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ABDOMINAL AORTIC ANEURYSM REPAIR IN ADVANCED AGE/ ELDERLY PATIENTS

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Abstract: Abdominal aortic aneurysm (AAA) represents a significant vascular condition in the elderly, with therapeutic challenges due to the high prevalence of comorbidities and the complexity of choosing between endovascular repair (EVAR) and open surgery (OSR). Objective: To analyze the main factors that impact the results of AAA repair in elderly patients, addressing surgical techniques, associated risks, postoperative complications and impact on quality of life. Methodology: Bibliographic review, conducted in the PubMed database. After applying the inclusion and exclusion criteria, 21 articles published between 2021 and 2025 were selected for analysis. Results: The choice between EVAR and OSR should be individualized, considering the patient's frailty and comorbidities, such as hypertension and renal failure. EVAR has lower in-hospital mortality (<1% in octogenarians), shorter recovery time and lower perioperative risk, but greater need for reinterventions over time. OSR, on the other hand, despite the higher initial surgical risk, can offer greater durability of the repair. Patients who were less frail and taking statins showed better long-term clinical and functional outcomes. Final considerations: EVAR is a safer approach for the elderly, especially octogenarians, but the decision should be based on an individualized assessment that includes frailty, comorbidities and post-operative support. Standardization of indication criteria and the development of new therapeutic strategies are essential to optimize outcomes and reduce the need for re-interventions.

Keywords: Abdominal aortic aneurysm, endovascular repair, open surgical repair, elderly.

INTRODUCTION

According to Prendes *et al.* (2021), abdominal aortic aneurysm (AAA) represents a significant vascular condition among the elderly, and is one of the main causes of cardiovascular morbidity and mortality in the geriatric population. It is estimated that approximately 1.5% of men over 60 and 1% of women over 64 are affected by the condition, with a higher prevalence in males, although women have higher rupture rates (Haque; Bhargava, 2022). Advancing age is directly associated with an increased risk of developing AAA due to the progressive degeneration of the extracellular matrix and the weakening of the arterial wall mediated by inflammatory and metabolic factors (De Ceniga *et al.*, 2021).

For Haque and Bhargava (2022), the management of AAA in elderly patients presents specific challenges, since the presence of multiple comorbidities, such as hypertension, coronary artery disease and renal failure, directly influences therapeutic decisions. Diagnosis is often incidental, with abdominal ultrasound being the method of choice for screening in at-risk populations, especially in men aged between 65 and 75 with a history of smoking. According to Hafeez *et al.* (2024), the indication for surgical treatment must take into account not only the aneurysmal diameter, but also the patient's life expectancy and general clinical condition. The decision between endovascular repair (EVAR) and open surgery (OSR) must be individualized, taking into account the operative risks and long-term benefits.

According to De Ceniga *et al.* (2021), the natural history of AAA in elderly patients suggests that aneurysm growth is slow and that the rupture rate for aneurysms smaller than 55 mm is relatively low. In nonagenarians, the estimated survival after the diagnosis of a small AAA may be less than the time needed for the aneurysm to reach the surgical criteria

for intervention. This raises questions about the need for rigorous follow-up in patients of advanced age with small aneurysms. Vikan *et al.* (2024) reinforce that, in nonagenarians, the perioperative mortality of open surgery reaches 100% in asymptomatic patients, suggesting that EVAR is the preferred approach when intervention is indicated.

Hafeez *et al.* (2024) show that in octogenarian patients undergoing EVAR, hospital mortality is less than 1%, while in open surgery it is as high as 7.5%. In addition, the two-year mortality rate is lower in patients who take statins and have a lower frailty index. These findings indicate that the impact of AAA repair in the elderly goes beyond immediate survival, affecting quality of life and long-term functional capacity. Thus, there is a need for better selection of patients who will really benefit from the intervention, avoiding futile procedures that do not alter the overall prognosis.

