

PROFESSIONAL PAPER

The frequency of rupture in undiscovered aneurysms of the abdominal aorta

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ABSTRACT

Background: Abdominal aortic aneurysm rupture remains a major challenge and is one of the most urgent conditions in medicine. The prevalence of abdominal aortic aneurysm is between 4.0%- 8.0% in studies related mainly to men. That is why we perform study to determine the frequency of ruptures in previously unrecognized abdominal aortic aneurysms in the total sample.

Material and Methods: The study was designed involving patients of the Clinic for Cardiovascular Surgery at the Clinical Center of the University of Sarajevo, who underwent surgery for rupture of an abdominal aortic aneurysm. Results: Of the total of 71 patients admitted due to a ruptured abdominal aortic aneurysm, in 59 the abdominal aortic aneurysm had not been recognized, that is, 83.1%. The most common rupture position was on the left retroperitoneally, in 45 or 63.4% of cases, then on the right retroperitoneally in 16 or 22.5%. The rarest site was intraperitoneal in 10 or 14.1%. The average size of AAA in the total sample (N=71) was 8.2±1.8 cm.

Conclusions: In most patients the abdominal aortic aneurysm had not been previously recognized. In the largest number of patients the position of the rupture was on the left retroperitoneally. Most patients who died had an intraperitoneal rupture.

Keywords: rupture, abdominal aortic aneurysm, unrecognized, position

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Introduction

The prevalence of abdominal aortic aneurysm is between 4.0%- 8.0% in studies related mainly to men. Abdominal aortic aneurysms (AAA) detected at screening are in most cases small in diameter. Aneurysms of 5.5 cm or larger were only found in 0.4%-0.6% of patients examined¹. One study conducted in a male population aged 65-74 showed an incidence of AAA of 55 per 100,000 people, increasing to 112 per 100 000 people for men aged 75-85². The same study showed a further increase of 298 per 100,000 people over 85 years of age³. The predictive values of hypertension, age, gender, beta-blocker use, and diabetes mellitus are inconsistent. However, most studies have shown a negative association between diabetes mellitus and aneurysm growth⁴. Perioperative mortality and morbidity, as well as other complications, were determined by the degree of urgency, comorbidities, the type of reconstructive procedure, and other factors⁵. The rate of expansion of the abdominal aortic aneurysm remains unchanged. In the male population with a detected sub-aneurysmal aorta (2.6 to 2.9 cm), 57.6% developed an abdominal aortic aneurysm greater than 3.0 cm in the subsequent 5 years. Twenty-eight percent developed a large abdominal aortic aneurysm (>5.5 cm) within 15 years⁶. Population screening studies provide the best evidence to determine the prevalence of AAA. The prevalence varies depending on age, and gender, as well as geographical location. The population prevalence of AAA is three times higher in men than in women. Smoking is closely related to the expansion of the aneurysm⁷. Factors related to AAA growth across multiple studies include: chronic obstructive pulmonary disease (COPD), fat metabolism disorder, and unregulated body weight. Other, less studied factors are: alcohol use, genetics, Chlamydia pneumonia, use of certain drugs (NSAIDs, angiotensin II blockers, angiotensin-converting enzyme inhibitors, roxithromycin, and corticosteroids), positive medical history of peripheral blood vessel disease, organ transplantation, height, and physical activity⁸.

The predictive values of hypertension, age, gender, beta-blocker use, and diabetes mellitus are inconsistent. However, most studies have shown a negative

association between diabetes mellitus and aneurysm growth⁸.

The objectives of this study were to determine the percentage of ruptures in primarily unrecognized abdominal aortic aneurysms, to find any correlation between the rupture position and its impact on the patient's outcome, and to determine the influence of age on the size of the AAA.

Material and methods

The study was designed in the form of classical retrospective clinical-analytical observational research. The research was conducted at the Clinic for Cardiovascular Surgery of the Clinical Center of the University of Sarajevo (UKCS). The study included patients who were admitted to an emergency room due to a ruptured abdominal aortic aneurysm from 2020 to 2023. A total of 88 patients were included in the study, 74 male and 14 female patients. Selection for abdominal aortic aneurysm rupture surgery was performed on the basis of a clinical examination by a specialist, confirmation of the diagnosis by CT angiography, and confirmation of the existence of indications for that procedure. All the patients underwent a surgical procedure that implied unconditional and uncompromising adherence to proper aseptic work in the operating rooms, as well as in the surgical station and intensive care.

