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INGUINAL HERNIA AS A PREDICTOR OF ABDOMINAL AORTIC ANEURYSM

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ABSTRACT

Background: This study aims to evaluate the potential predictive value of inguinal hernia (IH) as an indicator for the presence of abdominal aortic aneurysm (AAA) and proposes ultrasound screening of the abdominal aorta in men over 55 years of age.
Aim: The paper seeks to demonstrate that men aged 55 and older, who either undergo surgical treatment for inguinal hernias or are diagnosed with IH through examination, should be included in a screening program. This program would involve ultrasound examination of the abdominal aorta to reduce mortality and improve outcomes for this life-threatening condition.
Methods: Men over 55 years who underwent primary surgery for IH received ultrasound imaging of the abdominal aorta. The control group consisted of men without clinical evidence of IH. Results: The prevalence of AAA in the IH group was 5 out of 60 (8.33%), compared to 1 out of 60 (1.67%) in the control group, representing a statistically significant difference (p=0.0426). The aortic diameter in the experimental group was 2.24±0.61 cm, compared to 1.98±0.28 cm in the control group. The results show a significantly larger aortic diameter in the experimental group (p=0.0035).
Conclusion: Men aged 55 and older, who undergo surgical treatment for IH or are diagnosed with IH, particularly those with comorbidities such as hypertension (HTA), should be included in a screening program. This program should involve ultrasound examination of the abdominal aorta to reduce mortality and improve the chances of early detection and treatment of AAA.

Keywords: inguinal hernia, abdominal aortic aneurysm, ultrasound screening

INTRODUCTION

The prevalence of inguinal hernia (IH) is estimated to range from 27% to 43% in men and 3% to 6% in women [1]. Globally, 20 million IH surgeries are performed each year, making IH repair the most common procedure among all abdominal wall hernia operations [1,2]. Risk factors for the development of IH include: male gender, older age, family history of IH in first-degree relatives, disorder of collagen metabolism, history of prostatectomy using an open method [3,4,5]. Other risk factors, including white race, chronic cough, chronic constipation, smoking [6], and contralateral IH [7], are commonly reported but supported by less evidence. Inguinal hernias can be classified according to etiology into congenital and acquired. Acquired hernias are caused by weakening or disruption of the fibromuscular tissue of the body wall, which allows intra-abdominal contents to protrude through the acquired defect. Acquired inguinal hernias can develop as a result of inherent connective tissue abnormalities, chronic injury to the abdominal wall, or possible medication effects [8]. AAA that is linked to connective tissue abnormalities, is also believed to have a potential association with IH [9,10,11]. AAA and inguinal hernias are both chronic degenerative conditions that share common epidemiological features. Several researchers have explored the increased likelihood of developing hernias in patients treated for aortic aneurysms. However, only a limited number of studies indicate a potential association between AAA and inguinal hernias, possibly linked to connective tissue weakness. Chronic inflammation and dysregulation of connective tissue metabolism represent an underlying biological process, while genetic factors appear to be independently associated with both conditions [9, 12]. This study was designed to further investigate the possible predictive value of IH for the presence of AAA and suggests ultrasound screening of the abdominal aorta in men older than 55 years. The aim of this paper is to demonstrate that men aged 55 and

older who undergo surgical treatment for inguinal hernias or are diagnosed with such hernias should be included in a screening program that features ultrasound examination of the abdominal aorta. This inclusion aims to reduce mortality rates and enhance the chances of successful treatment for this life-threatening condition.

EXAMINEES AND METHODS

Examinees: The study included 120 male patients over the age of 55, divided into two groups. One group comprised patients who underwent elective or urgent IH surgery at the Clinic of Surgery, University Clinical Center Tuzla, during the year 2023/2024. The control group consisted of patients who were referred to an abdominal surgeon for evaluation due to suspected IH during the same period; however, physical examinations did not reveal the presence of IH or any hernias of the anterior abdominal wall. All patients underwent thorough history-taking, physical examinations, and ultrasound evaluations conducted by an experienced abdominal surgeon.

