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ABDOMINAL AORTIC ANEURYSM RUPTURE – CASE REPORT

Bogomila Chesmedzhieva[1], Anastas Cholakov[1], Stefan Stanev[1]*

[1]UMHAT St.George, Plovdiv, Clinic of Vascular Surgery, Bulgaria,
e- mail: bogui_tch@yahoo.com, anastascholakov@abv.bg, stanev.stefan@mail.bg

Abstract: An Abdominal Aortic Aneurysm (AAA) is a localized dilatation and weakening of the abdominal aorta, as it`s infrarenal part is most commonly affected by the disease. Risk of rupture: Size of the AAA is one of the strongest predictors of rupture, as aortic aneurysms above 5,5cm in diameter have a higher risk. Clinical manifestation: Most of the AAAs have no symptoms and are accidently found. Classis symptoms of ruptured AAA (rAAA) are suddenly occurring severe abdominal and/ or back pain, arterial hypotension and pulsatile abdominal mass. Preoperative management: When rAAA is suspected, the patient should be consulted with a vascular surgeon as soon as possible. Aggressive fluid resuscitation should be avoided. Surgical treatment: Open surgery is usually performed via a transperitoneal approach with a midline laparotomy. Depending on the anatomy of the AAA and iliac arteries involvement an aorto-arotal or aorto-bifemoral bypass is constructed. Complications after repair of rAAA: Local - Lower limb(s) ischemia, Ischemia of the colon; Systemic - Cardiac, Pulmonary, Renal, Liver or Multiorgan failure, with 30-day mortality reaching up to 89%.

CASE REPORT: Male patient, 81 years of age, with multiple concomitant diseases. He was diagnosed with AAA 4 months prior to the rupture. The maximal diameter of the AAA was 15,6cm, iliac arteries were not affected. The patient refused the suggested surgical or endovascular treatments. He presented at ER 4 months later with acute pain in the abdomen and back. Clinical status: severe pain in the abdomen, BP 96/57mmHg, Hgb 102 g/l with HCT -0.331 l/l. On the CT-angiography rupture of AAA was verified with massive retroperitoneal haematoma, occluded right renal artery and aneurysm of the left renal artery. Median laparotomy was conducted under common anaesthesia. Aneurysmal neck was clamped above renal arteries, with clamping time – 30 minutes. After reclamping aorto-bifemoral bypass was constructed. Postoperatively the patient was transferred to intensive care unit (ICU). In the course of ICU treatment, the patient was inadequate and lacked spontaneous diuresis. A temporary catheter for haemodialysis was placed and such was initiated. He was transferred in the Clinic of vascular surgery after stabilizing blood oxygen saturation. The patient was inadequate at the time of transfer, with jaundice present. The patient restored bowel passage, hepatoprotectors were administered and physiotherapy was initiated. On the 20th postoperative day, the patient had a rapid decline in the physical status, demonstrated by hypotonia, bradycardia and regardless of the reanimation, died.

DISCUSSION: Ruptured aneurysm of abdominal aorta has high mortality. Despite the immediate surgical treatment and adequate substitution, the patient had lethal outcome.

CONCLUSION: Ruptured abdominal aortic aneurysm has high 30-day mortality, ranging between 22,9%-65,9%. In cases of acute renal and/or liver failure following the surgical treatment and when haemodialysis is needed, mortality rate can reach up to 89%.

***Keywords**: Ruptured Abdominal Aortic Aneurysm (rAAA), Suprarenal cross-clamping, Postoperative complications of rAAA*

INTRODUCTION

An Abdominal Aortic Aneurysm (AAA) is a localized dilatation and weakening of the abdominal aorta, as it`s infrarenal part is most commonly affected by the disease (Golledge, J. 2006). The most common diameter (evaluated by Ultrasound imaging or Computer-tomography (CT) angiography) of infrarenal aorta, defined as AAA is ≥ 30mm or 1,5 times of normal aortic diameter with involvement of all three anatomic layers of the aortic wall (Lederle, F. A. 1997; Roy R.A. 2022).

The most important risk factors are male sex , smoking and old age, whereas interestingly, diabetes mellitus is a negative risk factor for AAA(Golledge, J. 2006; Lederle, F. A. 1997; Singh, K., 2001; Jamrozik, K., 2000. Cornuz J., 2004). Three phases are distinguished in disease progression: development, growth and rupture. Aneurysmal growth can be associated with upregulated matrix-metalloproteinases in aortic wall and increased plasma protein concentration in both the aneurysmal wall and the intraluminal thrombus (Tamarina, N. , 1997; Maguire, E. M., 2019; Behr Andersen, 2018).

*Corresponding author: bogui_tch@yahoo.com

Risk of rupture

Size of the AAA is one of the strongest predictors of rupture, as aortic aneurysms above 5,5cm in diameter have markedly higher risk of rupture (Aggarwal, S., 2011). Estimated annual risk of rupture increases from 3%-15% for AAA with diameter 5,0cm-5,9cm to 30-50% for AAA bigger than 8,0cm (Brewster DC, 2003).

