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ABDOMINAL AORTIC ANEURYSM

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Abstract:

Introduction: *Abdominal aortic aneurysm (AAA) is defined as an abdominal aortic dilation of three cm or more. It is well established that the prevalence of AAA increases with age. It is rare in persons younger than fifty years old; but it is estimated that twelve percent of males and five percent females 74 to 84 years of age have AAA. It is responsible for about 11,000 mortality in the US annually. The mortality rates from ruptured AAAs can be more than ninety percent.*

Aneurysms develop due to degeneration process of the arterial media and elastic tissues. Risk factors for AAA are the same as those of other cardiovascular problems. The main risk factors are male, smoker, older than 65 years, coronary artery disease, hypertension, previous myocardial infarction, peripheral arterial disease, and a family history of AAA. Blacks are at lower risk than other ethnicities.

Afar from the inherent risk of rupture, patients with AAA are also at an increased risk of cardiovascular disease and death independent of other factors. The degree to which risk factors affect AAA vs. atherosclerosis varies. dyslipidemia is a crucial coronary artery disease risk factor, though its role in AAA continues to be indeterminant, and diabetes mellitus could have a negative association with AAA.

Aim of work: *In this review, we will discuss the most recent evidence regarding surgical management of abdominal aortic aneurysm.*

Methodology: *We did a systematic search for surgical management of abdominal aortic aneurysm using PubMed search engine (http://www.ncbi.nlm.nih.gov/) and Google Scholar search engine (https://scholar.google.com). All relevant studies were retrieved and discussed. We only included full articles.*

Conclusions: *Abdominal aortic aneurysm denotes to abdominal aortic dilation of three cm or more. The most important risk factors are age older than 65 years, male sex, and smoking history. Other risk factors consist of family history of abdominal aortic aneurysm, coronary artery disease, hypertension, peripheral artery disease, and previous myocardial infarction. Diagnosis can be made by physical examination, an incidental finding on imaging, or ultrasonography. Men 65 to 75 years of age with a history of smoking must have at least one-time screening with ultrasonography based on evidence that screening will improve abdominal aortic aneurysm–related mortality in this population. Males in this age group without a history of smoking could potentially benefit if they have other risk factors such as family history of abdominal aortic aneurysm, other vascular aneurysms, coronary artery disease. There is inconsistent evidence to recommend screening for abdominal aortic aneurysm in women 65 to 75 years of age with a smoking history. Females without a smoking history should not undergo screening as the harms likely outweigh the benefits. Persons who have a stable abdominal aortic aneurysm should have regular surveillance or operative intervention depending on aneurysm size. Surgical intervention by open or endovascular repair is the primary option and is classically recommended for aneurysms 5.5 cm in diameter or greater. There are limited options for medical treatment beyond risk factor modification. Ruptured abdominal aortic aneurysm is considered a medical emergency presenting with hypotension, shooting abdominal or back pain, and a pulsatile abdominal mass. It has high prehospitalization mortality. Emergent surgical intervention is indicated for a rupture but has a high operative mortality rate.*

Key words: *surgical management, abdominal aortic aneurysm, indications, outcomes.*

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INTRODUCTION:

Abdominal aortic aneurysm (AAA) is defined as an abdominal aortic dilation of three cm or more.1 It is well established that the prevalence of AAA increases with age. It is rare in persons younger than fifty years old; but it is estimated that twelve percent of males and five percent females 74 to 84 years of age have AAA. [1] It is responsible for about 11,000 mortality in the US annually. The mortality rates from ruptured AAAs can be more than ninety percent. [2]

Aneurysms develop due to degeneration process of the arterial media and elastic tissues. Risk factors for AAA are the same as those of other cardiovascular problems. The main risk factors are male, smoker, older than 65 years, coronary artery disease, hypertension, previous myocardial infarction, peripheral arterial disease, and a family history of AAA [3]. Blacks are at lower risk than other ethnicities.