Methods: The ultrasound examinations were performed using a Mindray DC-70X insight ultrasound machine. The patients were positioned supine, and the aortic diameter was measured at three levels: at the junction of the renal arteries, at the aortic bifurcation, and at the midpoint between the previous two measurements. The diameter was measured in the horizontal anteroposterior plane, with the maximum diameter from the two distal measurements that was taken as the value. AAA is defined as an aortic diameter of 30 mm or greater. Aortic dilation was classified as present when the maximum diameter of the two distal measurements ranged between 25 and 30 mm. Additionally, we assessed the demographic and clinical characteristics of the patients, including cardiovascular risk factors and diseases, using standard definitions and methods. Inclusion criteria consisted of male patients over 55 years of age undergoing elective or emergency surgery for unilateral or bilateral IH. Exclusion criteria included patients younger than 55 years, females, and those with recurrent inguinal hernias.

STATISTICAL ANALYSIS

Statistical analysis was performed using the MS Excel program package. Statistical significance, difference between groups, was tested using Student's t-test for continuous variables, chi-square and Fisher's exact test for categorical variables. All tests were two-sided, at a 5% significance level. Prevalence (frequency of aneurysms in the observed group) and risk ratio (odds ratio) were estimated in the form of 95% confidence intervals. No adjustment was made between the groups due to the relatively small size of the sample.

RESULTS

Characteristics of study groups

The experimental and control groups each had 60 patients. Demographic and clinical characteristics of the two groups are in Table 1.

Table 1. Demographic and clinical characteristics of the two groups

	Hernia group		Control group		
Characteristics	(n=60)		(n=60)		P
Age, average (SD)	65.7	(6.2)	69.8	(9.0)	<0.05
BMI, average (SD)	26.5	(2.5)	26.8	(2.3)	NS
Hypertension, no. (%)	48	(80.0)	41	(68.3)	NS
Diabetes mellitus, no. (%)	10	(16,6)	22	(36.6)	<0.05
Coronary disease, no. (%)	11	(18.3)	11	(18.3)	NS
Dyslipidemia, no. (%)	11	(18.3)	35	(58.3)	<0.05
COPD, no. (%)	2	(3.3)	2	(3.3)	NS
Smoker, no. (%)	26	(43.3)	26	(43.3)	NS
Sedentary life style, no. (%)	54	(90.0)	55	(91.6)	<0.05

NS-not significant

The analysis shows a statistically significant difference based on age, with the mean age of the control group being higher than that of the experimental group. Among the clinical factors in the experimental group that are comparable to those in the control group, the analysis reveals statistically significant differences related to diabetes, dyslipidemia, and a sedentary lifestyle, with higher incidence rates observed in the control group. There is a noticeable increase in the incidence of hypertension within the experimental group.

Aneurysm prevalence

The prevalence of AAA in men in the group with a history of inguinal hernia was 5/60 (8.33 percent) of subjects and 1/60 (1.67 percent), which represents a statistically significant difference (p=0.0426). Aortic diameter in the experimental group was 2.24±0.61cm, and in the control group 1.98±0.28cm. The test shows that the diameter in the experimental group is significantly higher compared to the control group (p=0.0035).

In the experimental group, the diameter of the aortic diameter was greater than 3 cm for 5 patients, between 2.5 cm and 3 cm for 7 patients, and below 2.5 cm for the other 48 patients. In the control group, the diameter of the aortic diameter was greater than 3 cm for one patient, between 2.5 cm and 3 cm for 3 patients, and below 2.5 cm for the other 56 patients. The test shows a statistically significant difference between the two groups of patients (p=0.0426). The relationship does not change if the incidence of diameter above 3 cm and below 3 cm is tested for both groups (p=0.0458), which further points to the conclusion of the difference between these two groups.In the experimental value AAA="Yes" there is 1 patient older than 65 years and 4 patients younger than 65 years. In the control group, only 1 patient younger than 65 years has this characteristic.

On the table Table 2. is a recapitulation of other elements.

