

Vaskulární poranění – doporučení ESVS 2025

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ESVS guideline 2025

Systematicky přehled (MEDLINE) 1/2000-1/2022



59 stran, 10 kapitol —→ 103 klinických doporučení



- Metodologie
- Obecné doporučení
- Vaskulární trauma krku
- Hrudní aorta
- Abdominální vaskulární trauma
- Končetinové vaskulární trauma
- Pooperační management
- Dětské vaskulární trauma
- Odborné „mezery“ v doporučeních
- Perspektiva pacienta

CLINICAL PRACTICE GUIDELINE DOCUMENT

European Society for Vascular Surgery (ESVS) 2025 Clinical Practice Guidelines on the Management of Vascular Trauma

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Table 2. European Society for Vascular Surgery (ESVS) clinical practice guidelines levels of evidence grading system.		
Level of evidence A	Data derived from multiple randomised trials or meta-analyses of randomised trials	
Level of evidence B	Data derived from a single randomised trial, high quality non-randomised studies, or a meta-analysis of such studies	
Level of evidence C	Data derived from consensus opinion of experts, from low quality** studies, or meta-analysis of such studies	

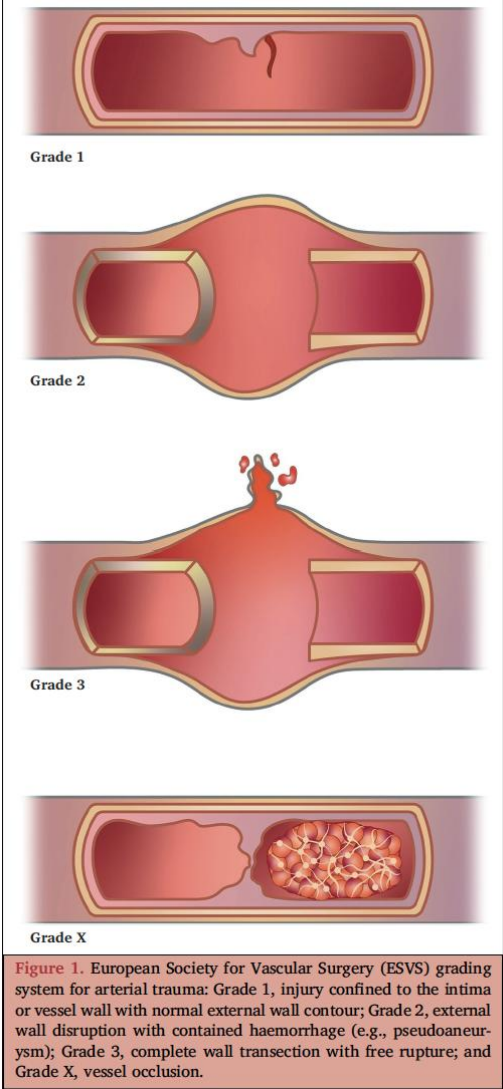
Class	Definition	Wording
I	Evidence and or general agreement that a given treatment or procedure is beneficial, useful, effective	is or are recommended
II	Conflicting evidence and or divergence of opinion about the usefulness or effectiveness of the given treatment or procedure	
IIa	Weight of evidence or opinion is in favour of usefulness or effectiveness	should be considered
IIb	Usefulness or effectiveness is less well established by evidence or opinion	may be considered
III	Evidence or general agreement that a given treatment or procedure is not useful or effective, and in some cases may be harmful	
IIIa	The given treatment or procedure is not necessarily useful or effective	is or are not indicated
IIIb	The given treatment or procedure may be dangerous or harmful to patients	is or are not recommended



• Wahlgren CM et al., European Society for Vascular Surgery (ESVS) 2025 Clinical Practice Guidelines on the Management of Vascular Trauma, EJVES 2024

ESVS klasifikace arteriálního poranění

Table 5. European Society for Vascular Surgery (ESVS) grading system for arterial trauma and management.			
ESVS Grade	Description	Examples	General management
1	Partial wall injury Normal external wall contour	Intimal flap Intramural haematoma	Observation ± antithrombotics
2	Complete wall injury Abnormal external wall contour Contained bleeding	Pseudoaneurysm Arteriovenous fistula	Urgent repair
3	Complete wall injury Uncontained haemorrhage	Blunt arterial transection Penetrating arterial injury	Emergency repair
X	Occlusion	Traction injury Transection	Emergency intervention if acutely ischaemic limb or end organ is salvageable



