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E.L. KALMYKOV¹, W. AHMAD¹, I.A. SUCHKOV²,
R.E. KALININ², O. NEMATZODA³, A.D. GAIBOV⁴,
D.D. SULTANOV⁴, P. MAJD¹, J. BRUNKWALL¹



DEMOGRAPHICS OF PATIENTS WITH ABDOMINAL AORTIC ANEURYSM IN 3 DIFFERENT COUNTRIES: GERMANY, TAJIKISTAN AND RUSSIA

Cologne University Clinic¹, Cologne,
Germany,

I.P. Pavlov Ryazan State Medical University², Ryazan,
Russian Federation,

Republican Scientific Center for Cardiovascular Surgery
of the Ministry of Health and Social Protection of the Population³, Dushanbe,
Avicenna Tajik State Medical University⁴, Dushanbe,
Republic of Tajikistan

Цель. Сравнить демографические характеристики, сопутствующие заболевания и факторы риска у пациентов с аневризмой брюшной аорты (АБА), получавших лечение в трех странах: Германия, Таджикистан и Россия.

Материал и методы. Было проведено ретроспективное сравнительное исследование с участием пациентов с инфраренальной аневризмой брюшной аорты, которые лечились либо с помощью эндоваскулярного протезирования, либо с помощью открытого протезирования аневризмы брюшной аорты в период с 2011 по 2015 год в Кельне, Душанбе и Рязани. В исследование были включены 711 пациентов: 499 из Кельна, 46 из Душанбе и 166 из Рязани. Ретроспективно были собраны демографические данные, включавшие возраст, пол, индекс массы тела, сопутствующие заболевания (диабет, ишемическая болезнь сердца, гипертония, цереброваскулярные заболевания, ХОБЛ, курение), фактическое лечение, а также диаметр брюшной аорты.

Результаты. Статистически значимой разницы в распространенности аневризмы брюшного отдела аорты в зависимости от пола между исследовательскими центрами не было. Точно так же индекс массы тела существенно не отличался между 3 центрами. Однако пациенты из Кельна были старше, чем из Душанбе и Рязани. Количество пациентов с разрывом аневризмы брюшной аорты было значительно меньше в Кельне по сравнению с двумя другими учреждениями ($p < 0,05$). Диаметр АБА у пациентов в Рязани и Душанбе был больше, чем в Кельне. Что касается лекарств, которые получали пациенты, то в Кельне значительно чаще применялись препараты, снижающие агрегацию тромбоцитов, статины и бета-блокаторы. Пациенты из Таджикистана страдали ХОБЛ чаще, чем пациенты из других центров.

Заключение. Распространенность сопутствующих заболеваний, факторы риска, а также лекарственная терапия у пациентов с аневризмой инфраренальной брюшной аорты различаются в разных географических регионах.

Ключевые слова: аневризма брюшной аорты, разрыв аневризмы, факторы риска, демографические различия, летальность, эндоваскулярное лечение

Objective. To compare the demographics, comorbidities and risk factors in patients with abdominal aortic aneurysm (AAA) treated in three different communities; Germany, Tajikistan and Russian Federation.

Methods. A retrospective comparative study including patients with an infrarenal AAA who were treated with either endovascular aneurysm repair (EVAR) or open repair (2011-2015) in Cologne, Dushanbe and Ryazan was done. A total number of 711 patients, 499 from Cologne, 46 from Dushanbe and 166 from Ryazan were included in the study. Demographic data including age, gender, body mass index (BMI), comorbidities (diabetes, coronary artery disease (CAD)), hypertension, cerebrovascular disease, chronic obstructive pulmonary disease (COPD, smoking), actual treatment as well as the diameter of the abdominal aorta were collected, retrospectively.

Results. There was no statistically significant difference in AAA prevalence with respect to gender between the study centers. Similarly, the BMI did not differ significantly between these 3 centers. Though, the patients from Cologne were older than those from Dushanbe and Ryazan. Moreover, the number of patients treated due to ruptured aneurysm was significantly lower in Cologne in comparison to the other two centers ($P < 0.05$). The AAA-diameter of patients in Ryazan and Dushanbe was greater than that found in Cologne. Regarding the actual medication that patients were presented with, antiplatelet-aggregation medication, statin and beta blockers were used significantly more often in Cologne. Patients from Tajikistan had COPD more often than patients from the other centers.