The expansion rate is another important factor in the risk of rupture (Gadowski GR, 1994; Bengtsson H, 1993). Diameter growth of AAA by 0,5cm for six months is considered in high risk of rupture (Hirsch AT, 2006). Continued smoking, uncontrolled hypertension and increased stress on the aortic wall are other factors, increasing the chance of rupture (Brewster DC, 2003).

Clinical manifestation

Most of the AAAs have no symptoms and are accidently found during ultrasonography, CT of the abdomen or magnetic resonance imaging, performed for different purposes. Symptomatic AAAs are with higher chance of rupture (Aggarwal, S., 2011). Abdominal aortic aneurysm symptoms are nonspecific, diffuse abdominal or lower back pain and pulsatile mass in the abdomen (Roy R.A. 2022). For up to 50% of the patients the rupture is the first clinical presentation of the AAA (Jeanmonod D, 2022).

Classis symptoms of ruptured AAA are suddenly occurred severe abdominal and/or back pain, arterial hypotension and pulsatile abdominal mass (Salata K. 2022).

Diagnostic imaging evaluation

Ultrasound imaging: When used in patients with abdominal and lower back pain or other symptom, consistent with ruptured AAA, ultrasound can identify AAA with high sensitivity and specificity(Knaut AL, 2005; Rubano E, 2013). Major disadvantages of this method are that it is operator dependent, also obesity and overlying bowel gas can hinder proper imaging of the aorta (Scott RA, 1991).

Computed tomography: When evidences of retroperitoneal hematoma and AAA on a CT are present, ruptured AAA is almost certain (Weinbaum FI, 1987). Contrast enhanced CT in those cases help plaining open surgical repair or EVAR (Salata K. 2022).

Preoperative management

When rAAA is suspected, the patient should be consulted with a vascular surgeon as soon as possible. Full blood count, biochemistry and haemostasis should be obtained, while the patient is on active monitoring (heart rate, blood pressure, oxygen saturation). At least 2 large venous lines should be placed, as well as Foley catheter. Aggressive fluid resuscitation should be avoided, because permissive hypotension of rAAA patients improves survival (Spahn DR, 2019). Systolic reassure ranging 70-80mmHg, maintaining consciousness, avoiding ST depression and reducing vital organ ischemia should be targeted (Dick F, 2013).

Surgical treatment

Open surgery is usually performed via a transperitoneal approach with midline laparotomy. Alternatively, a left retroperitoneal approach can be used. Aortic cross clamping should be performed below the renal arteries if possible. If the AAA extends above the renal arteries supraceliac clamping may be preferred, increasing rates of renal dysfunction and risk of multiorgan failure (Bown MJ, 2003). Distal clamping of iliac arteries should be assured before opening the aneurysmal sack to reduce the blood loss. After opening the sack rapid suture ligation of the lumbar arteries and inferior mesenteric artery (IMA) is necessary. Depending of the anatomy of the AAA and iliac arteries involvement tube graft is used to construct aorto-arotal bypass (in case of patient and not aneurysmal iliac arteries); Bifurcated graft for aorto-biliac or bifemoral bypass, in case of not patient, stenotic or aneurysmal iliac arteries.

PRBC and FFP transfusion is usually started after aortic clamping. Before declamping of the anastomoses, a close cooperation with anesthesiologists' team is required to avoid rapid decrease of blood pressure. After hematoma evacuation, a primary abdominal closure is usually used.

Complications after repair of rAAA

Local complications:

• Lower limb(s) ischemia due to graft thrombosis or distal embolization require rapid treatment – thrombectomy of the graft and affected limb(s) arteries;

• Ischemia of the colon – it is caused by combination of factors – ligation of IMA, internal iliac arteries occlusion, perioperative hypotension;

• Abdominal compartment syndrome – caused by large retroperitoneal haematomas and tissue oedema. In those cases, decompression laparotomy is recommended.

• Spinal ischemia – rare complication causing lower extremities paraparesis or paraplegia, due to interruption of pelvic blood supply, prolonged aortic clamping and perioperative hypotension.

Systemic complications:

• Cardiac – arrhythmia, congestive heart failure, myocardial infarction and cardiac arrest increase

mortality of rAAA(Johnston KW. 1994)

• Pulmonary – pulmonary failure, pneumonia and other respiratory complications develop in 36-41% of the cases of rAAA, most commonly resulted by chronic obstructive pulmonary disease (Edwards ST, 2014; Desgranges P, 2015)

• Renal – developing due to hypoperfusion, pre-existing renal disease, contrast media administration, suprarenal clamping, in cases of rAAA it can reach incidence of 26-45% (Edwards ST, 2014). The need of postoperative hemodialysis can reach 11-40%, with mortality rate of those patients varying between 76-89% (Edwards ST, 2014; Johnston KW, 1994; Harris LM, 1991)

• Hepatic – Liver failure in patients with rAAA is caused by hypoxic injury and is usually late complication. Unknown pre-existing liver dysfunction, combined with increased metabolic demands, due to hematoma absorption can lead to renal, cardiac, pulmonary and gastrointestinal disfunctions with a mortality rate of 83% (Hermreck AS, 1997; Maziak DE, 1998; Salata K. 2022).