Vaskulární trauma - epidemiologie

- 2-5% všech traumat (USA, UK, Německo, Švédsko, Austrálie registr)
- 2% > 65 let, 0.7% < 65 let
- 16% střelných poranění má minimálně 1 cévní poranění
- Distribuce cévního poranění : 26% HK – 25% břicho – 24% hrudník – 18% DK – 10% krk

Table 4. Orthopaedic injuries associated with vascular injuries.	
Orthopaedic injury	Vascular injury
Distal femur fracture	Superficial femoral artery
Posterior knee dislocation	Popliteal artery
Proximal tibia fracture	Popliteal artery and trifurcation
Clavicle fracture	Subclavian artery
Shoulder dislocation	Axillary artery
Supracondylar humerus fracture	Brachial artery
Elbow dislocation	Brachial artery
Cervical spine injury	Carotid and or vertebral artery
Pelvic fracture	Internal iliac artery branches

Základní principy vaskulární traumatologie

- Organizace, prostor a dostupnost – komplexní TC

Recommendation 1			
Rapid access to a clinical team 24/7 competent in haemorrhage control and delivery of both open and endovascular surgery is recommended for the management of patients with life or limb threatening vascular injuries.			
Class	Level	References	ToE
I	C	DuBose <i>et al.</i> (2020), ³⁷ Harfouche <i>et al.</i> (2022) ³⁹	

25% pac. vyžaduje EV intervenci !

- REBOA

Recommendation 8			
Resuscitative endovascular balloon occlusion of the aorta (REBOA) is not recommended as a routine approach for temporary haemorrhage control in trauma patients with exsanguinating torso haemorrhage.			
Class	Level	References	ToE
IIIb	B	Jansen <i>et al.</i> (2023) ⁸¹ , Maiga <i>et al.</i> (2022) ⁸⁰	

5-13% cévních komplikací



Recommendation 3		
Emergency access to an operating room with hybrid capability is recommended for the operative treatment of the trauma patient with a vascular injury.		
Class	Level	References
I	C	Consensus

Základní principy vaskulární traumatologie

- Jak je zobrazovací metoda volby ?

CTA u stabilního pacienta

Recommendation 9			
Haemodynamically unstable patients, deemed unsuitable for computed tomography angiography, are recommended to be immediately transferred to the operating room for surgical intervention.			
Class	Level	References	ToE
I	C	Consensus	

- Kdy a jaký vaskulární „shunt“ použít ?

- Vždy pokud chirurg není schopen rekonstrukce.
- NGS, močový katetr, karotický shunt, dren.
- Cévní rekonstrukce do 6 hodin.

Recommendation 14			
The use of temporary vascular shunts to rapidly restore blood flow is recommended when timely primary definitive vascular repair is not feasible due to patient physiology or injury pattern.			
Class	Level	References	ToE
I	C	Tung <i>et al.</i> (2021), ¹¹¹	

- Interpozitum nebo bypass ?

Anatomická rekonstrukce je metodou volby.

Recommendation 16			
Short interposition grafts are recommended in patients with vascular trauma requiring reconstruction.			
Class	Level	References	ToE
I	C	Ray <i>et al.</i> (2019), ¹²⁴ Karmy-Jones <i>et al.</i> (2003), ¹³⁰ Aksoy <i>et al.</i> (2005), ¹²⁶ Yagubyan <i>et al.</i> (2004), ¹²⁷ Lyons <i>et al.</i> (2024) ¹³¹	

- Žila nebo protéza ?

Nejsou RCT

Obnovení průtoku ASAP (proteza) – stabilizace – žila

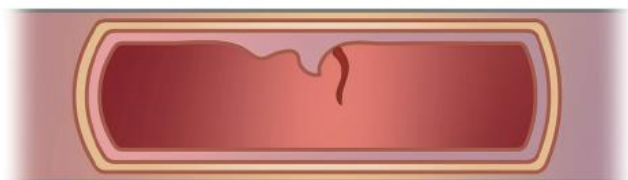
Recommendation 17			
Synthetic interposition grafts may be considered for emergency definitive vascular repair.			
Class	Level	References	ToE
IIb	C	Hafez <i>et al.</i> (2001), ¹³²	

