameter		
	Haemangioma	46 patients reported	1. No relation to lesion diameter 2. Rare < 65 years of age		
	Nodular Regenerative Hyperplasia	Four patients reported	Present in 2.5% of autopsies but SHH rare		
	Cystadenoma	One patient reported			
	Angiomyelolipoma	One patient reported			

HPB 2015, 17, 872–880 © 2015 International Hepato-Pancreato-Biliary Association



876 HPB

Table 1 Continued

	Diagnosis	Frequency	Associated features	Risk factors for rupture	Ref
Vascular	Peliosis hepatis	Two patients reported			
Connective tissue disease	Amyloid	11 patients reported		Hepatomegaly with vascular fragility is common	
	SLE	SHH rare but hepatomegaly present in 1% to 20% of SLE patients	Hepatic necrosis with fibrinoid necrosis of hepatic arterial branches		
	Polyarteritis nodosa	10 patients reported	Hepatic infarction and cirrhosis may also present	Aneurysm of intrahepatic arteries present in 60% of patients	
Miscellaneous	Vomiting	Single report only			
	Warfarin therapy	Single report only			

HCC, hepatocellular carcinoma; HELLP, haemolysis, elevated liver enzymes, low platelets; FNH, focal nodular hyperplasia; SLE, systemic lupus erythematosis.

Spontanous

- Pediatric → emangioma, adenoma, sarcoma, hepatoblastoma, HCC
- Pregnancy associated → adenoma, HCC, HELLP, acute fatty liver
- Malignant → HCC, angiosarcoma, haemangioendothelioma, Mts
- Benign → adenoma, FNH, 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

Summary of haemostatic treatments for a spontaneous hepatic haemorrhage

Spontanous

Treatment practice **emphasizes arterial embolization** to obtain haemostasis

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

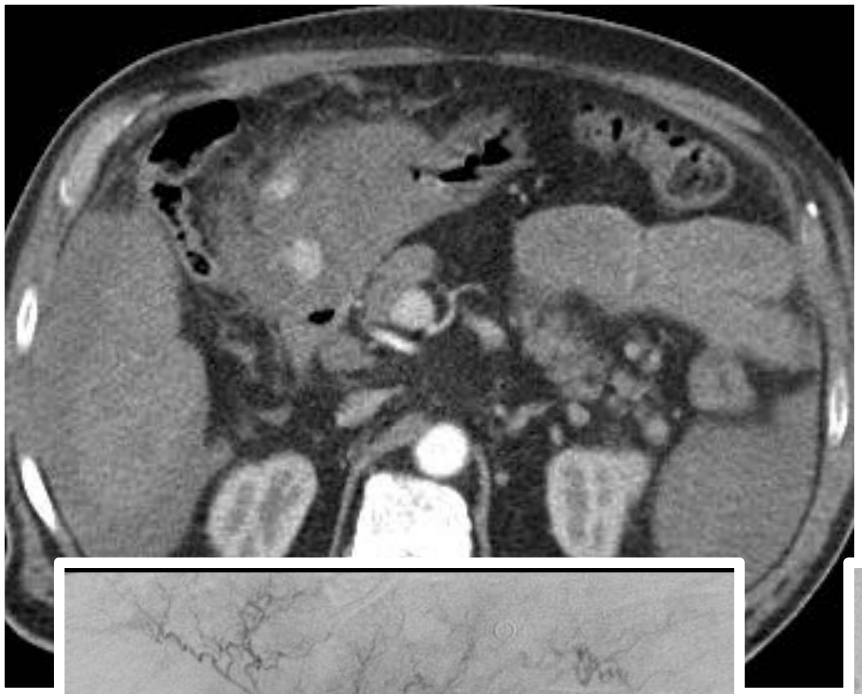
Reference	Year	Conservative	TAE	HAL	Segmental HAL	Packing/Plication	Resection
Chearanai[39]	1983	27 (7) (4) (0)		26 (24) (0) (0)		9 (0) (0) (0)	1 (1) (1) (0)
Lai[21]	1989	4 (–) (–) (–)		39 (28) (16) (9)	8 (4) (4) (1)	2 (2) (1) (1)	7 (5) (4) (1)
Miyamoto[38]	1991	14 (4) (4) (0)	57 (40) (40) (17)	10 (10) (4) (0)		30 (28) (11) (2)	31 (31) (23) (13) [Delayed Hepatectomy 1 (21) (21) (15)]
Dewar[7]	1991	2 (0) (0) (0)	4 (4) (0) (0)	12 (8) (3) (0)		8 (6) (2) (0)	11 (5) (4) (0)
Cherqui[22]	1993			1 (0) (0) (0)			4 (4) (3) (1)
Xu[19]	1994	68 (35) (35) (1)		9 (9) (3) (1)		7 (7) (2) (–)	2 (2) (2) (2)
Chiappa[23]	1999						6 (6) (4) (3)
Liu[24]	2001	67 (44) (–) (–)	42 (35) (25) (0)	23 (23) (–) (–)		8 (8) (–) (–)	2 (2) (–) (–)
Kirikoshi[20]	2009	32 (16) (2) (–)	16 (15) (15) (7)				
Battula[8]	2009		7 (5) (–) (–)			6 (6) (–) (–)	1 (1) (–) (–)
Battula[51]	2012	44 (32) (32) (30)	4 (4) (–) (–)			2 (1) (0) (0)	11 (7) (5) (5)
Total		244 (158) (77) (31)	130 (99) (80) (24)	120 (92) (26) (10)	8 (4) (4) (1)	72 (58) (16) (3)	76 (64) (46) (25)