• Multiorgan failure - Clinical data indicate, that a suprarenal clamping and duration of clamping are associated with higher risk of MOF and death (Mehta M., 2005; El- Sabrout RA, 2001). The incidence of MOF can reach up to 64% in cases of rAAA (Visser JJ, 2009).

Inhospital mortality:

Thirty-day mortality of rAAA is ranging from 22,9%-65,9% (Lieberg J, 2018; Karthikesalingam, A., 2014)

CASE REPORT

Male patient, 81 years of age, with several concomitant disease – congestive heart failure, cerebro-vascular disease. The patient was diagnosed with AAA 4 months prior to the rupture. The maximal diameter of the AAA was 15,6cm with length of 15,5cm, iliac arteries were not affected by the disease. The patient refused suggested surgical or endovascular treatments, discharged on conservative treatment.

The patient presented at ER four months later with acute pain in the abdomen and back, sweating and tingles in the limbs.

Clinical status: severe pain in the abdomen, during the examination, adequate psychological behaviour, blood pressure 96/57, Hgb 102 g/l with Haematocrit -0.331 l/l. Emergent consultation with vascular surgeon was conducted. On the CT-angiography rupture of AAA was verified with massive retroperitoneal haematoma, occluded right renal artery and aneurysm of the left renal artery.

After signing the informed consent, an emergent vascular reconstruction was undertaken.

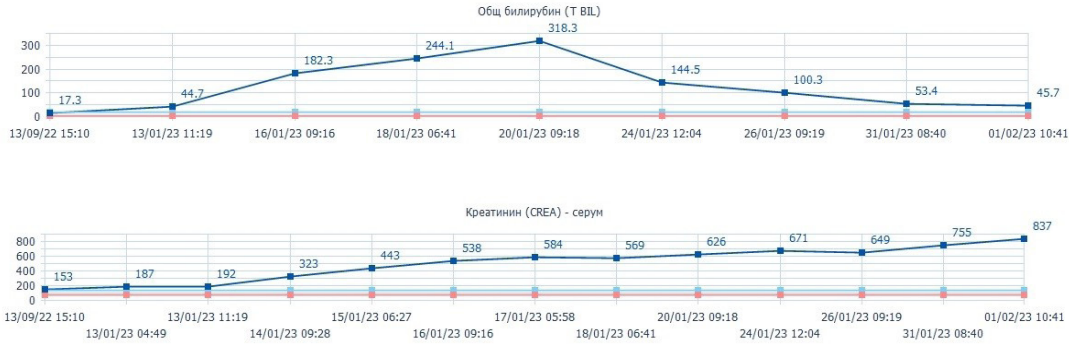
Under common anaesthesia median laparotomy was conducted. Laparotomy revealed huge retroperitoneal hematoma. Aneurysmal neck was clamped above renal arteries, with clamping time – 30 minutes, for constructing the proximal anastomosis. After recalmping an aorto-bifemoral bypass was constructed with silver knitted dacron prosthesis 22/11mm.

Postoperatively the patient was transferred to intensive care unit (ICU) for monitoring with stabile blood pressure and heart rate, varying between RR 110-130/7-80 mmHg, FR 60-75/min. In the course of ICU treatment, the patient was inadequate and lacked spontaneous diuresis. A temporary catheter for haemodialysis was placed for initiating haemodialysis.

He was transferred in clinic of vascular surgery after stabilizing blood oxygen saturation. The patient was inadequate at the time of transfer with jaundice present.

The initiated haemodialysis was continued on regular basis one time/ daily. The patient restored

bowel passage, hepatoprotectors were administered, physiotherapy was initiated.



On the 20th postoperative day, the patient had rapid decline in the physical status, demonstrated by hypotonia, bradycardia and regardless of the reanimation, died.

DISCUSSION

Ruptured aneurysm of abdominal aorta has high mortality (Lieberg J, 2018; Karthikesalingam, A., 2014). Despite the immediate surgical treatment and adequate substitution, the patient had a lethal outcome. Patients with AAA in diameter above 55mm, refusing to undergo conventional or endovascular treatment should be held in supervision as this way local or systemic complications might be avoided.

CONCLUSION

Ruptured abdominal aortic aneurysm has high 30-day mortality, ranging between 22,9%-65,9% (Lieberg J, 2018; Karthikesalingam, A., 2014). In cases of acute renal and/or liver failure following the surgical treatment and when haemodialysis is needed, the mortality rate can reach up to 89% (Edwards ST, 2014; Johnston KW, 1994; Harris LM, 1991, Hermreck AS, 1997; Maziak DE, 1998; Salata K. 2022). Short neck AAA or such involving renal arteries should be intervened after careful planning so the risks of local or systemic complications can be minimized.

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