Vaskulární trauma krku - karotídy

- 20% všech penetrujících poranění krku je spojeno s cévním postižením
- **Klinické známky:** pulsující hematoma – krvácení, dysfagie, hemateméza, hemoptýza, CMP
- **Diagnostika:** nestabilní pacient – klinika, stabilní - CTA

- **Management**

Recommendation 19			
Immediate open surgical exploration is recommended for patients with penetrating neck injury and active haemorrhage from the wound or expanding haematoma.			
Class	Level	References	ToE
I	C	Bell <i>et al.</i> (2007), ¹⁵⁷ Tisherman <i>et al.</i> (2008), ¹⁵⁸ Sperry <i>et al.</i> (2013) ¹⁵⁹	



Grade 1

Recommendation 22			
Reconstruction rather than ligation of the common or internal carotid artery, when patient physiology allows and technically feasible, is recommended in patients with penetrating ESVS Grade 2 or 3 carotid artery injury.			
Class	Level	References	ToE
I	C	Plotkin <i>et al.</i> (2023), ¹⁶⁹ du Toit <i>et al.</i> (2009), ¹⁶⁷ Reva <i>et al.</i> (2011), ¹⁶⁸ Madsen <i>et al.</i> (2024) ¹⁴⁷	

Recommendation 21			
Non-operative management with single antiplatelet therapy may be considered for patients with minor (ESVS Grade 1) carotid artery injury due to penetrating trauma.			
Class	Level	References	ToE
IIb	C	Weinberg <i>et al.</i> (2016), ¹⁶⁴ Ronaldi <i>et al.</i> (2021) ¹⁶³	

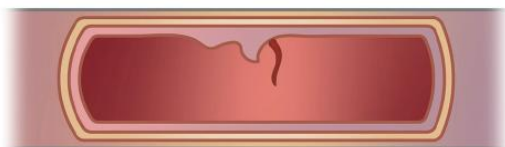
→ Mortalita: ligace vs rekonstrukce

ACC : 21% vs 12%

ACI: 25% vs 7%

Vaskulární trauma krku - vertebrální tepny

- Management



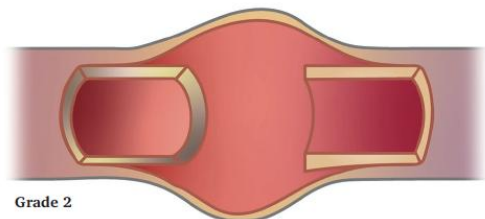
Grade 1



Recommendation 23

Non-operative management with single antiplatelet therapy may be considered for patients with an ESVS Grade 1 vertebral artery injury due to penetrating trauma.

Class	Level	References	ToE
IIb	C	Piper <i>et al.</i> (2021), ¹⁷⁰ Asensio <i>et al.</i> (2020) ¹⁵⁰	



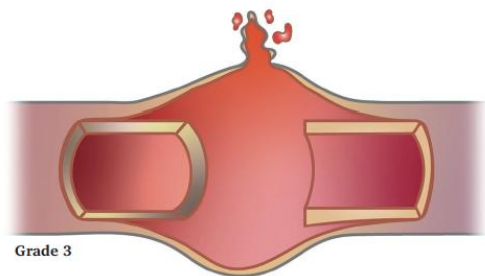
Grade 2



Recommendation 24

Endovascular therapy should be considered as first line treatment for symptomatic or progressing pseudoaneurysm or arteriovenous fistula (ESVS Grade 2) in patients with penetrating vertebral artery injury.

Class	Level	References	ToE
IIa	C	Piper <i>et al.</i> (2021) ¹⁷⁰ Asensio <i>et al.</i> (2020) ¹⁵⁰	



Grade 3



Recommendation 25

Emergency endovascular management with embolisation if feasible is recommended for patients with penetrating extracranial vertebral artery injury and uncontrolled haemorrhage (ESVS Grade 3).

