

Rastreo Oportunístico de Aneurisma da Aorta Abdominal à Cabeceira do Doente num Internamento de Medicina Interna

Point of Care Opportunist Screening of Abdominal Aortic Aneurysm in an Internal Medicine Ward

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Resumo:

Introdução: O aneurisma da aorta abdominal é uma entidade prevalente no mundo ocidental, com elevada mortalidade associada à rotura do aneurisma. Os programas de rastreio assim como a cirurgia eletiva podem prevenir este evento com elevado risco de vida. Com este trabalho pretendemos avaliar se os internos de Medicina Interna são capazes de realizar ecografia abdominal para rastreio de aneurisma da aorta abdominal, e com isso aumentar a nossa precisão diagnóstica desta condição potencialmente ameaçadora de vida.

Material e Métodos: Cinco internos de Medicina Interna, sem experiência prévia em ecografia, rastreamos para aneurisma da aorta abdominal, homens com mais de 65 anos, admitidos no internamento de Medicina Interna. Os doentes foram avaliados em dois tempos diferentes por dois internos de Medicina Interna, e um conjunto de doentes foi também avaliado por um cirurgião vascular ou por tomografia computadorizada abdominal (sendo ambas consideradas as avaliações *gold standard*). A concordância entre ambas avaliações dos internos de Medicina, e dos internos de Medicina e as avaliações *gold standard* foram analisadas.

Resultados: Foram avaliados 98 doentes e diagnosticados um total de 8 aneurismas da aorta abdominal, perfazendo uma prevalência de 8,2%. Foi obtida uma boa concordância no que diz respeito à presença de aneurisma da aorta abdominal e à sua medição entre as avaliações dos internos de Medicina Interna ($\kappa = 0,918, p < 0,01$) e entre os internos de Medicina Interna e as avaliações *gold standard* ($\kappa = 0,950, p < 0,01$).

Discussão e Conclusão: A prevalência do aneurisma da aorta abdominal no nosso estudo foi elevada. Os internos de Medicina Interna são capazes de diagnosticar esta entidade com precisão. O rastreio oportunístico e à cabeceira

do doente, pode ser realizado durante o internamento na Medicina Interna, providenciando um diagnóstico precoce, com possibilidade de referenciação para cirurgia eletiva de reparação.

Palavras-chave: Aneurisma da Aorta Abdominal/diagnóstico por imagem; Programas de Rastreio; Ultrassonografia.

Abstract:

Introduction: Abdominal aortic aneurysm is a prevalent disease in western world, with a high mortality rate when rupture occurs. Screening programs and elective surgery may prevent such a life-threatening event. We pretend to evaluate if internal medicine residents would be able to perform quality abdominal ultrasound for abdominal aortic aneurysm screening, and therefore increase our diagnostic accuracy of this life-threatening condition.

Material and Methods: Five internal medicine residents without previous experience in ultrasound screened men over 65 years admitted to Internal Medicine wards for Abdominal Aortic Aneurysm. The patients were evaluated in different times by two internal medicine residents, and a subset of patients was also evaluated by vascular surgery attendant or abdominal computed tomography scan (established as *gold standard* evaluations). Agreement between both internal medicine resident's observations and internal medicine residents' and *gold standard* evaluations were analyzed.

Results: A total of 98 patients were evaluated, with 8 abdominal aortic aneurysms diagnosed, resulting in an 8.2% prevalence. There was good agreement regarding Abdominal Aortic Aneurysm presence and measurement between internal medicine residents' examinations ($\kappa = 0.918, p < 0.01$) and internal medicine residents'/*gold standard* ($\kappa = 0.950, p < 0.01$).

Discussion and Conclusion: Abdominal aortic aneurysm prevalence in our study was high. Internal medicine residents were able to accurately diagnose aortic abdominal aneurysm. Point of care opportunistic aortic abdominal aneurysm screening can be performed in Internal Medicine

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wards, providing an early diagnosis and referral for elective repair surgery.

Keywords: *Aortic Aneurysm, Abdominal/diagnostic imaging; Mass Screening; Ultrasonography.*

Introduction

Abdominal aortic aneurysm (AAA) is present when the vessel has a diameter of 30 mm or more.¹⁻⁴ Western world prevalence has been reported between 1.2% to 3.0%.^{1,5-11} Age and gender influence greatly AAA prevalence, being more common in males, particularly over 65 years old, where it can achieve a prevalence as high as 4.0% to 8.0%.^{1,2,12} This is not surprising considering that smoking, arterial hypertension and dyslipidemia are well known risk factors for AAA,^{1,3,13-15} all medical conditions often encountered in western male seniors.