Conclusion. The prevalence of comorbidities, risk factors as well as medication in patients with infrarenal abdominal aortic aneurysm is different in the various geographical regions.

Keywords: abdominal aortic aneurysm, ruptured aneurysm, risk factors, demographic differences, mortality, endovascular treatment

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Demographic Differences in Patients with Abdominal Aortic Aneurysm in 3 Different Countries: Germany, Tajikistan and Russian Federation



E.L. Kalmykov, W. Ahmad, I.A. Suchkov, R.E. Kalinin, O. Nematzoda, A.D. Gaibov, D.D. Sultanov, P. Majd, J. Brunkwall

Научная новизна статьи

Исследование демонстрирует, что распространенность сопутствующих заболеваний, факторы риска, а также лекарственная терапия у пациентов с аневризмой инфраренальной брюшной аорты различаются в разных географических регионах. Впервые эти различия были продемонстрированы у пациентов из Российской Федерации и Таджикистана.

What this paper adds

The study demonstrates that the prevalence of comorbidities, risk factors as well as medication in patients with infrarenal abdominal aortic aneurysm is different in the various geographical regions. These differences have been firstly demonstrated in patients from the Russian Federation and Tajikistan.

Introduction

Abdominal aortic aneurysm (AAA) is a common and potentially life-threatening disease, with a high mortality due to rupture [1,2]. AAA is multifactorial and most patients have comorbidities that may significantly influence the postoperative results and survival rate after elective or emergency treatment [3]. In addition, some comorbidity may also increase the progression of AAA [4]. A number of studies have demonstrated that cardiovascular and pulmonary diseases increase morbidity and mortality after open or endovascular repair in patients with AAA [3,5,6]. The development of minimally invasive endovascular technologies has decreased the number of postoperative complications within 30 days as well as the mortality, especially in the group of patients with severe comorbidity and high operative risk [6].

In recent years, a couple of studies have published data about differences in the structures of comorbidities and risk factors in patients with AAA, but almost all these were restricted to patients from either the European Union, USA or East Asia [3,7-10]. No studies have been published on the risk factors in patients from Tajikistan and there are very few English-language publications from Russia. As far as we know today there are no publications comparing demographics, comorbidities, and risk factors in patients from different geographical regions.

Objective. To compare the demographics, comorbidity and risk factors in patients with abdominal aortic aneurysm (AAA) treated in three different countries - Cologne (Germany), Dushanbe (Tajikistan) and Ryazan (Russian Federation).

Methods

A retrospective comparative study of patients with an infrarenal AAA treated with either EVAR or

open repair (2011-2015) in the University Hospital of Cologne, Germany, I.P. Pavlov Ryazan State Medical University, Ryazan, Russian Federation and the National Center for Cardiovascular Surgery, Dushanbe, Tajikistan has been conducted.

Cologne University Hospital is the largest hospital in Cologne, with approximately 1,500 beds, 63,200 patients in inpatient department and approximately 312.500 outpatients as of 2017.

Ryazan Regional Cardiology Clinic is the largest hospital in the Ryazan region with 60 beds and about 2.200 patients per year. The National Center for Cardiovascular Surgery in Dushanbe is the main medical center in the Republic and treats patients with vascular pathology from three different regions of the country. The clinic has a capacity of 120 beds and cares about 5.100 patients per year.

The study included 711 patients, 499 - from Cologne, 46 - from Dushanbe and 166 - from Ryazan. Epidemiological data, including age, gender and body mass index (BMI), with such comorbidities as diabetes, coronary artery disease (CAD), hypertension (defined as the presence of a systolic component ≥ 140 mmHg and diastolic ≥ 90 mmHg), cerebrovascular disease, (COPD), smoking, current medication as well as the diameter of the abdominal aorta were studied, retrospectively.

Due to the retrospective nature of the present study, no additional approval from the Ethics Commissions was required. Written informed consent was obtained prior to each procedure.

Statistics

The statistical analyses were performed by using SPSS 25 statistical software (IBM SPSS Statistics Version 25.0.0.0, 2017). A test on normality was performed for all numeric data before the statistical comparison. Data are reported as median and interquartile ranges (IQRs) for continuous variables and as percentages for nominal variables.