Class	Level	References	ToE
I	C	Piper <i>et al.</i> (2021), ¹⁷⁰ Asensio <i>et al.</i> (2020) ¹⁵⁰	

Vaskulární trauma krku – jugulární žíly

- Management

- v.jugularis interna – zachovat aspoň 1
- v.jugularis extrana – ligace obou možná

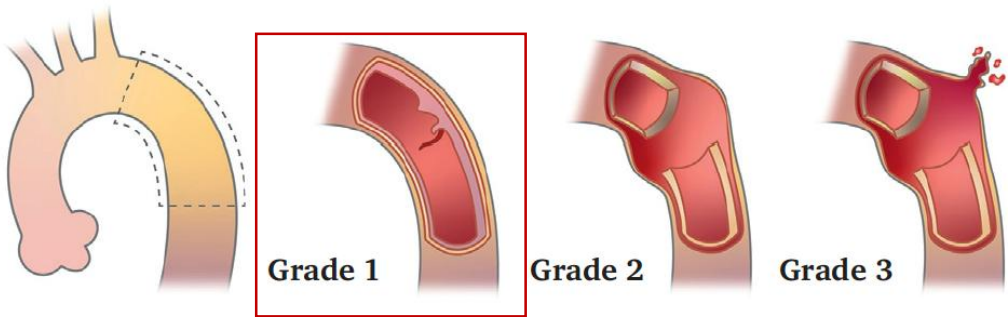
Recommendation 27		
Ligation is recommended if repair of internal jugular vein injury is not easily achievable, provided one internal jugular vein remains patent.		
Class	Level	References
I	C	Consensus

Hrudní aorta (tupé poranění hrudní aorty, BTAI)

- 80% mortalita, postižen je aortální isthmus v 90%
- **Klinické známky:** často asymptomatické, symptomy do několika hodin (hemoragický šok – projevy disekce)
- **Diagnostika:** CTA

- **Management**

Recommendation 44			
Non-operative management with blood pressure control and follow up imaging is recommended in patients with ESVS Grade 1 blunt thoracic aortic injury without concomitant severe traumatic brain injury.			
Class	Level	References	ToE
I	C	Yadavalli <i>et al.</i> (2023), ²⁶⁴ Jacob-Brassard <i>et al.</i> (2019), ²³⁸ Soong <i>et al.</i> (2019), ²⁶⁵ Fox <i>et al.</i> (2015), ²⁵³ Demetriades <i>et al.</i> (2009), ²⁶⁶ Alarhayem <i>et al.</i> (2021), ²⁶⁷ Harris <i>et al.</i> (2016), ²⁵⁸ DuBose <i>et al.</i> (2015), ²⁶⁰ Starnes <i>et al.</i> (2012) ²⁵⁷	



Recommendation 45			
Endovascular stent graft repair may be considered in patients with ESVS Grade 1 blunt thoracic aortic injury and concomitant severe traumatic brain injury when blood pressure control is not feasible.			
Class	Level	References	ToE
IIb	C	Rabin <i>et al.</i> (2014), ²⁶¹ Arbabi <i>et al.</i> (2022) ²⁶⁸	

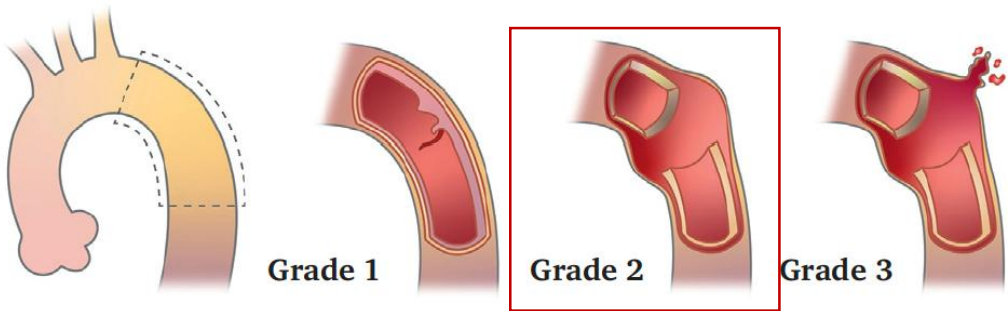
Kontrolní CTA za 48-72 hodin



Hrudní aorta (tupé poranění hrudní aorty, BTAI)

- Management

Recommendation 46			
Delayed (> 24 hour) endovascular stent graft repair should be considered for patients with blunt thoracic aortic injury and any external wall contour abnormality (ESVS Grade 2) if <u>there are no high risk injury features</u> .*			
Class	Level	References	ToE
Ila	C	Yadavalli <i>et al.</i> (2024), ²⁷¹ Jacob-Brassard <i>et al.</i>	