(–), not reported; TAE, transarterial embolization; HAL, hepatic artery ligation.

HPB 2015, 17, 872–880

Spontaneous bleeding of an HCC

Spontanous



Iatrogenic

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.

HPB 2006; 8:458–464
Radiol Med 2005; 110:88–96
Emerg Radiol 2008; 15:249–254
Diagn Interv Radiol 2015; 21: 494–497

Iatrogenic

Emerg Radiol (2008) 15:249–254
DOI 10.1007/s10140-008-0715-4

ORIGINAL ARTICLE

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 the enables diagnosis and treatment of IHAI in a single session.


…after cholecistectomy
Iatrogenic
PID:H1356/4
23/09/1944
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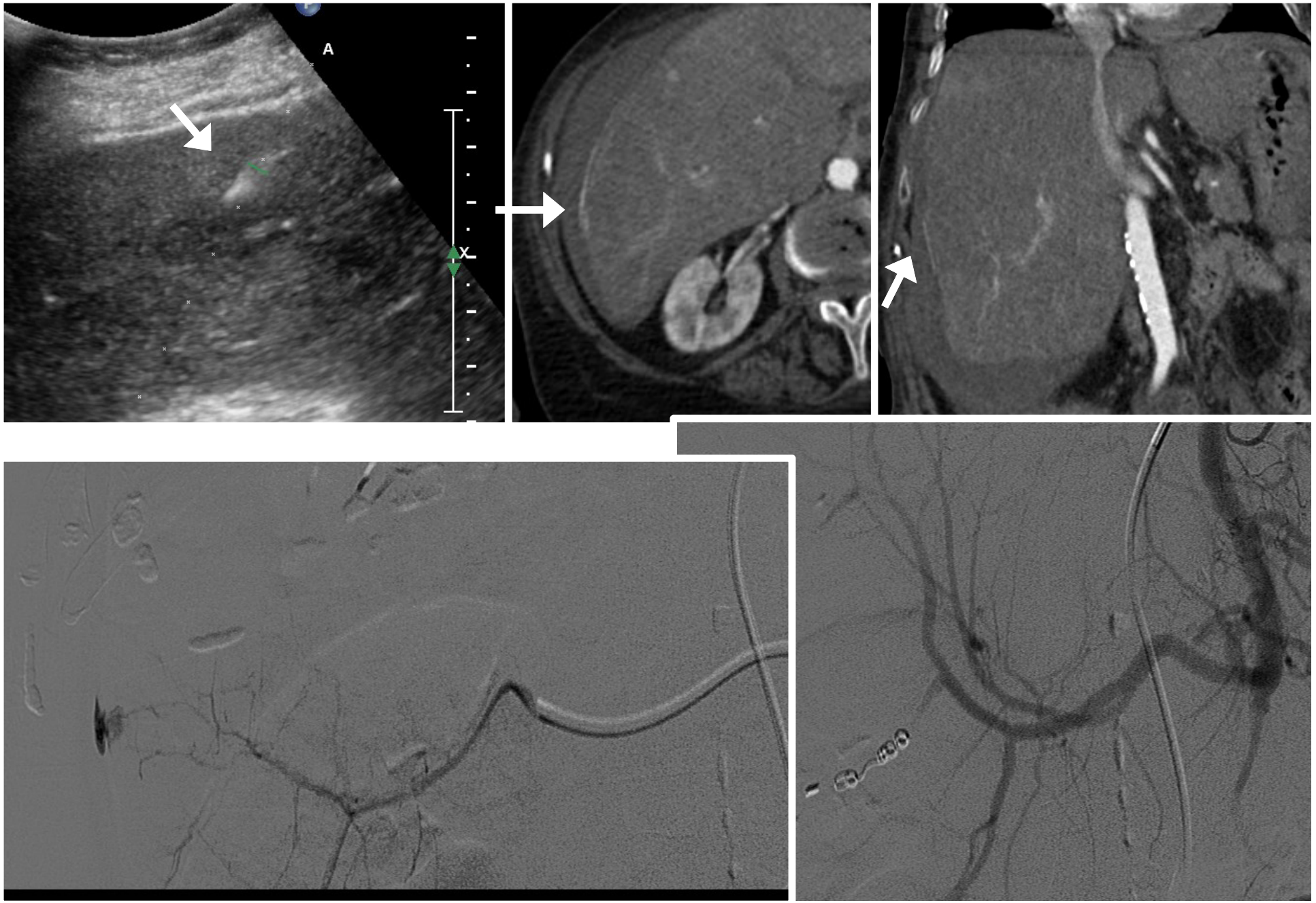
18:35
SE:

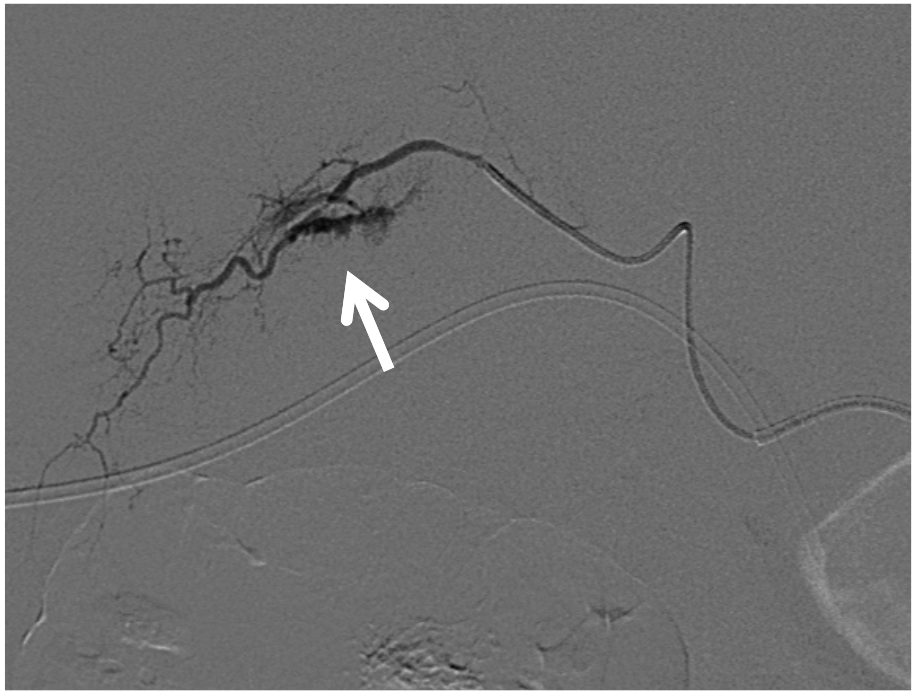
Iatrogenic

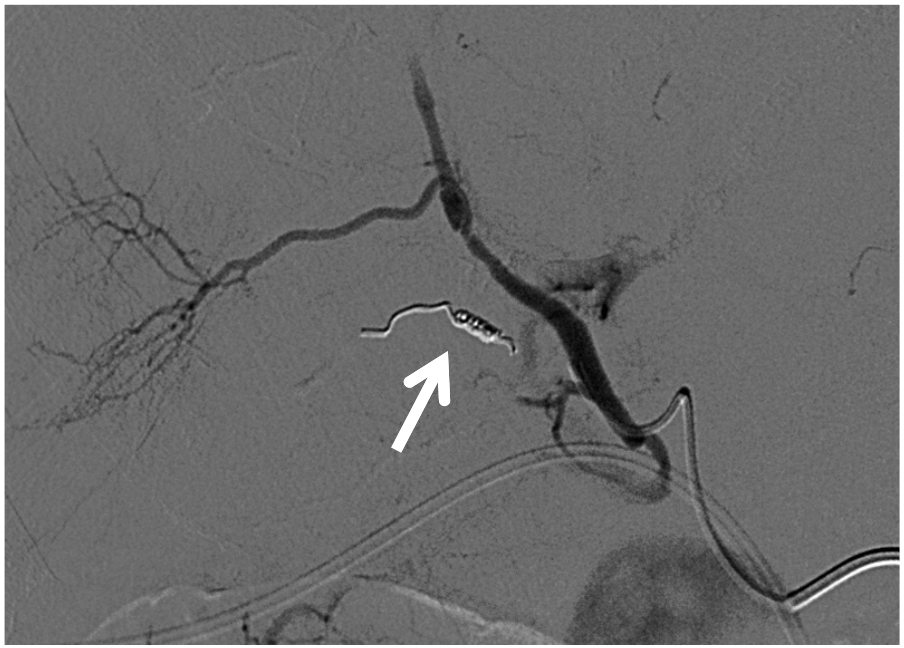
Bleeding after hepatic biopsy