For statistical comparisons of non-parametric data, the Kruskal-Wallis test for independent samples was used and the Mann-Whitney test, whereas the t-test was used for the statistical analysis of parametric data. To compare categorical variables a square test was used. A Bonferroni Test as a type of multiple comparison test used on a significance level. The value of $p < 0.05$ was considered to be statistically significant.

Results

Details of demographics, comorbidities, patients' medication, and clinical data are presented in the table. Male-to-female ratios and BMI were nearly the same at these three centers. However, the patients from Cologne were older than those from Dushanbe and Ryazan.

By comparing the comorbidities in these three centers, the rates of diabetes, CAD, hypertension and COPD were greater in Dushanbe than in Cologne. During the same time, the rates of CAD and hypertension were greater in Ryazan than in Cologne.

The prescription rate of "vascular medication" such as β -blockers, statins and aspirin were highest in Cologne and lowest in Dushanbe.

The AAA diameter was somewhat greater in patients from Ryazan and Dushanbe than from Cologne and this was reflected both in the frequency of patients with ruptured aneurysm (rAAA) and in the 30-day mortality. The findings for Ryazan and Dushanbe were very similar regarding this end-point.

The performed comparative analysis showed that the frequency of lethal outcomes associated with aneurysm ruptures was significantly higher in patients in Ryazan and Dushanbe (28 (57%) and 8 (61%), respectively) compared to Cologne 11 (22%) with $P < 0.001$. Moreover, the 30-day mortality was the highest in Dushanbe (2 (6%)), than in Ryazan (2 (1.7%)) and Cologne (9 (2%)); although without a statistically significant difference.

Discussion

AAA is to date one of the commonest and most life threatening diseases, with extremely high mortality when rupture occurs. We compared the findings from three centers – Cologne (Germany), Ryazan (Russian Federation) and Dushanbe (Tajikistan, Central Asia).

In our study, the largest number of patients with abdominal aortic aneurysms was in Cologne (Germany) and the least in Dushanbe (Tajikistan, Central Asia). 30-day mortality after an elective operation was similar in all three centers, but the lethal outcomes due to rupture was significantly

higher in Ryazan and Dushanbe. This fact in our opinion may be a result of more frequent application of screening program in Cologne [11]. As well as the known higher incidence of AAA in the western world as compared to the developing countries including Asian countries [6, 12]. On the other hand, the prevalence of AAA is much lower in Latin America and Central Asia [4,6]. The use of the term "Asian population" causes some confusion, since the Asian region is populated by significantly different ethnic groups, it does not allow adopting the results of the Asian region to another, in particular, regarding the aortic aneurysm

These differences may be due to differences in patients' care, to differences in comorbidities and smoking or perhaps due to inherent differences in patient populations.

Patients' care:

Since patients undergo a wider screening program in Germany, it is more probable that aneurysms would be detected. In Ryazan and Dushanbe no screening programs – partially because of the distance between settlements, but exacerbated by social and financial factors and low adherence to treatment [4]. Potentially, the diameter of the aortic aneurysm and the frequency of rAAA were significantly lower in patients from Cologne than in those from Ryazan and Dushanbe.

Another factor that might have played a favorable role regarding the perioperative mortality in Cologne may be the frequent use of endovascular surgery in comparison to Russian Federation and Tajikistan where rAAAs were treated with open repair.

Comorbidities and Smoking:

The association between AAA and smoking is fairly well known [13]. There is also an indirect association between smoking and the development of an aneurysm, via CAD and COPD.

According to Kühnl A et al. [14], the most common comorbidities of AAA in Germany are hypertension, CAD and PAD. In our study, we found CAD and hypertension to be common comorbidities.

In Tajikistan and the Russian Federation the number of patients with CAD and hypertension were significantly greater than that in Cologne.

In our study, the number of smokers was significantly lower in Ryazan than this in Cologne and Dushanbe.

The highest rate of COPD was in patients in Dushanbe, and the lowest in Cologne. A meta-analysis by Jiang Xiong et al. [5] demonstrated that AAA mortality is higher among COPD patients than non-COPD patients, and that COPD can increase the postoperative mortality in group of patients with rAAA. Moreover, long-term mortality was greater with more severe COPD.