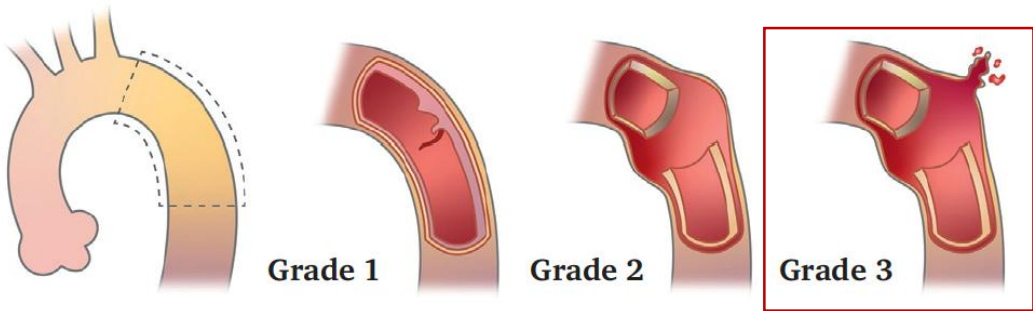
Recommendation 47			
Urgent (< 24 hour) endovascular stent graft repair is recommended for patients with blunt thoracic aortic injury and any external contour abnormality (ESVS Grade 2) with <u>high risk aortic features</u> .*			
Class	Level	References	ToE
I	C	DuBose <i>et al.</i> (2015), ²⁶⁰ Yadavalli <i>et al.</i> (2024), ²⁷¹ Jacob-Brassard <i>et al.</i>	

Table 10. High risk features for urgent treatment of blunt thoracic aortic injury. ^{257,259,269}
High risk features
Large mediastinal haematoma
Left haemothorax
Aortic coarctation
Large pseudoaneurysm
Systolic blood pressure < 90 mmHg
Traumatic brain injury

Hrudní aorta (tupé poranění hrudní aorty, BTAI)

- Management

Recommendation 48			
Immediate operative repair is recommended for patients with blunt thoracic aortic injury with active extravasation (ESVS Grade 3).			
Class	Level	References	ToE
I	C	Yadavalli <i>et al.</i> (2024), ²⁷¹ Jacob-Brassard <i>et al.</i> (2019), ²³⁸ Soong <i>et al.</i> (2019), ²⁶⁵ Fox <i>et al.</i> (2015) ²⁵³	



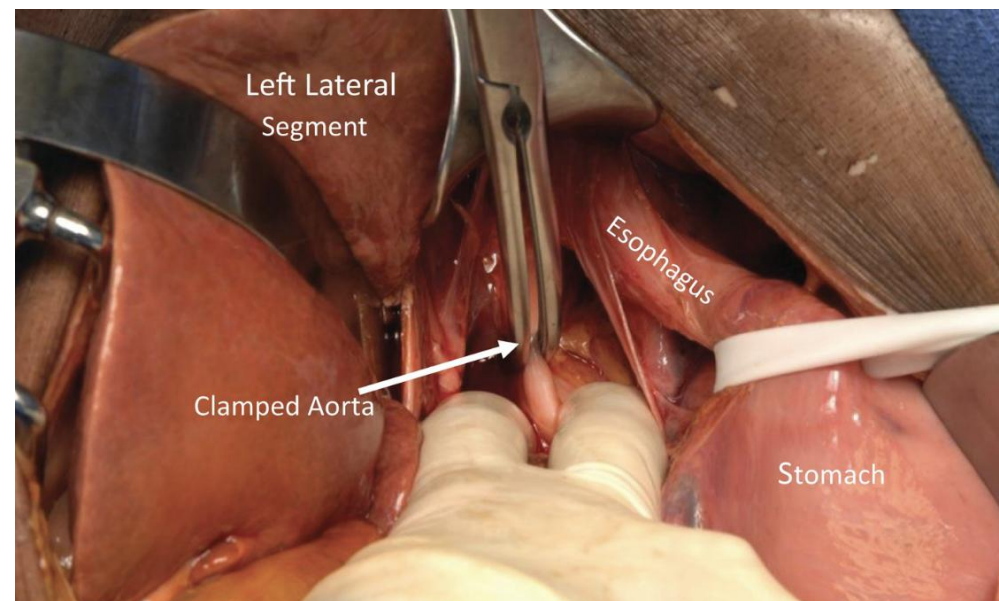
Recommendation 51			
Routine left subclavian artery revascularisation is not indicated for patients with blunt thoracic aortic injury requiring endovascular stent graft repair with coverage of the left subclavian artery.			
Class	Level	References	ToE
IIIa	C	Kritayakirana <i>et al.</i> (2022), ²⁹⁰	