According to Mansoor *et al.* (2023), the factors that influence the outcomes of AAA repair in the elderly include the choice of surgical technique, the presence of comorbidities, patient frailty and postoperative recovery time. Quality of life should be considered as a determining factor in therapeutic decision-making, as many elderly patients have significant functional limitations after surgery. In this way, personalizing treatment becomes essential to guarantee better clinical and functional results.

This study aims to analyze the main factors that affect the results of abdominal aortic aneurysm repair in elderly patients, looking at surgical techniques, associated risks, post-operative complications and the impact on quality of life. Understanding these aspects can help optimize therapeutic strategies and define more precise criteria for indicating surgical treatment in this population.

METHODOLOGY

A literature review developed according to the criteria of the PVO strategy, which stands for: population or research problem, variables and outcome. This strategy was used to develop the research question “What are the main factors that influence the clinical results of abdominal aortic aneurysm repair in elderly patients, considering surgical approaches, postoperative complications and quality of life?”. The searches were carried out using the PubMed - MEDLINE (Medical Literature Analysis and Retrieval System Online) databases. The search terms were used in combination with the Boolean terms “AND” and “OR”, using the following search strategy: (“surgical procedures, operative”[MeSH Terms] OR (“surgical”[All Fields] AND “procedures”[All Fields] AND “operative”[All Fields]) OR “operative surgical procedures”[All Fields] OR “surgical”[All Fields] OR “surgically”[All Fields] OR “surgicals”[All Fields]) AND (“repairability”[All Fields] OR “repairable”[All Fields] OR “repare”[All Fields] OR “repaired”[All Fields] OR “repairment”[All Fields] OR “wound healing”[MeSH Terms] OR (“wound”[All Fields] AND “healing”[All Fields]) OR “wound healing”[All Fields] OR “repair”[All Fields] OR “repairing”[All Fields] OR “repairs”[All Fields]) AND (“aortic aneurysm, abdominal”[MeSH Terms] OR (“aortic”[All Fields] AND “aneurysm”[All Fields] AND “abdominal”[All Fields]) OR “abdominal aortic aneurysm”[All Fields] OR (“abdominal”[All Fields] AND “aneurysm”[All Fields]) OR “abdominal aneurysm”[All Fields]) AND (“aged”[MeSH Terms] OR “aged”[All Fields] OR “elderly”[All Fields] OR “elderlies”[All Fields] OR “elderly s”[All Fields] OR “elderlys”[All Fields]) AND (“patient s”[All Fields] OR “patients”[-MeSH Terms] OR “patients”[All Fields] OR “patient”[All Fields] OR “patients s”[All Fields])). From this search, 1,512 articles were found, which were then submitted to the selection criteria. The inclusion criteria were: articles in

English; published between 2021 and 2025 and which addressed the themes proposed for this research, studies of the type (narrative review, systematic review, observational studies, case reports. The exclusion criteria were: duplicate articles, available in abstract form, which did not directly address the proposal studied and which did not meet the other inclusion criteria. After applying the search strategy to the database, a total of 30 articles were found. After applying the inclusion and exclusion criteria, 21 articles were selected from the PubMed database to make up this study’s collection.

DISCUSSION

COMPARISON BETWEEN ENDOVASCULAR REPAIRS (EVAR) AND OPEN REPAIRS (OSR)

According to Mwipatayi *et al.* (2020), the choice between endovascular repair (EVAR) and open surgery (OSR) in the treatment of abdominal aortic aneurysm (AAA) in the elderly should consider factors such as perioperative mortality rate, recovery time and impact on quality of life. Studies show that EVAR is associated with lower initial postoperative mortality, and is the preferred approach in many centers due to its lower invasiveness and faster recovery. However, there are concerns about the durability of the stents and the greater need for long-term reinterventions (Mwipatayi *et al.*, 2020; Sada *et al.*, 2024).

