

Spleen injury

Splenic injury is the most common cause of hemoperitoneum in patients with blunt abdominal trauma or trauma to the left lower thoracic and hypochondriac region (thoracoabdominal trauma). The typical mechanism of injury is high-energy trauma such as car accidents and falls from heights (usually as part of polytrauma), or it is a direct injury to the abdomen caused by a blow or fall on a foreign object.^[1]

Splenic injuries can be fatal not only immediately after trauma, but also delayed during rupture of a subcapsular hematoma or pseudoaneurysm. In the treatment of splenic trauma, conservative or minimally invasive management (observation, angioembolization) is clearly preferred in hemodynamically stable patients in order to preserve the spleen and its function, especially in children, taking into account its immunological importance.^[2]



CT projection of splenic rupture

The spleen is located in the left upper quadrant of the abdomen below the diaphragm, externally on the left it is protected by the 9th - 11th ribs (Saegesser's ribs), the parenchyma is covered by a capsule. From a physiological point of view, the spleen is an important source of antibody production, especially against encapsulated pathogens such as *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Neisseria meningitidis* and protozoal organisms.^[1]

Classification

AAST classification (American Association for the Surgery of Trauma)

- degree I:
 - subcapsular haematoma < 10% of the surface
 - parenchymal laceration < 1 cm deep
 - capsule rupture
- degree II:
 - subcapsular hematoma 10-50 % of the surface
 - intraparenchymal hematoma < 5 cm
 - parenchymal laceration 1-3 cm deep
- degree III:
 - subcapsular hematoma > 50 % of the surface
 - ruptured subcapsular or intraparenchymal hematoma > 5 cm
 - parenchymal laceration > 3 cm deep
- degree IV:
 - + splenic vascular injury or active bleeding inside the capsule
 - Parenchymal lacerations involving segmental or hilar vessels causing > 25% devascularization
- degree V:
 - shattered spleen
 - + splenic vascular injuries with active bleeding outside the spleen into the peritoneum.^[3]

WSES classification (World Society of Emergency Surgery)

- mild (grade I): haemodynamically stable, AAST I-II → conservative treatment - observation;
- intermediate (grade II-III): haemodynamically stable, AAST III-V → conservative treatment - observation, angioembolisation;
- severe (grade IV): haemodynamically unstable, AAST I-V → surgical revision.^[2]

Types of ruptures

There are two types of ruptures:

Monotonous: In a monotonous rupture, bleeding immediately follows the injury. With splenic dilatation or hilar vessel damage, the bleeding is rapid (clinically expressed by hemorrhagic shock and hemoperitoneum = so-called acute form according to classification grade III and IV). With less severe injury (grade I or II), the so-called subacute form of haemorrhage occurs.

Double-period: Double-period splenic rupture can be an unpleasant surprise after blunt abdominal trauma with initial bland symptomatology. It may suddenly present around day 10 with rapid bleeding. It results from a type I injury when the splenic capsule loosens under the pressure of a subscapular hematoma. As a result of a small but persistent haemorrhage, sudden collapse of the entire circulation may occur up to several days apart. Thanks to regular sonographic follow-up, the frequency of two-period ruptures has decreased, as it is possible to proceed to a given therapeutic intervention in a timely manner.^{[4][5]}

Symptoms

Symptoms - subjectively perceived pain in the left shoulder is caused by irritation of the n. phrenicus by blood in the submandibular space (Kehr's sign). Other symptoms include weakness, collapse, abdominal dislocation, dislocation of the Douglas space (Delbet's sign). Tachycardia (heart rate above 100 beats per minute), hypotension, leukocytosis.^{[4][5]}

Diagnostics

- medical history, clinical physical examination including per rectum examination;
- bed-side abdominal sonography - E-FAST (Extended Focused Assessment with Sonography in Trauma) - common first choice method; clear method of choice in haemodynamically unstable patients;
- CT scan with intravenous administration of contrast agent (gold standard) - in haemodynamically stable patients;
- historically: diagnostic peritoneal lavage;
- control of coagulations and blood counts.^[1]

Treatment

- conservative treatment - intensive monitoring of vital functions, laboratory values of blood count and coagulation, clinical follow-up and regular sonographic or CT scans of the abdomen;
- angiography/angioembolization (minimally invasive procedure) - selective embolization of the arteria lienalis and their branches by an interventional radiologist;
- surgical solutions - rescue procedures: splenorrhaphy, partial splenectomy, packing using absorbable mesh, fibrin glue;
- surgical solution - radical procedure: splenectomy.
 - risk of fulminant splenectomy sepsis syndrome (OPSI - overwhelming postsplenectomy infection) with high mortality within hours;
 - early vaccination against encapsulated pathogens is necessary;
 - thrombocytosis develops, therefore there is a high risk of both arterial and venous thrombosis in the early postoperative period.^[1]

References

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References

1. HLAVÁČ, J – KRTIČKA, M – IRA, D. , et al. Spleen injury - conservative versus surgical therapy. *Úraz chir* [online]. 2017, y. 21, vol. 2, p. -, Available from <<https://www.prolekare.cz/casopisy/urazova-chirurgie/2017-2-14/poraneni-sleziny-konzervativni-versus-operacni-terapie-63605>>.
2. COCCOLINI, Federico – MONTORI, Giulia – CATENA, Fausto. Splenic trauma: WSES classification and guidelines for adult and pediatric patients. *World Journal of Emergency Surgery*. 2017, y. 1, vol. 12, p. ?, ISSN 1749-7922. DOI: 10.1186/s13017-017-0151-4 (<http://dx.doi.org/10.1186/s13017-017-0151-4>).
3. <https://radiopaedia.org/articles/aast-spleen-injury-scale>
4. Vladimír Pokorný (MUDr.). . *Traumatologie*. - edition. 2002. 307 pp. ISBN 9788072542772.
5. Petr Višňa, Jiří Hoch. . *Traumatologie dospělých : učebnice pro lékařské fakulty*. - edition. 2004. 157 pp. ISBN 9788073450342.