Recommendation 53			
Delayed left subclavian artery revascularisation should be considered for selected patients with blunt thoracic aortic injury requiring endovascular stent graft repair who develop ischaemic symptoms with coverage of the left subclavian artery.			
Class	Level	References	ToE
IIa	C	Kritayakirana <i>et al.</i> (2022), ²⁹⁰ Chen <i>et al.</i> (2019), ²⁹¹ Sepehripour <i>et al.</i> (2011), ²⁹² Rizvi <i>et al.</i> (2009), ²⁹³ Matsumura <i>et al.</i> (2010), ²⁹⁴ van der Zee <i>et al.</i> (2019), ²⁷⁸ Romagnoli <i>et al.</i> (2023), ²⁹⁵ Kruger <i>et al.</i> (2022), ²⁹⁶ McBride <i>et al.</i> (2015) ²⁸⁹	

Abdominální vaskulární trauma

- Vysoká mortalita, nejčastěji : AA – AMS - Ilické tepny – AR – VCI – VP - ilické žíly
- Kombinace 25 – 35% s poraněním jater a střeva, 10 – 20% slezina, pankreas, urogenital
- **Klinické známky:** hemoperitoneum – hemoragický šok - srdeční zástava
30% KP stabilní – důsledkem retroperitonealni tamponády
- **Diagnostika:** CTA
- **Management :** intraperitoneální krvácení

Recommendation 61			
Immediate surgical exploration and haemorrhage control are recommended for patients in shock with ongoing bleeding and suspicion of major abdominal vascular injury.			
Class	Level	References	ToE
I	C	Sorrentino <i>et al.</i> (2012) ³⁴⁴	



- Evakuace hematomu
- Peritonealni „packing“ – hledání zdroje
- Krvácení pokračuje – svorka na AA pod bránici