Afar from the inherent risk of rupture, patients with AAA are also at an increased risk of cardiovascular disease and death independent of other factors. [4] The degree to which risk factors affect AAA vs. atherosclerosis varies. dyslipidemia is a crucial coronary artery disease risk factor, though its role in AAA continues to be indeterminant, and diabetes mellitus could have a negative association with AAA.

In this review, we will discuss the most recent evidence regarding surgical management of abdominal aortic aneurysm.

METHODOLOGY:

We did a systematic search for surgical management of abdominal aortic aneurysm using PubMed search engine (http://www.ncbi.nlm.nih.gov/) and Google Scholar search engine (https://scholar.google.com). All relevant studies were retrieved and discussed. We only included full articles.
The terms used in the search were: surgical management, abdominal aortic aneurysm, indications, outcomes.

The incidence and outcome of AAA repair

The enhancement in the pre-, peri and postoperative care of AAA patients has had a huge impact on the epidemiology of AAA repair. The most critical development in this field has been brought around by EVAR , however advances in pre operative work-up, perioperative care and postoperative management of complications has also affected AAA repair incidence and outcome.

In early 2000, the higher usage of EVAR was a topic of debate, with opponents to the endovascular methods even describing it as a “failed experiment”. [5] The broad introduction of EVAR happened in conjunction with the trials revealing an obvious survival benefit for EVAR in comparison to open repair. [6] This benefit was later confirmed in a US-based trial with more modern devices.24 Though the early survival benefit of EVAR is not maintained during long-term follow- up, [7] and the cost-effectiveness of EVAR in comparison to open repair continues to be a topic of debate, [8] EVAR is the recommended management for AAA in almost all the countries, based on the marked early survival benefit as well as patient preference for minimally invasive surgery. The less invasive nature of EVAR has led to increasing number of elderly patients, who previously were deemed unfit for surgery, now being offered AAA repair.

The old trend along with these modifications has been an increasing incidence of intact AAA (iAAA) repair. In a nationwide analysis of incidence of AAA repair in Sweden based on the Swedvasc Registry, the incidence of iAAA repair arised by 46%, from 33 repairs per 100,000 male population in more than fifty years in 1994-1999 to 48 in 2010-2014. In the female population, the increase was 42%, from 5.7 to 8.1 repairs per
100,000 female population >50 years during the same period. In recent years, the iAAA repair incidence

has stabilized in Sweden at about 27 iAAA repairs per 100,000 inhabitants ≥50 years per year, for the first time showing a trend break in the continuous increase in number of repairs seen previously.

Both the short- and long-term mortality after intact AAA repair has declined markedly.28, 30, 31 In an analysis of the Swedvasc Registry, the 30-day mortality rate decreased from 4.7% to 1.7% during the last two decades. Significantly, the previously observed difference in 30-day mortality depending on patient age no longer remains.

Presentation

Physical examination with abdominal palpation is considered only moderately sensitive for the detection of AAA, with one study showing a sensitivity of more than fifty percent and specificity of 75%.6 The most common finding is pulsatile mass around the level of the umbilicus on palpation. Abdominal auscultation could show the presence of a bruit. The accuracy of abdominal palpation is decreased due to many factors such as obesity, abdominal distention, and smaller aneurysm size. specifically, abdominal girth greater than 100 cm (39.4 in) is linked with decreased sensitivity for identification with palpation.6 An aneurysm might rarely produce findings related to compression of adjacent structures, such as lower extremity edema related to compression of the inferior vena cava. [9]

Diagnosis of AAA is frequently made as an accidental finding on imaging studies, like abdominal ultrasonography or computed tomograph. AAA may sometimes be visible on plain radiography, if the aneurysm wall is calcified.

A ruptured AAA is considered a medical emergency associated with high mortality rates. The classic syndrome is known by by hypotension, shooting abdominal or back pain, and a pulsatile abdominal mass. This triad may be incomplete or absent, and misdiagnosis can occur in up to 60% of cases. So, physicians must be mindful of atypical presentations and attentive to new-onset, nonspecific back or abdominal pain in patients at risk of AAA. [10]

Screening

As AAA is most commonly clinically silent, screening may enhance the detection. Ultrasonography has a high sensitivity and specificity for detecting AAA when done in a setting experienced in the use of ultrasonography. Additionally, there are no significant harms associated with abdominal ultrasonography.4 Though more studies are needed, preliminary data propse that family physicians can be trained to effectively screen for AAA in the office setting.