Table

Baseline characteristics of the incidence of comorbidities and drug therapy				
Parameters	Cologne, Germany	Dushanbe, Tajikistan	Ryazan, Russian Federation	p-value
sex:				
female	346 (69,3%)	33 (72%)	130 (78,3%)	p=0.085
male	153 (30,7%)	13 (28%)	36 (21,7%)	
Age) (years) (Me[Q1-Q3])	73 [67-79]	65 [63-68]	68 [62-76]	*p<0.001 **p<0.001 ***p=0.036
Height (m)(Me [Q1-Q3])	1,75 [1,70-1,80]	1,72 [1,68-1,76]	1,72 [1,68-1,76]	*p=0.014 **p<0.001 ***p=0.974
BMI (body mass index)(Me [Q1-Q3])	26.3 [23,9-29,3]	25.7 [24,6-27,9]	26 [24,2-28,7]	p=0.585
Diameter of AAA (mm)(Me [Q1-Q3])	54 [50-61]	58 [54-63]	60 [48-75]	*p=0.003 **p<0.001 ***p=0.744
Aneurism rupture	50 (10%)	13 (28,2%)	49 (29,5%)	*p=0.001 **p<0.001 ***p=0.513
Diabetes	85 (17%)	11 (24%)	10 (6,2%)	*p=0.311 **p<0.001 *** p=0.001
CAD	119 (24%)	28 (61%)	129 (77%)	*p<0.001 **p<0.001 *** p=0.035
Hypertension	341 (68%)	44 (95%)	133 (80,1%)	*p<0.001 **p=0.019 *** p=0.012
Smoking	163 (33%)	15 (33%)	32 (19%)	*p=0.554 **p<0.001 *** p=0.045
COPD	92 (18,4%)	18 (39%)	33 (20 %)	*p=0.002 **p=0.733 *** p=0.011
Я-blockers	290 (58,1)	12 (26%)	31 (18,6%)	*p<0.001 **p=0.163 *** p=0.175
Statins	282 (56,5%)	14 (30%)	70 (42%)	*p<0.001 **p<0.001 ***p=0.175
Aspirin	335 (67%)	14 (30%)	87 (52%)	*p<0.001 **p<0.001 ***p=0.012

* – Comparison between Cologne and Dushanbe; ** – Comparison between Cologne and Ryazan; *** – Comparison between Dushanbe and Ryazan.

Takagi H et al. [15] demonstrated a statistically significant association of CAD with slower AAA growth rates, but Elkalioubie A. et al. [16] found that AAA prevalence in patients was 8.4% was higher in patients with CAD versus subjects without CAD.

Diabetes may be protective against AAA, possi-

bly due to an effect of metformin [13]. In our study, the incidence of diabetes was significantly different in patients from these three different countries, with the largest number of patients from Tajikistan.

We have not obtained statistically significant differences in BMI between the three centres. The

role and significance of this factor in AAA progression is debatable. Stackelber O. et al. [17] demonstrated the waist circumference but not BMI was associated with risk of AAA incidence.

Patients' Populations:

Since it is well known that there is a genetic component in susceptibility to AAA, it is highly plausible that there are genuine differences between different population cohorts [4]. However, it is practically almost impossible to identify these patients from the whole population and to provide them a special screening program for AAA.

Conclusion

Clinical outcomes, rates of comorbidities, risk factors as well as medication in patients with infrarenal abdominal aortic aneurysm are different in the various geographical regions. These differences may be associated with differences in patients' care, comorbidities or in the genetics of the different populations.

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The research was carried out without any financial assistance.

Conflict of interests

The authors declare no conflicts of interest.

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Адрес для корреспонденции

Клиника сосудистой
и эндоваскулярной хирургии,
Университетская клиника города Кельн,
Kerpener Street 62, 50937 Кельн, Германия
e-mail: egan0428@mail.ru,
Калмыков Еган Леонидович

Сведения об авторах

Калмыков Еган Леонидович, к.м.н., сосудистый хирург, Клиника сосудистой и эндоваскулярной хирургии, Клиника Кельнского университета,

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Address for correspondence

Clinic of Vascular and Endovascular Surgery,
Helios University Clinic.
Wuppertal, Germany.
Heusener Street 40, 42283, Wuppertal
e-mail: egan0428@mail.ru
Kalmykov Egan L.

Information about the authors

Kalmykov Egan L., PhD, Vascular Surgeon, Clinic of Vascular and Endovascular Surgery, Cologne University Clinic, Cologne, Germany.

Кельн, Германия.

<https://orcid.org/0000-0001-6784-2243>

Ahmad Wael, доктор медицины, клиника сосудистой и эндоваскулярной хирургии, Университетская клиника города Кельн, г. Кельн, Германия.