Table 2. The prevalence of AAA in men in the groups

	Hernia group		Control group				
Characteristics	(n=60)		(n=60)		OR	OR (CI)	P
Aortic diameter, average (SD) cm	2.2	(0.6)	1.9	(0.2)			<0.05
Aneurisym prevalence, no. (%)	5/60	(8.3)	1/60	(1.6)			<0.05
AAA prevalence, no. (%), age					1.1	(0.0-1.5)	NS
>65	1/34	(2.9)	0/41	(0.0)			
<65	4/26	(11.5)	1/19	(5.2)			
Aneurysm prevalence, no. (%), Arterial Hypertension							NS
Yes	5/48	(10.4)	1/41	(0.0)			
No	0/12	(0.0)	0/19	(0.0)			
Aneurysm prevalence, no. (%), Diabetes mellitus typ 2							NS
Yes	0/10	(0.0)	1/22	(0.0)			
No	5/50	(10.0)	0/38	(0.0)			
Aneurysm prevalence, no. (%), Coronary disease					1.1	(0.1-11.1)	NS
Yes	1/11	(9.0)	0/11	(0.0)			
No	4/49	(8.1)	1/49	(0.0)			
Aneurysm prevalence, no. (%), Dyslipidemia					3.4	(0.5-23.4)	NS
Yes	2/11	(18.1)	1/35	(0.0)			
No	3/49	(6.1)	0/25	(0.0)			
Aneurysm prevalence, no. (%), COPD							NS
Yes	0/2	(0.0)	1/2	(0.5)			
No	5/58	(8.6)	0/58	(0.0)			
Aneurysm prevalence, no. (%), Smoker					2.0	(0.3-13.5)	NS

Yes	3/26	(11.5)	1/26	(0.0)			
No	2/34	(5.8)	0/34	(0.0)			
Aneurysm prevalence, no. (%), Sedentary life style							NS
Yes	5/54	(9.2)	1/55	(0.0)			
No	0/6	(0.0)	0/5	(0.0)			
Aneurysm prevalence, no. (%), Previous hernia					3.9	(0.5-27.2)	NS
Yes	2/10	(20.0)	0/0	---			
No	3/50	(6.0)	1/60	(0.0)			

NS – not significant

DISCUSSION

Acquired hernias occur due to the weakening or disruption of the fibromuscular tissue in the body wall, which permits intrabdominal contents to protrude through the resulting defect. One theory suggests that acquired inguinal hernias may develop as a result of inherent connective tissue abnormalities [8]. Aneurysmal disease of the aorta, linked to connective tissue abnormalities, is also associated with inguinal hernia [9,10,11,12]. Only a limited number of studies have explored the connection between these two medical conditions. Given the potential benefits of such research, it is essential to conduct more studies on this topic to justify the implementation of ultrasound screening of the abdominal aorta in a high-risk men.

Risk factors for IH include family history, previous contralateral hernia, male gender, age, abnormal collagen metabolism, prostatectomy, and low body mass index [3]. Although rare, various inborn errors of metabolism, such as abnormalities in the synthesis of collagen types I and III, can contribute to the development of hernias and may also be linked to the onset of aortic aneurysmal disease [13].

In a 1999 study, Pleumeekers HJ et al. demonstrated that men with a history of IH are at increased risk of developing AAA, particularly if they are smokers [10]. In a multicenter study Antoniou GA et al. concluded that inguinal hernia is a significant risk factor for AAA. They suggest that men over 55 years of age undergoing IH surgery should be considered for entry into a screening program for AAA [11]. In our study, we demonstrated a statistically significant higher prevalence of AAA and an increased aortic diameter in the experimental group. However, no significant difference was observed between the experimental and control groups regarding smoking habits.

Lehnert B and Wadouh F concluded that the prevalence of inguinal hernias is significantly higher in patients with AAA compared to those with peripheral arterial occlusive disease or coronary atherosclerosis, suggesting a link to systemic fiber degeneration. Similar to our study, no differences in smoking habits were observed between the groups they examined [12].

In a prospective study from 2012, the results showed a positive predictive value of simple renal cysts and anterior abdominal wall hernias for the presence of AAA and a strong association, but not a predictive value between COPD and AAA [14]. In our study, an increased incidence of HTA was notable in the experimental group, while for other comorbidities and characteristics there was no statistically significant difference in favor of the experimental group.

CONCLUSION

Men aged 55 and older who undergo surgical treatment for inguinal hernia, or are diagnosed with it during examination especially those with comorbidities such as hypertension should be included in a screening program that includes ultrasound examination of the abdominal aorta. This approach aims to reduce mortality and improve recovery outcomes for this life-threatening condition.

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Conflicts of interest: None to declare.

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