Iatrogenic



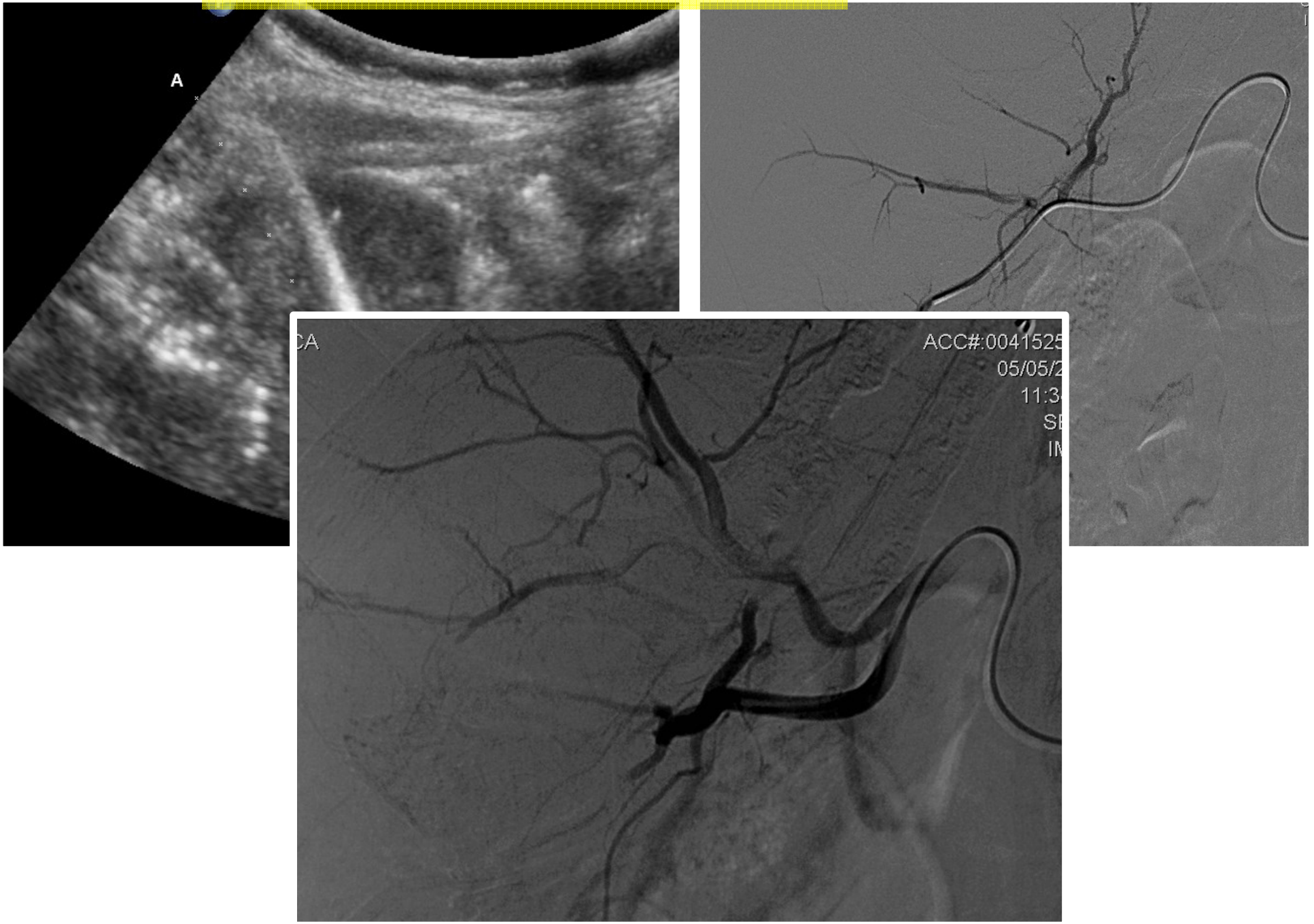
hepatic arterial bleeding after percutaneous biliary drainage atrogenic