According to Scallan *et al.* (2020), although OSR has a higher operative risk, it remains the preferred option in some cases, especially in younger patients or those with unfavorable anatomy for EVAR. The rate of late complications, such as endoleaks and endoprosthesis failure, is lower with OSR, which may justify its choice. However, prolonged recovery and a high rate of post-operative complications make this approach less viable for elderly and frail patients.

According to Alberga *et al.* (2021), the perioperative mortality rate in octogenarians was 1.9% for EVAR and 11.8% for OSR, with the presence of comorbidities being a determining factor in the choice of procedure. Patients without comorbidities had lower mortality rates, reinforcing the need for a careful assessment before making a therapeutic decision. According to Sada *et al.* (2024), the choice of surgical technique can also be influenced by the type of anesthesia used, with regional anesthesia being a viable alternative for high-risk patients, reducing pulmonary complications and the need for post-operative ventilatory support. Thus, the literature indicates that EVAR is the preferred approach for the elderly due to lower morbidity and mortality in the immediate postoperative period, while OSR may be indicated for patients with a longer life expectancy and lower operative risk, ensuring greater durability of the repair (Alberga *et al.*, 2021; Sada *et al.*, 2024).

FRAILITY, COMORBIDITIES AND RISK FACTORS IN THE MANAGEMENT OF AAA IN THE ELDERLY

According to Blair *et al.* (2023), frailty and the presence of comorbidities are determining factors in the postoperative prognosis of elderly people undergoing abdominal aortic aneurysm (AAA) repair. Patients with chronic diseases, such as renal and heart failure, have significantly higher 30-day mortality rates. In addition, the ASA IV-V classification was identified as a strong predictor of complications, including respiratory failure and cardiovascular complications. These findings reinforce the importance of a careful evaluation prior to surgical indication, in order to minimize risks and optimize clinical outcomes.

According to Park *et al.* (2021), an analysis of outcomes between octogenarians and younger patients undergoing AAA repair revealed a higher prevalence of hypertension (86.2% vs. 69.9%) and chronic kidney disease (13.8% vs. 4.4%) among the elderly. In addition, complications such as postoperative delirium (15.5% vs. 3.4%) and respiratory infections (5.2% vs. 1.2%) were more frequent in this group. However, the authors emphasize that advanced age should not be considered an absolute contraindication to surgery, since factors such as nutritional status and hemodynamic stability directly influence outcomes.

According to Rockley *et al.* (2020), perioperative management strategies adapted to the patient's frailty can reduce the rate of postoperative complications. Strict monitoring of hemodynamic and respiratory parameters, combined with the judicious use of anesthesia and nutritional support, has been shown to have a positive impact on postoperative recovery. Thus, individualizing the surgical approach can contribute to better clinical outcomes and a reduction in serious complications in elderly patients undergoing AAA repair.

The survival of octogenarian patients undergoing surgery for ruptured AAA reinforces the need for careful selection. The study revealed that, one year after the procedure, 50% of patients were still alive, and 82.6% of survivors returned to their preoperative place of residence, indicating satisfactory functional recovery. However, patients with multiple comorbidities and functional dependence had significantly higher mortality rates. Thus, the decision for surgery should be based not only on chronological age, but also on the patient's functional condition and expected recovery (Roosendaal *et al.*, 2021)

LONG-TERM OUTCOMES AND REINTERVENTION RATES

According to Banno *et al.* (2021), long-term survival after endovascular abdominal aortic aneurysm repair (EVAR) and open surgery (OSR) in octogenarians varies according to the technique used and the clinical conditions of the patients. In a five-year analysis, the survival rate was 50.5% for EVAR and 43.3% for OSR, with an initial advantage for EVAR due to lower perioperative mortality. However, EVAR showed a higher rate of reinterventions over time due to the incidence of endoleaks and structural failures of the stent, while the durability of OSR was superior (Banno *et al.*, 2021; Marcos Garcia *et al.*, 2021).