Although over 80% of AAA are asymptomatic, it is believed that 1 in every 3 AAA may progress to rupture.¹⁶⁻¹⁷ This is a life-threatening event, with mortality rate reaching up to 80% to 90%.^{2,18} AAA rupture hazard is greater in large aneurysms, particularly those above 50 mm.² Elective surgical repair should be considered for vessels over 55 mm.^{2,18} Mortality rate for elective surgery is reportedly low, both for open and endovascular techniques (5.0% and 2.0%, respectively).²

Abdominal ultrasound is an accessible, safe, efficient and low-cost screening method for AAA.^{3,18,19} Its limitations are that it is operator dependent, and it can be more difficult to perform in obese patients or if there is marked intestinal gas presence.^{2,3,19}

Due to its high mortality burden, low complications rates of elective surgical repair and a simple and low-cost screening method, several countries (such as United States of America, Sweden and United Kingdom), have implemented national screening programs for senior males. Reduced mortality not only due to AAA rupture but also from all causes of mortality has been reported.^{20,21} As most countries, Portugal does not have a national screening program for AAA.

In 2015, 534 patients admitted to our internal medicine ward were male over 65 years old and would therefore qualify as ideal candidates to AAA screening. Also, as expected in an internal medicine ward, AAA risk factors are very common in all our patients. Only 16 male patients over 65 years old had a diagnosis of AAA at ward admission. Considering western world's prevalence for this gender and age group, we could be underdiagnosing between 5 to 27 AAA per year.

In the absence of a national screening program, hospital admission could be an opportunity to perform AAA screening by ultrasound, without significantly increasing hospitalization cost or length of stay. However, in this type of screening we will probably identify older and more fragile patients. Point of care ultrasound is available at our ward, although there is no

previous report to our knowledge of internal medicine physicians doing this procedure. We considered that, with a short training period, internal medicine residents would be able to perform quality abdominal ultrasound for AAA screening, and therefore increase our diagnostic accuracy of this life-threatening condition

Material and Methods

Five internal medicine residents (IMR) without previous experience in ultrasound received a total of 5 hours of training, divided in two sessions, provided by an Internal Medicine attending with point of care ultrasound experience and a vascular surgeon attending.

Male patients over 65 years old admitted to general Internal Medicine Wards at our tertiary care academic hospital, without known AAA, were candidates to opportunistic AAA screening. The only exclusion criterion was the patient refusal to participate in the study. The ultrasounds were made preferentially in the morning, and if was not possible the aorta imagining because of inference of bowel gas, the exam was repeated in other time.

After informed consent was obtained, protocol dictated that each patient would be evaluated in different times by two IMR, in order to assess non specialist interobserver consistency. A subset of patients was also randomly evaluated by vascular surgery attendant or abdominal computed tomography (CT) scan, which was made for other motives, and were used to compare the IMR evaluation to a gold standard measurement of AAA. All examinations were made without knowing the result of previous evaluations. If at least one of the IMR diagnosed a AAA, a gold standard evaluation of this patient was mandatory, although that examiner was blinded for the first measurement.

Abdominal ultrasounds were performed using Siemens ACUSON P500® ultrasound with an CH5-2 transducer. After the evaluation along abdominal aorta, transversal diameter was determined below renal arteries, since AAA occur more frequently in this location, and it was considered the easiest method for non-experienced operators. It was considered AAA a measurement of 30 mm or more. Measurement differences were evaluated, both between IMR observations and also IMR-gold standard. Risk factors for AAA were recorded.

Statistical analysis was performed using SPSS v26.0. Absolute and relative frequencies were used for qualitative variables and mean, and standard deviation (SD) were used for quantitative variables. Interobserver measurement agreement for quantitative variables was evaluated by intraclass correlation coefficient (ICC) and 95% confidence interval (95% CI). Cohen's Kappa coefficient was used to evaluate agreement between observers in the determination of AAA presence (qualitative variable). ICC > 0.9 and Cohen Kappa > 0.8 were considered as a strong concordance between observers. A significance level of 0.05 was considered for all analysis.

The study was approved by the ethical committee.

All positive cases were sent for follow-up at Vascular Surgery consultation.

Results

From November 2017 to April 2019, a total of 98 patients gave consent to participate in our study. All patients were evaluated by 2 IMR, except for one that was evaluated by 1 IMR and the Vascular Surgeon attendant. In 24 patients, IMR evaluation was compared to a gold standard exam (12 abdominal CT performed for other reasons + 12 vascular surgeon ultrasounds). A total of 207 abdominal ultrasounds were performed (195 by IMR and 12 by vascular surgeon). The number of ultrasounds performed by each IMR were 55, 44, 43, 38 and 14.

Mean age was 77.7 (SD = 9.2) years old and 99.0% were Caucasian. Except for 3 patients, all had at least 1 risk factor for AAA other than age and gender. Risk factor prevalence is presented in Table 1.