Bleeding after percutaneous MWA

Iatrogenic



Tools

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.

Emerg Radiol (2008) 15:249–254
Diagn Interv Radiol 2015; 21: 494–497

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.

Emerg Radiol (2008) 15:249–254
Diagn Interv Radiol 2015; 21: 494–497

Tools

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.

Emerg Radiol (2008) 15:249–254
Diagn Interv Radiol 2015; 21: 494–497

Tools

PSA after bilio-hepatic surgery

Tools

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.

Emerg Radiol (2008) 15:249–254
Diagn Interv Radiol 2015; 21: 494–497

TAE: intraprocedural CBCT

Tools

Cardiovasc Intervent Radiol (2016) 39:530–537
DOI 10.1007/s00270-015-1213-1

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CLINICAL INVESTIGATION ARTERIAL INTERVENTIONS

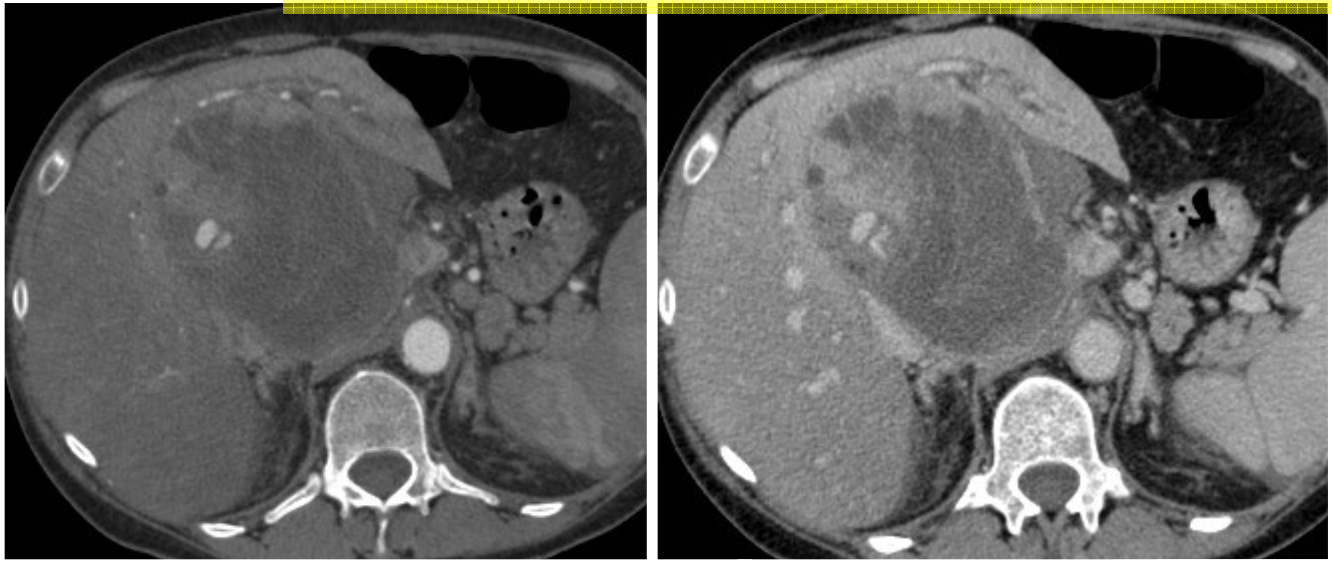
Usefulness of Cone-Beam Computed Tomography and Automatic Vessel Detection Software in Emergency Transarterial Embolization