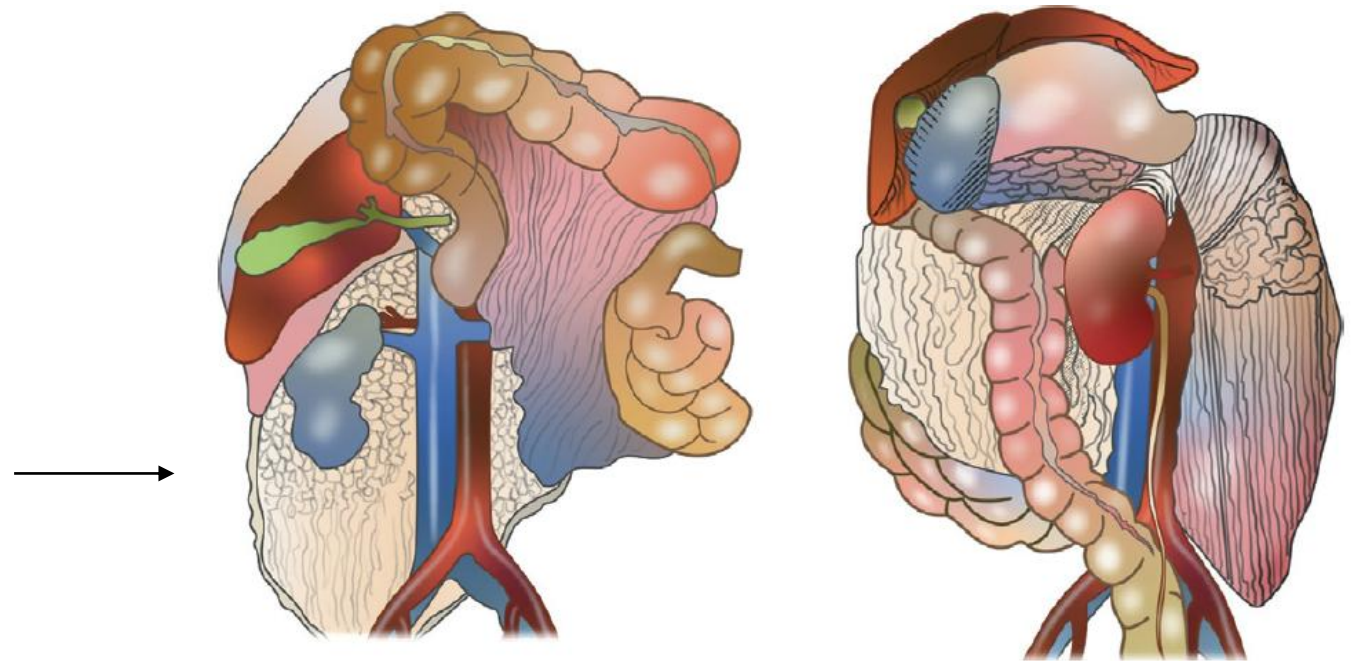
Abdominální vaskulární trauma

- Management : retroperitoneální krvácení

Recommendation 62

Surgical exploration of retroperitoneal haematomas during trauma laparotomy is recommended in patients who are haemodynamically unstable OR who have an unstable retroperitoneal haematoma (expanding, pulsatile, or actively bleeding).

Class	Level	References
I	C	Consensus

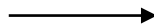


- Pravá a levá mediální viscerální rotace

Abdominální vaskulární trauma - AA

- Několik studií potvrdilo efekt konzervativního postupu u tupého poranění AA u všech s výjimkou ESVS 3
- Operační léčba** – v případě nálezu poranění AA během laparotomie nebo u ESVS X (uzávěr)

Recommendation 65			
Open surgical repair is recommended as first line treatment for patients with blunt or penetrating abdominal aortic injury with free haemorrhage and haemodynamic instability (ESVS Grade 3).			
Class	Level	References	ToE
I	C	Shalhub <i>et al.</i> (2014), ³⁴⁸ Charlton-Ouw <i>et al.</i> (2016) ³⁵⁰	



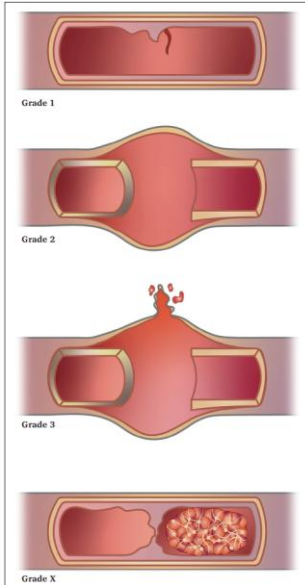
Recommendation 66		
Synthetic graft material is recommended for aortic reconstruction in emergency situations with or without concomitant bowel injury.		
Class	Level	References
I	C	Consensus

Recommendation 67			
Endovascular stent graft repair should be considered for haemodynamically stable patients and abdominal aortic injury with external contour abnormality such as a pseudoaneurysm (ESVS Grade 2).			
Class	Level	References	ToE
IIa	C	Shalhub <i>et al.</i> (2014), ³⁴⁸ Dayama <i>et al.</i> (2017) ³⁵²	

Abdominální vaskulární trauma – ilické tepny, AMS, AR

Table 11. Abdominal arterial injuries: summary of general treatment approaches. Specific management should follow the recommendations above, individualised to the patient, clinical environment, and available resources.

ESVS Grade	Description	Management		
		Common and external iliac arteries	Superior mesenteric artery	Renal artery
1	Partial wall injury, normal external wall contour	Antithrombotic or single antiplatelet therapy + surveillance	Antithrombotic or single antiplatelet therapy + surveillance	Antithrombotic or single antiplatelet therapy + surveillance
2	Complete wall injury, abnormal external wall contour, pseudoaneurysm	Consider stent graft	Consider stent graft	Consider stent graft
3	Complete wall injury, uncontained haemorrhage	Open surgical repair, shunt, or stent graft	Open surgical repair, shunt or ligate, or stent graft	Stable haemodynamics: consider operative repair Unstable haemodynamics: renal artery ligation
X	Occlusion	Open surgical repair (interposition graft) Temporarily shunt if required	Non-operative. Endovascular stent or stent graft repair if inadequate collateralisation or salvageable bowel ischaemia	Non-operative unless single kidney or bilateral renal artery occlusions and salvageable kidney. No revascularisation of a devascularised unilateral kidney