There are 4 randomized, controlled, population-based studies provided much of the available data on AAA screening. [11] The Multicentre Aneurysm Screening Study was the biggest, following approximately 70,000 men between 65 and 74 years of age for 10 years. patients were randomized to an offer of ultrasonography or to a control group. Those with AAA detected at screening were followed by ultrasound surveillance or elective surgery based on predefined criteria. The decrease in AAA-related mortality improved from 42% at four-year follow-up to 48% at 10-year follow-up, showing continued benefit over the duration of the study. This program also showed continued cost-effectiveness, particularly as the study progressed, as the major costs of screening occur early with initial screening and intervention.15 Other data have substantiated the cost-effectiveness of AAA screening. [12]

As studies such as the Multicentre Aneurysm Screening Study designate, the primary benefit of screening is decreased AAA-related mortality. but this does not mean to improved all-cause mortality in men or women. Persons with the highest possible benefit from screening have the major risk factors of male sex, increased age, and history of smoking. Approximately 238 men older than 65 years need to be screened to prevent one AAA-related death.18,19 Men younger than 65 years and those who have never smoked have a lower risk of developing AAA.9 In addition, women are at lower risk of developing AAA. Available mortality data have not showed marked benefit from screening women.4,18 Family history of AAA could be an important screening consideration because it doubles the risk, and some recommendations include this as a consideration for males and females. [13]

The risks of screening include the morbidity and mortality linked with elective repair. open repair has a mortality rate of 4.2% and a complication rate of 32%.4 but this risk is smaller than that of AAA-related mortality in the absence of screening. Other risks include a transient increase in anxiety and lower self-rated health scores among individuals being screened. These differences resolve within 6 weeks after screening.

The U.S. Preventive Services Task Force (USPSTF) updated its 2005 guideline on ultrasonography screening for AAA. The USPSTF still recommend one-time screening with ultrasonography for men 65 to 75 years of age with a history of smoking (level B

recommendation). Noteworthy, a history of smoking is defined as at least 100 cigarettes over the individual's lifetime. The USPSTF recommends that doctors selectively offer screening in men 65 to 75 years of age who have never smoked. Risk factors associated with a higher likelihood of AAA include first-degree relatives with AAA, history of other vascular aneurysms, coronary artery disease, cerebrovascular disease, atherosclerosis, hypercholesterolemia, obesity, and hypertension). Factors associated with a decreased risk of AAA include black race, Hispanic ethnicity, and diabetes. Of note, the perceived net benefit to screening this population is thought to be small.

The primary difference between the 2005 and 2014 guidelines includes screening in women. In 2005, the guideline recommended against screening in all females. The 2014 guideline has been updated to suggest that the benefit of screening in women 65 to 75 years of age with a history of smoking is inconclusive (level I statement).

Surveillance

The progression of AAA reveals that as aneurysms increase in size, they expand at a greater rate and the risk of rupture increases. So, in persons found to have aneurysms on initial screening, regular surveillance is needed every 6 months to 3 years, depending on aneurysm size.

TREATMENT:

Medical

Many nonsurgical options are available and have been well studied for the potential ability to slow aneurysm progression. Smoking cessation could help because smoking causes an incremental increased growth rate of up to 0.4 mm per year. [14] In terms of medical therapy, statins, antihypertensives, and antibiotics have been studied. Beta blockers are known to improve perioperative mortality for AAA repair; but, randomized trial results indicate that their effects on AAA enlargement are not marked.