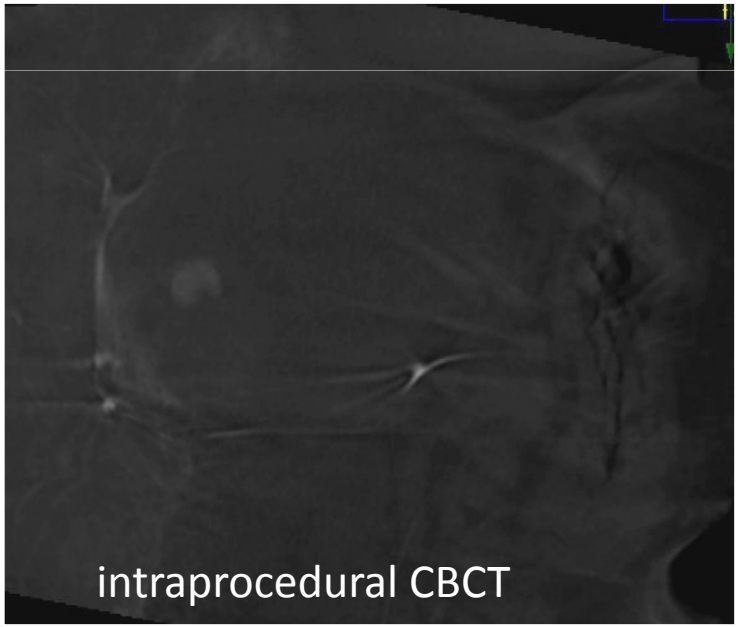
Gianpaolo Carrafiello[1] · Anna Maria Ierardi[1] · Ejona Duka[1] · Alessandro Radaelli[2] · Chiara Floridi[1] · Alessandro Bacuzzi[3] · Maximilian de Bucourt[4] · Giuseppe De Marchi[1]

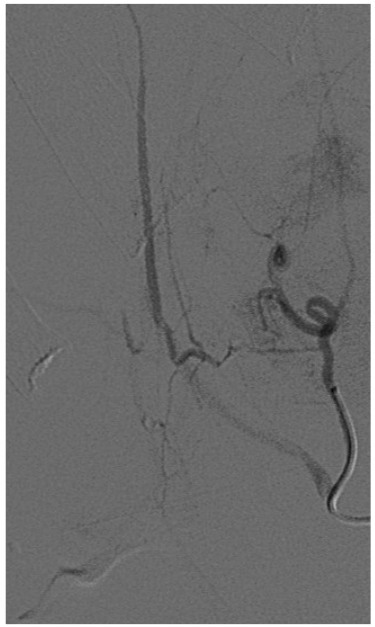
Conclusions C-arm CBCT and AVD software during TAE of angiographically challenging arterial bleedings is feasible and may facilitate successful embolization. Staff training in CBCT imaging and software manipulation is necessary.