The study was conducted on the basis of a special registry created for each patient containing anamnestic data, data from the specialist's physical examination, and data on the local status of the patient taken at admission (before surgery).

On the basis of the exclusion criteria, 17 patients were eliminated, and 71 patients of both sexes were included in the definitive study, 63 male patients and 8 female patients. All the patients were monitored from the moment of admission to the hospital until the moment of discharge from the hospital, or possible transfer to another hospital or clinic. The criteria for inclusion in the study included the following: rupture of the abdominal aortic aneurysm, confirmed diagnosis, no previous AAA repair, infrarenal

aneurysm, and the existence of complete data in the register. The exclusion criteria from the study included the following: a lack of the necessary medical documentation, patients with symptomatic aneurysm without rupture, non-ruptured aneurysms, traumatic aneurysms, iatrogenic aneurysms, and hereditary disorders

Patients with significant comorbidities that could affect the outcome or complicate the interpretation of results, previous aortic surgery, and pregnancy were excluded.

Retrospective analysis observed the parameters that demonstrated the quality and character of the course of the examined pathological change, that is, rupture of the abdominal aortic aneurysm.

The parameters taken were recorded based on anamnestic data for each patient taken from the medical records archives available at the cardiovascular surgery clinic of UKCS. The parameters included: age, sex, the size of the aneurysm, aneurysms in other localization, patient outcome and rupture position.

Furthermore, all these data were used to determine any correlations or risk factors for the occurrence of an aneurysm or its rupture. Moreover, we used the data to determine the correlation between the position of the aneurysm rupture and the patient's outcome.

Statistical analysis

Testing of statistical differences and impacts was performed using the Student's t-test, chi-square test and Pearson's coefficient of linear correlation. The results of all these tests were considered statistically significant at a 95% confidence level or where $p < 0.05$. The analysis

was carried out using the IBM Statistics SPSS v 23.0 statistical package

Results

The analysis of the age of the respondents of our study showed that the average age of the total sample ($N=71$) was 70.6 ± 9.7 , where the age of the youngest patient was 51 years, and the oldest respondent was 94 years old at the time of admission to the clinic.

Analysis of gender representation from the total sample ($N=71$) showed that men were significantly more represented, with 63 men or 88.7% of cases, compared to eight women, 11.3%.

Table 1. The Relationship between Recognized and Unrecognized Abdominal Aortic Aneurysms

Aneurysm		
	N	%
Unrecognized	59	83
Recognized	12	16.9
Total	71	100

On the basis of the analysis in our study, based on the data from the UKCS archives, we found a significant correlation between the non-timely recognition of an abdominal aortic aneurysm and its rupture. Namely, we found that out of the total of 71 patients who were admitted due to a ruptured abdominal aortic aneurysm, in 59 of them the abdominal aortic aneurysm had not been previously recognized, that is in 83.1%, compared to 12 patients, or 16.9% who had a previously recognized abdominal aortic aneurysm that had not been electively resolved.

Table 2. Correlation between Abdominal Aortic Aneurysm Size and Fatal Outcome

Aneurysm size (cm)						
	N	Average	SD	I AM	Minimum	Maximum
Survivors	59	8.08	1.60	0.21	4.30	12.60
Exitus Letalis	12	8.48	2.57	0.74	4.20	13.00
Total	71	8.15	1.78	0.21	4.20	13.00

Our analysis found that the average size of the aneurysm in the total sample ($N=71$) was 8.2 ± 1.8 cm. The smallest ruptured aneurysm measured was 4.2 cm, and the largest was 13 cm.

Table 3. Abdominal Aortic Aneurysm Rupture Positions

Rupture position		
	N	%
Intraperitoneal	10	14.1
Retroperitoneal - left	45	63.4
Retroperitoneal - right	16	22.5
Total	71	100.0

The most common position of rupture was on the left retroperitoneally in 45 or 63.4% of cases, then on the right retroperitoneally in 16 or 22.5%, and the rarest was intraperitoneal in 10 or 14.1%.

Table 4. Correlation Between Intraperitoneal Rupture and Fatal Outcome

Outcome * Rupture position					
			Rupture position		Total
			Other locations	Intraperitoneal	
Outcome	Survivors	N	57	2	59
		%	93.4	20.0	83,1
	Exitus letalis	N	4	8	12
		%	6.6	80.0	16,9
Total		N	61	10	71
		%	100,0	100.0	100.0

The analysis of fatalities in relation to the rupture position shows that as many as 80% of patients with intraperitoneal rupture had a fatal outcome, compared to only 6.6% of patients with rupture in other positions (retroperitoneal L and R).