Abdominální vaskulární trauma – VCI

- VCI poranění (ESVS 3) – 70% mortalita

Recommendation 80			
Non-operative management with close observation and follow up imaging should be considered in haemodynamically stable patients with inferior vena cava injury and a stable retroperitoneal haematoma (not expanding and not actively bleeding).			
Class	Level	References	ToE
Ila	C	Pinto <i>et al.</i> (2023), ³⁸⁶ Choi <i>et al.</i> (2023) ³⁸⁷	

- Drobné poranění VCI – primární sutura (zúžení 30 % akceptováno)
- Velký defekt (bez možnosti primární sutury) VCI
 - a) zavedení „shuntu“ a pokus o rekonstrukci pomocí GORE 20 AVF pro udržení vyšší průchodnosti není indikované
 - b) ligace VCI

Končetinová vaskulární trauma - tepny

- Nejčastější místo cévního poranění, vysoká míra amputace a invalidizace
- **Klinické známky:** krvácení – absence pulzace – známky akutní ischemie (nemusí být projev krvácení !)
- **Diagnostika:** klinické vyšetření - CTA
- **Management :** 1.revaskularizace **do 6 hodin** (ideálně do 1 hodiny) – 2. skelet

Recommendation 85

Revascularisation as soon as possible, ideally within one hour of admission, is recommended in patients with clinical evidence of acute ischaemia due to extremity vascular trauma.

Class	Level	References	ToE
I	C	Alarhayem <i>et al.</i> (2019), ¹⁰⁷ Perkins <i>et al.</i> (2022), ⁴⁰⁹ Glass <i>et al.</i> (2009), ⁴¹¹ Perkins <i>et al.</i> (2015), ⁴⁰⁸ Ray <i>et al.</i> (2019), ¹²⁴ Zaraca <i>et al.</i> (2011), ⁴¹² Hsieh <i>et al.</i> (2022), ⁴¹³ Chipman <i>et al.</i> (2023), ⁴¹⁰ Lewis Jr <i>et al.</i> (2022), ⁴¹⁴ Magnotti <i>et al.</i> (2020) ⁴¹⁵	

Recommendation 86

The use of a temporary vascular shunt to rapidly restore blood flow in the extremity is recommended when timely primary definitive vascular repair is not feasible due to patient physiology or skeletal instability.

Class	Level	References	ToE
I	C	Tung <i>et al.</i> (2021), ¹¹¹ Borut <i>et al.</i> (2010), ¹¹² Subramanian <i>et al.</i> (2008), ¹¹³ Polcz <i>et al.</i> (2021), ¹¹⁷ Laverty <i>et al.</i> (2022), ¹¹⁸ Feliciano <i>et al.</i> (2013) ¹⁰⁹	

- Ligace AR/AU při patentním palmárním oblouku je **MOŽNE**
- Ligace/embolizace infrapopliteálních tepen při zachování 1 bérkové tepny je **MOŽNE**

Končetinová vaskulární trauma - žíly

- Jednoduché poranění nebo izolované žilní poranění je možné rekonstruovat v případě že je pacient stabilní bez jiných život ohrožujících okolností – jinak je indikace k **LIGACI**

Recommendation 95			
Repair of localised femoral or popliteal venous injury should be considered over ligation in haemodynamically stable patients.			
Class	Level	References	ToE
IIa	B	O'Shea <i>et al.</i> (2022), ⁴⁵¹ Byerly <i>et al.</i> (2020), ⁴⁵³ Matsumoto <i>et al.</i> (2019), ⁴⁵² Manley <i>et al.</i> (2018), ⁴⁵⁴ Perkins <i>et al.</i> (2015) ⁴⁰⁸	

Limitace ESVS GL 2025

- Málo RCT, systematických přehledů a studií s velkými kohortami pacientů
- Nelze aplikovat v zemích 3.světa a zemích s nízkou ekonomickou silou
0 cévních chirurgů – Zambia (20 mil.obyvateľ), Rwanda (15 mil.), Ethiopia (110 mil)
- Limitovaně lze akceptovat v ČR kde není možnost hybridního sálu (standard moderního TC !!!)



Ďekuji za pozornost