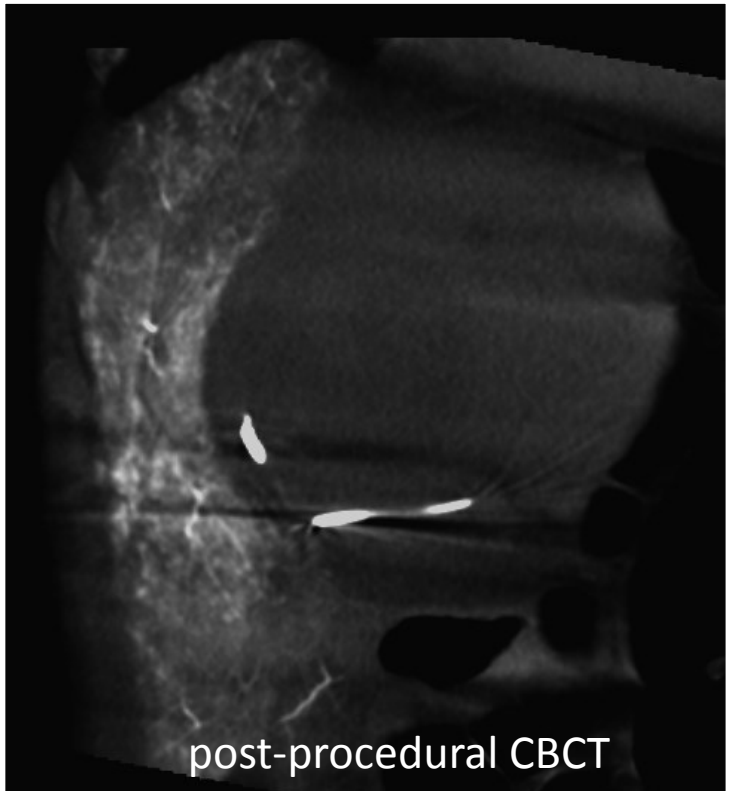
Spontaneous bleeding of an intrahepatic sarcoma