<https://orcid.org/0000-0001-5090-3468>

Сучков Игорь Александрович, д.м.н., профессор, проректор по научной работе и инновационному развитию, профессор кафедры сердечно-сосудистой, рентгенэндоваскулярной, оперативной хирургии и топографической анатомии, Рязанский государственный медицинский университет имени академика И.П. Павлова, г. Рязань, Российская Федерация.

<https://orcid.org/0000-0002-1292-5452>

Калинин Роман Евгеньевич, д.м.н., профессор, ректор, заведующий кафедрой сердечно-сосудистой, рентгенэндоваскулярной, оперативной хирургии и топографической анатомии, Рязанский государственный медицинский университет имени академика И.П. Павлова, г. Рязань, Российская Федерация.

<https://orcid.org/0000-0002-0817-9573>

Нематзода Окилджон, к.м.н., ведущий научный сотрудник, Республиканский научный центр сердечно-сосудистой хирургии Министерства Здравоохранения и Социальной Защиты Населения, г. Душанбе, Республика Таджикистан.

<https://orcid.org/0000-0001-7602-7611>

Гаиров Алиджон Джураевич, член-корр. АМН РТ, д.м.н., профессор, профессор кафедры хирургических болезней № 2, Таджикский государственный медицинский университет им. Абуали ибни Сино; Республиканский научный центр сердечно-сосудистой хирургии, г. Душанбе, Республика Таджикистан.

<https://orcid.org/0000-0002-7767-2556>

Султанов Джавли Давронович, д.м.н., профессор, профессор кафедры хирургических болезней № 2, Таджикский государственный медицинский университет им. Абуали ибни Сино, г. Душанбе, Республика Таджикистан.

<https://orcid.org/0000-0001-7935-7763>

Majd Payman, доктор медицины, клиника сосудистой и эндоваскулярной хирургии, Университетская клиника города Кельн, г. Кельн, Германия.

<https://orcid.org/0000-0002-5835-8318>

Brunkwall Jan, профессор, клиника сосудистой и эндоваскулярной хирургии, Университетская клиника города Кельн, г. Кельн, Германия.

<https://orcid.org/0000-0003-3082-6009>

<https://orcid.org/0000-0001-6784-2243>

Ahmad Wael, Doctor of Medicine, Department of Vascular and Endovascular Surgery, University Clinics, University of Cologne, Cologne, Germany.

<https://orcid.org/0000-0001-5090-3468>

Suchkov Igor A., MD, Professor, Vice-Rector for Research and Innovative Development, Professor of the Department of Cardiovascular, X-ray Endovascular, Operatives and Topographic Anatomy, I.P. Pavlov Ryazan State Medical University, Ryazan, Russian Federation

<https://orcid.org/0000-0002-1292-5452>

Kalinin Roman E., MD, Professor, Rector, Head of the Department of Cardiovascular, X-ray Endovascular, Operatives and Topographic Anatomy, I.P. Pavlov Ryazan State Medical University, Ryazan, Russian Federation

<https://orcid.org/0000-0002-0817-9573>

Nematzoda Okildzhon, PhD, Leading Researcher, Republican Scientific Center for Cardiovascular Surgery of the Ministry of Health and Social Protection of the Population, Dushanbe, Republic of Tajikistan.

<https://orcid.org/0000-0001-7602-7611>

Gaibov Alidzhon D., Corresponding Member of AMS of RT, MD, Professor of the Department of Surgical Diseases No2, Avicenna Tajik State Medical University, Republican Scientific Center for Cardiovascular Surgery of the Ministry of Health and Social Protection of the Population, Dushanbe, Republic of Tajikistan.

<https://orcid.org/0000-0002-7767-2556>

Sultanov Dzhavili D., MD, Professor of the Department of Surgical Diseases No2, Avicenna Tajik State Medical University Dushanbe, Republic of Tajikistan.

<https://orcid.org/0000-0001-7935-7763>

Majd Payman, Doctor of medicine, Clinic of Vascular and Endovascular Surgery, Cologne University Clinic, Cologne, Germany.

<https://orcid.org/0000-0002-5835-8318>

Brunkwall Jan, Professor, Clinic of Vascular and Endovascular Surgery, Cologne University Clinic, Cologne, Germany.

<https://orcid.org/0000-0003-3082-6009>

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