Table 1: Abdominal aortic aneurysm risk factors prevalence

Risk Factor	n (%)
Caucasian	97 (99)
Smoking (past and present)	75 (76.5)
Dyslipidemia	60 (61.2)
Arterial hypertension	75 (76.5)
Family history of AAA	1 (1.0)
Past diagnosis of other aneurysmatic lesions	5 (5.1)
Coronary disease	36 (36.7)
Cerebrovascular disease	28 (28.6)
Peripheral arterial disease	14 (14.3)

AAA - abdominal aortic aneurysm

A total of 8 AAA were diagnosed, resulting in an 8.2% prevalence. A total of 24 patients were evaluated both by 2 IMR and gold standard evaluation, resulting in a total of 47 interactions (24 first IMR evaluation-gold standard + 23 evaluation by the second IMR-gold standard). Only 1 IMR examination failed to identify an AAA when both the gold standard and the other IMR confirmed its presence, but the maximum difference between measures was only 3.1 mm. The mean of the measurements made by IMR was 19.1 mm and by gold standard was 26.8 mm. There was good agreement regarding AAA presence between IMR examinations and IMR/gold standard (Table 2).

Considering IMR AAA screenings, there was a mean difference of 1.8 mm (SD 1.88; min 0.10 mm; max 9.40 mm)

Table 2: Agreement regarding the presence of abdominal aortic aneurysm

	n	Cohen's Kappa (SE)	p
Between IMR	97	0.918 (0.082)	<0.001
Between IMR/gold standard	47	0.950 (0.049)	<0.001

SE: standard error; IMR: internal medicine residents

between measurements. Good measurement agreement was observed between the different IMR observers. When comparing IMR to gold standard evaluations, there was a mean difference of 3.34 mm (SD 3.84; min 0.10 mm; max 17.90 mm) between measurements.

Likewise, there was a good agreement between observers (Table 3).

Table 3: Measurement agreement

	n	ICC	95% CI	p
Between IMR	97	0.956	0.935-0.970	<0.001
Between IMR/gold standard	47	0.957	0.923-0.976	<0.001

95% CI: 95% confidence interval; ICC: intraclass correlation coefficient; IMR: internal medicine residents

The life-long impact of this opportunistic AAA screening is yet to be determined. From the 8 patients diagnosed with AAA, 4 had indication for elective surgical repair. Two of them underwent surgery without any reported perioperative complication and 1 refused any intervention. One patient had significant comorbidity that would recommend against AAA surgical repair. The other four patients died from unrelated medical conditions.

Discussion

Our study showed a high prevalence of AAA in hospitalized males over 65 years old. In fact, our prevalence of 8.2% matches the upper limit estimated for western countries and is much higher than a previous reported 2.4% prevalence in a Portuguese non-hospitalized population.^{2,22} This can certainly result from the significant presence of AAA risk factors in our population,²³ something we believe can also be encountered in other European Internal Medicine wards. Also, it confirms that AAA may be an underdiagnosed condition in male seniors admitted to internal medicine wards.

IMR without previous experience in ultrasound, submitted to a 5-hour training program, were able to accurately perform abdominal ultrasound for AAA screening, with the advantage of not taking time off the patient's usual observation, as it can be integrated into the objective examination. They could

correctly diagnose AAA and its size comparatively to gold standard evaluations and also had a good agreement between them. We have not analysed individual performance of each of the IMR since there was a good agreement between examinations both for diagnose of AAA presence and AAA measurement. Recently, Brakel *et al*²⁴ have reported the use of a 4-point aorta scan ultrasound by unexperienced health practitioners to determine the presence AAA. Comparatively to our study, there was a greater number of discrepancies between the unexperienced health practitioners and control evaluation by radiologist. However, other studies have already proved the effectiveness of teaching ultrasound to non-radiologists, but in the emergency department or in outpatients,^{25,26} showing a different type of patients.

Our study has limitations. Only 1 in each 4 patients of our study population were evaluated by a gold standard exam, either an abdominal ultrasound performed by a vascular surgeon or abdominal CT scan. Also, since by protocol gold standard evaluation was mandatory if any of the IMR diagnosed an AAA, these patients are overrepresented in the subset of patients submitted to gold standard evaluation.

Since individuals with high comorbidity burden can usually be found in Internal Medicine wards, more judicious patient selection maybe in order and protocols with Vascular Surgery Department should be established and revised as new techniques for AAA surgical repair development. Our study shows that AAA screening can be implemented in internal medicine wards by the available health staff, without significant costs or time constrains.

Conclusion

Point of care opportunistic AAA screening can be performed in Internal Medicine wards in selected patients with known risk factors. This intervention may provide an early diagnosis, in time of preventing the catastrophic event of an AAA rupture, particularly in countries without a national AAA screening program.

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acordo com a Declaração de Helsínquia da Associação Médica Mundial. Proveniência e Revisão por Pares: Não comissionado; revisão externa por pares.

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