Discussion

Abdominal aortic aneurysm rupture remains a major challenge and is one of the most urgent conditions in medicine. In Germany, there were 2410 cases of rupture of the abdominal aortic aneurysm in 2010⁹. Abdominal aortic aneurysm rupture should most commonly be suspected in patients over 50 years of age who complain of abdominal or back pain, and in whom a pulsating abdominal mass, consistent with systole, can be observed during a physical examination⁹. Abdominal aortic aneurysm most commonly ruptures posteriorly into the retroperitoneal cavity,

anteriorly into the intraperitoneal cavity, and, in rare cases, into the abdominal veins of the intestine. The different positions of the rupture determine the variety of common and rare symptoms and signs we see in patients with ruptured abdominal aortic aneurysms. Recognition of these diverse clinical presentations will lead to earlier diagnosis and timely intervention, which may have a positive impact on the high mortality rate associated with abdominal aortic aneurysm rupture¹⁰. Analysis of the ages of the respondents in our study shows that the average age of the total sample (N=71) was 70.6± 9.7, where the age of the youngest patient was 51 years, and the oldest respondent was 94 years old.

Analysis of gender representation in the total sample (N=71) shows that men were significantly more represented, with 63 or 88.7%, compared to women, of whom there were eight, which is 11.3% of cases^{11, 12}.

The incidence of rupture is far higher in patients with unrecognized aneurysms, which results in increased mortality from this condition (Table 1). It emerges that the greatest problem is the lack of screening and the non-recognition of symptoms, as well as the lack of theoretical knowledge about this disease. In our study, we tried to determine the correlation between aneurysm size and patient death (Table 2). Namely, out of the total number of patients (N= 71), 59 or 83.1% survived the surgery, while 12 or 16.9% of patients had a fatal outcome. The most common position of the rupture was on the left retroperitoneally (Table 3) in 45 or 63.4% of cases, then on the right retroperitoneally in 16 or 22.5%, and the rarest was intraperitoneal in 10 or 14.1%.

The analysis of fatalities in relation to the rupture position shows that as many as 80% of patients with intraperitoneal rupture (Table 4) had a fatal outcome, compared to only 6.6% of patients with ruptures in other positions. Of the total number of patients admitted to the Clinical Center of the University of Sarajevo, the largest number of patients underwent surgery and survived - 55 or 77.5% of cases, in four or 5.6% of cases the patients were transferred to other centers for treatment, while 16.9% had a fatal outcome. This is considered to be affirmative because mortality from AAA rupture, depending on the report, is estimated at 70-90%¹³. Also, a comparison of mean age versus death shows that patients with exitus letalis were significantly older (75.4±8.7 years; range 65-94 years) compared to patients who survived (69.6±9.7 years; range 51-89 years). Statistical analysis using the Student's t-test and Pearson's linear correlation coefficient showed that there was a statistically significant difference, as well as a correlation between death and age ($p<0.05$). This can be explained by the greater number of comorbid conditions in the elderly population.

Conclusion

Most patients did not have a previously recognized abdominal aortic aneurysm. The share of abdominal

aortic aneurysms in our study was 83.1%, which confirms our hypothesis. Most of the patients were male. Men accounted for 88.1% of the total sample. All the patients were elderly. Statistical analysis showed that the average age was 70.6 ± 9.7 . In most patients, in 63.4% of cases, the abdominal aortic aneurysm ruptured on the left retroperitoneally.

The highest number of deaths occurred in patients who had intraperitoneal rupture of the abdominal aorta. We showed that as many as 80% of the deaths were due to intraperitoneal rupture of the abdominal aorta.

Conflict of interests

The authors have no relevant financial or non-financial interest to disclose.

Patient Consent Form: All participants were informed about subject of the study.

Author's Contribution: Ali Gavrankapetanovic: Data curation, Visualization, Investigation, Writing-Reviewing, Edin Hodzic: Data curation, Visualization, Investigation, Bekir Rovcanin; Conceptualization,-Methodology, Sanela Brzika: Data curation, Investigation, Admir Bektasevic; Conceptualization, Methodology, Amel Hadzimehmedagic; Writing-Original draft, Supervision.

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