(2021), although EVAR provides faster recovery, the need for continuous reinterventions can compromise its long-term effectiveness. The study showed that reintervention rates were 10% in elderly patients undergoing EVAR, while in OSR this rate was only 5%. In addition, the rate of late complications, such as stent thrombosis and vascular infections, was higher in the EVAR group, making it essential to carry out close follow-up to identify structural complications early (Marcos Garcia *et al.*, 2021; Isernia *et al.*, 2021).

For Elahwal *et al.* (2024), endovascular fenestration (EVFAR) has emerged as a promising alternative for elderly patients with unfavorable anatomy for conventional EVAR, with technical success rates comparable to those of younger patients. However, data indicate that the overall survival of octogenarians undergoing EVAR is lower than that of younger patients, with a tendency towards a higher incidence of reinterventions due to the complexity of the procedure. Isernia *et al.* (2021) point out that late occlusion of the iliac branches was one of the main causes of EVAR failure, reinforcing the importance of individualized assessment to choose the most appropriate technique (Elahwal *et al.*, 2024; Isernia *et al.*, 2021).

IMPACT OF PERSONALIZED APPROACHES AND DETERMINING FACTORS ON TREATMENT SUCCESS

The adoption of personalized approaches in the treatment of abdominal aortic aneurysms (AAA) has proven essential for optimizing clinical outcomes, especially in elderly populations. The individualization of treatment, based on the anatomy of the aneurysm and the patient's clinical conditions, contributes to the most appropriate selection between endovascular repair (EVAR) and open surgery (OSR). Studies have shown that careful selection of patients for EVAR can significantly reduce perioperative morbidity and mortality rates and prolong the durability of the endoprosthesis (Pasqui *et al.*, 2021).

According to Zil-E-Ali *et al.* (2022), the determining factors for successful treatment of AAA go beyond the choice of surgical technique, including perioperative management and postoperative follow-up. Functional assessment of the patient, combined with cardiovascular risk stratification and the implementation of rehabilitation protocols, contributes to better long-term outcomes. In addition, advances in the customization of endovascular devices allow for more precise adaptation to the morphology of the aneurysm, minimizing the incidence of endoleaks and the need for reinterventions.

According to Jacobs *et al.* (2022), referral centers with a high volume of procedures have more favorable rates of therapeutic success, attributed to the experience of the multidisciplinary team and the adoption of evidence-based strategies. Rigorous patient monitoring, combined with early management of complications and individualization of the treatment plan, has a direct impact on the survival and quality of life of patients undergoing AAA repair. According to Vikan *et al.* (2024), the choice between surgical treatment and conservative follow-up must take into ac-

count not only the anatomy of the aneurysm, but also the life expectancy of the patient and the operative risk. The study showed that, in nonagenarians, EVAR was the preferred approach, with a lower short-term mortality rate, although the long-term survival results are still debated (Jacobs *et al.*, 2022; Vikan *et al.*, 2024).

FINAL CONSIDERATIONS

The management of abdominal aortic aneurysms in the elderly represents a significant challenge due to the high prevalence of comorbidities in this population, requiring an individualized approach to the choice of treatment between endovascular repair (EVAR) and open surgery (OSR). The findings of this review indicate that EVAR has a lower in-

-hospital mortality rate, especially in octogenarians, while open surgery can be indicated in selected cases, according to the anatomy of the aneurysm and the patient's clinical conditions. In addition, less frail patients and those taking statins show better long-term results, reinforcing the importance of preoperative preparation. However, the literature still lacks studies with prolonged follow-up that assess functional outcomes and quality of life after procedures, as well as more standardized guidelines for risk stratification and the choice of the ideal technique. Future research should focus on defining more precise criteria for patient selection, exploring the impact of perioperative management and the role of new therapeutic strategies. In this way, it will be possible to guarantee safer, more effective and individualized treatment for this population.

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