Tools





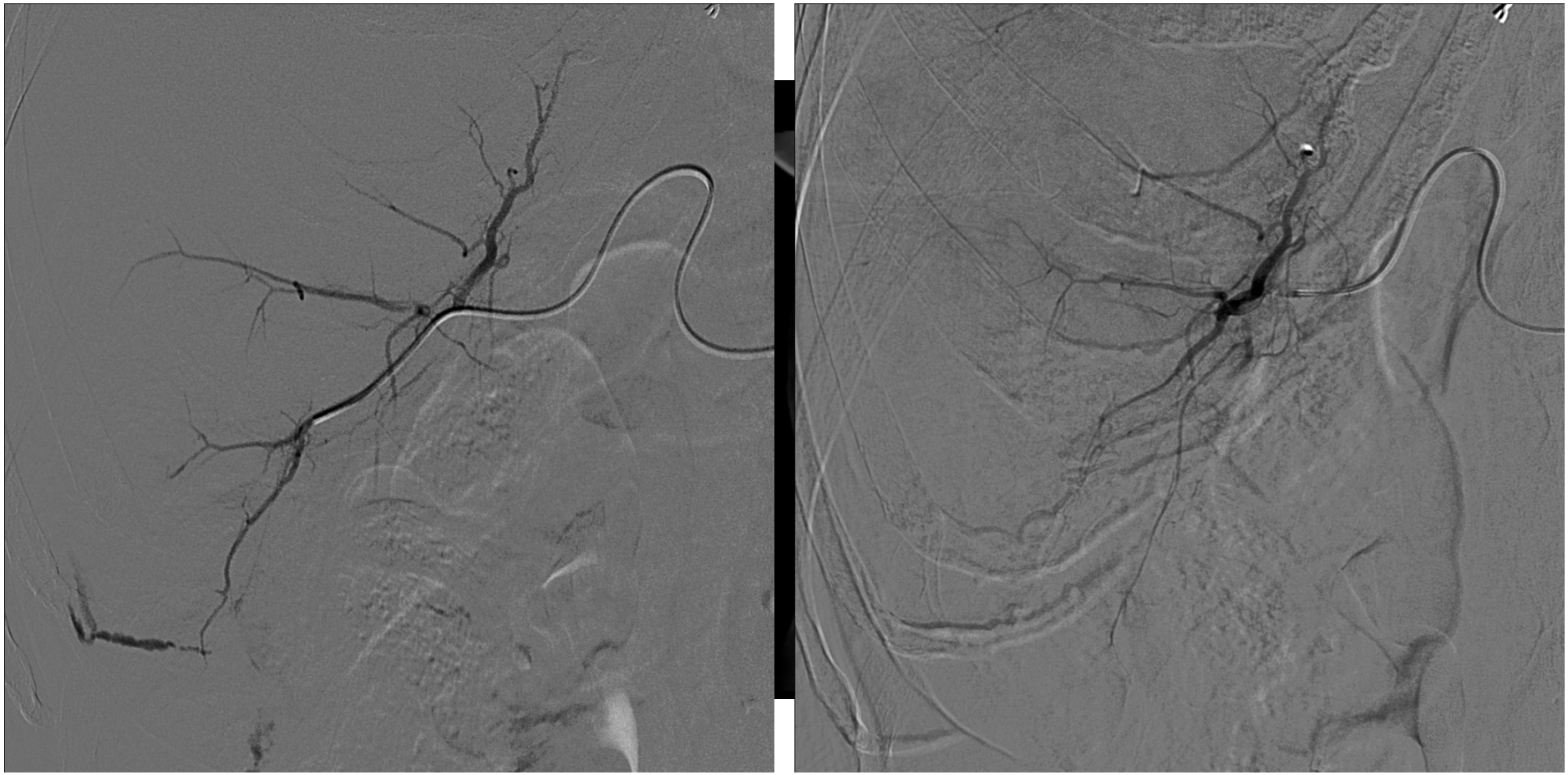




Tools

hepatic bleeding after MWA

IMMEDIATE ASSESSMENT of TREATMENT

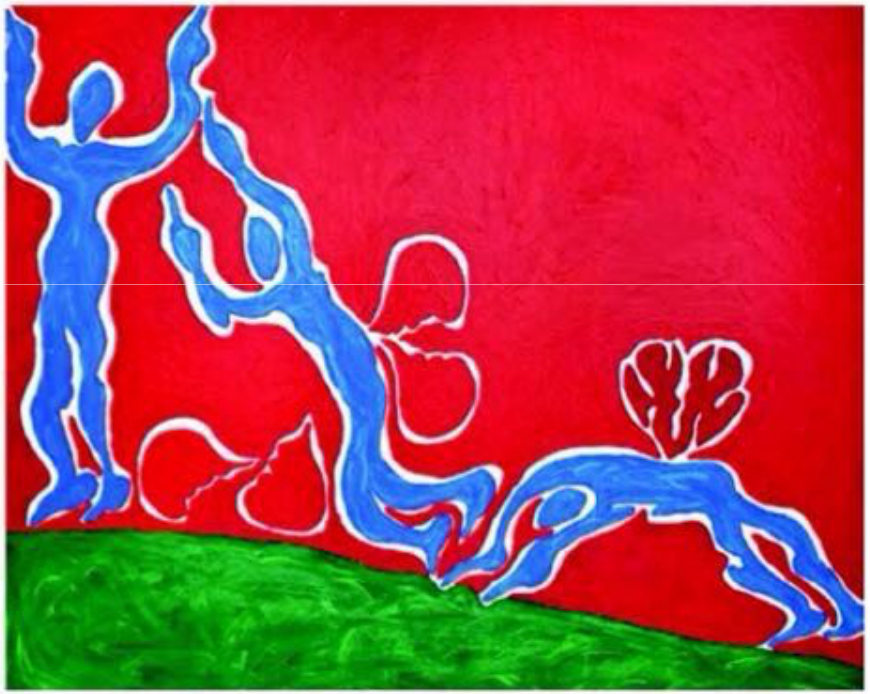


Conclusions

- Correct multidisciplinary approach is mandatory to obtain the best outcomes

- Endovascular treatment plays an important role either in NOM than in OM

Thank you



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