Other antihypertensive medications (e.g., angiotensin-converting enzyme inhibitors) also do not seem to be effective. Though there have been recommendations supporting statin use, the evidence for reducing AAA growth or rupture has been poor, and better-quality studies do not indicate a direct benefit. Statins are likely to be used for overall cardiovascular risk reduction and do improve all-cause mortality in patients after AAA repair. Moreover, roxithromycin (a macrolide antibiotic not available in the United States) and doxycycline have less strong evidence for inhibiting AAA growth, because secondary infection in the aortic wall, likely from *Chlamydophila pneumoniae,* may promote AAA progression. [15]

Surgical

Elective Repair of Stable AAA. A diameter of 5.5 cm has been recommended in many protocols as a threshold for performing elective surgery, specifically for infrarenal and juxtarenal aneurysms. At this size, it is believed that the advantages of surgery outweigh the risks. Open and endovascular repair are the 2 primary techniques. Many studies have concluded that there is no marked difference between the 2 techniques in terms of overall long-term mortality. [16] Open repair has a 30-day mortality risk between 4% and 5%. The less-invasive endovascular technique has gained favor because of improved early outcomes, with a 30-day mortality risk between 1% and 2%.30 but, studies have shown that the mortality benefits initially reported with endovascular repair are essentially gone by two to three years postprocedure.

Moreover, patients undergoing endovascular repair have an increased rate of graft complications and need for secondary interventions in comparison to patients undergoing open repair. This could make endovascular repair less cost-effective in the long term. The patient's age could also have a role in which surgery is more effective. One study showed better survival with endovascular repair in patients younger than 70 years, while patients 70 years or older tended to do better with open repair. [17]

Emergent Repair of Ruptured AAA

It is estimated that ruptured AAAs is responsible for 4% to 5% of sudden deaths in the US. Up to 50% of patients with ruptured AAAs do not reach the hospital, and those who do survive to the operating room have a mortality rate as high as 50%.33 Much like elective repair, studies so far have not recognized a significant difference in survival with endovascular vs. open repair of ruptured AAA. Factors that appear to affect survival include decreased time from presentation to operative intervention, and the presence of a surgical team experienced in AAA repair. [18]

Progress in experience and technology in critical care and anesthetic settings during the last decades has not been supplemented by similar advances in mortality rates of conventional treatment for ruptured AAA. Widespread adoption of endovascular approaches for the elective treatment of AAAs is consistent with solid evidence demonstrating early survival advantages over surgical repair and shows a

paradigm shift in management practice of aortic aneurysmal disease. But, the optimal treatment of ruptured AAA continues to be controversial in the absence of convincing high-level evidence from randomized trials. The perceived benefits of EVAR for ruptured AAA are supported by several observational studies that reveal a trend toward improved outcomes with this approach compared with open repair and are depicted in the increasing establishment of EVAR protocols by several institutions worldwide.

CONCLUSIONS:

Abdominal aortic aneurysm denotes to abdominal aortic dilation of three cm or more. The most important risk factors are age older than 65 years, male sex, and smoking history. Other risk factors consist of family history of abdominal aortic aneurysm, coronary artery disease, hypertension, peripheral artery disease, and previous myocardial infarction. Diagnosis can be made by physical examination, an incidental finding on imaging, or ultrasonography. Men 65 to 75 years of age with a history of smoking must have at least one-time screening with ultrasonography based on evidence that screening will improve abdominal aortic aneurysm–related mortality in this population. Males in this age group without a history of smoking could potentially benefit if they have other risk factors such as family history of abdominal aortic aneurysm, other vascular aneurysms, coronary artery disease. There is inconsistent evidence to recommend screening for abdominal aortic aneurysm in women 65 to 75 years of age with a smoking history. Females without a smoking history should not undergo screening as the harms likely outweigh the benefits. Persons who have a stable abdominal aortic aneurysm should have regular surveillance or operative intervention depending on aneurysm size. Surgical intervention by open or endovascular repair is the primary option and is classically recommended for aneurysms 5.5 cm in diameter or greater. There are limited options for medical treatment beyond risk factor modification. Ruptured abdominal aortic aneurysm is considered a medical emergency presenting with hypotension, shooting abdominal or back pain, and a pulsatile abdominal mass. It has high prehospitalization mortality. Emergent surgical intervention is indicated for a rupture but has a high operative mortality rate.

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