

PORCELAIN-LOOKING INFLAMMATORY ANEURYSM OF THE COMMON ILIAC ARTERY: A LITERATURE REVIEW

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Abstract: The pathogenesis of iliac artery aneurysms is multifactorial and similar to that of abdominal aortic aneurysms (AAA). Contributing etiologies include predominantly atherosclerotic changes, inflammatory processes, arterial wall stress and strain, proteolytic degradation of arterial wall tissue, and molecular genetics. Most patients experience abdominal pain, although some cases may mimic symptoms of other conditions, similar to the pain of appendicitis. The prevalence is higher in males and in the age group between 65 and 75 years. Diagnosis is usually made through imaging and physical examination. Ultrasonography is commonly used as a screening study, while Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) provide images with greater precision or accuracy. The goal of surgical intervention is to eliminate aneurysmal flow and wall tension, thereby preventing further dilation and rupture. Several reconstruction options have been proposed, including resection of the aneurysm with reconstruction of the artery using prosthetic material, aneurysmorrhaphy and reconstruction using a venous or prosthetic graft. Endovascular treatment has been increasingly used, with advantages such as less blood loss, minimal trauma, faster recovery and shorter hospital stay. However, in some cases, open surgical repair may be preferable due to limitations of the endoluminal approach. Some alternative techniques have been developed, such as open surgical repair through a median incision, retroperitoneal approach or endovascular treatment, to preserve blood flow in the hypogastric arteries in patients with incompatible anatomy, demonstrating technical success and low rate of pelvic ischemia.

Keywords: Iliac aneurysm; Aneurysm; Arteritis.

INTRODUCTION

The aneurysm is characterized as a focal dilation of an artery, which presents an increase of more than 50% in relation to the normal diameter of the vessel, which can cause rupture of the arterial wall and be fatal (CAPOCCIA & RIMBAUD, 2015). To standardize, the value of 02 cm is used as the mean diameter of the abdominal aorta, considered aneurysmal when it reaches more than 03 cm (PEREIRA & PEREIRA, 2013). Aneurysm formation most often occurs in the abdominal aorta, but may also be seen in other locations, such as a thoracic or peripheral aneurysm (BUSCH et al., 2017).

Inflammatory aneurysms are a distinct clinical entity in which there is significant thickening of the arterial wall with extensive perianeurysmal and retroperitoneal fibrosis. These are different from intimate sarcomas of the arteries, malignant tumors with characteristics similar to inflammatory aneurysms, including presenting markers (SEO et al., 2020).

The abdominal aorta is most commonly affected by inflammatory aneurysms, which are accompanied by inflammation and can cause problems for adjacent organs (CAPOCCIA & RIMBAUD, 2015).

The pathogenicity of iliac artery aneurysms is similar to that of abdominal aortic aneurysms. According to Wilderman and Sanchez (2011), the etiologies include atherosclerotic changes, inflammation, tension and stress of the vessel walls, proteolytic degradation of the tissue of the artery walls and genetic factors.

Inflammatory aneurysms represent only 3-10% of all aortoiliac aneurysms and are more common in men, with a ratio of 90:1 to 30:1 in relation to women (PARAVASTU et al., 2009). As mentioned by Wilderman and Sanchez (2011), these aneurysms are more common in the iliac arteries than in the aorta, and may occur in the context of retroperitoneal fibrosis

and, on ultrasound, they present thick walls surrounded by hypoechoic fibrotic tissue.

Inflammatory aneurysms of the common iliac artery can cause urological complications in some situations due to the possibility of ureter entrapment by perianeurysmal fibrosis and even simulate an acute appendicitis (MIEOG et al., 2008).

Ferreira et al. (2010) suggest that hypertension is the most prevalent cause of aneurysms, being diagnosed 10 years earlier when associated with smoking. Pereira and Pereira (2013) point to advanced age, smoking, male sex and family history as the main risk factors, with diabetes being a protective factor.

Rare but clinically significant single-gene diseases associated with aortic aneurysms include Marfan and Ehlers-Danlos syndromes (PEREIRA & PEREIRA, 2013) and neurofibromatosis (TRAJBAR et al., 2006).

Other etiologies for inflammatory aneurysms include Kawasaki's disease (YOSHIKANE et al., 2004), Behçet's disease, characterized as a multisystem inflammatory disorder, Takayasu's arteritis, a chronic inflammatory disease of idiopathic etiology that mainly affects the aorta and its branches (Lima et al., 2011), Horton's disease and IgG4-related periarteritis. In addition to vascular trauma that can also be causes (MIZUSHIMA et al., 2014).

Before the revolution in modern radiology, inflammatory aneurysms were often discovered only during surgery. Nowadays, computed tomography (CT) and magnetic resonance imaging (MRI) provide enough information for the diagnosis of inflammatory aneurysms. In up to 73% of cases, using only CT, it was possible to give an accurate diagnosis. MRI, superior to CT for evaluation, showed a correct diagnosis rate equivalent to the surgical finding, providing better preparation and basis for planning and choosing the surgical method (STELLA et al.,

1991; KOCH et al., 1994).

The treatment of the aneurysm aims to prevent its rupture, and can be performed surgically by open repair, which involves opening the abdomen, or endovascularly. According to Paravastu et al. (2009), both methods can be considered in the therapeutic approach, depending on each specific case. The endovascular method is associated with lower mortality in 01 year compared to open surgery, however open surgery is preferred in cases of present hydronephrosis. The present study aims to gather information on inflammatory aneurysms in the common iliac arteries, identify the main differences between inflammatory aneurysms and the others, their repercussions, prevalence, diagnosis, follow-up and therapeutic decisions, in addition to deepening knowledge about inflammatory aneurysms in the common iliac arteries in porcelain, exploring its main aspects and presenting the pathophysiology.

METHODOLOGY

This is an integrative literature review, with emphasis on non-probabilistic retrospective observational studies for convenience. The research was carried out using virtual searches on the platforms *National Library of Medicine* (PubMed) and *The Cochrane Library*, between the months of August and October 2022.

The descriptor used in the research was: "Aneurysms in the common iliac artery". Articles and reviews referring to inflammatory aneurysms in the iliac artery, published between 1972 and 2022, articles in English, Portuguese and Spanish, works available in full and diagnostic manuals were included. Resulting in a total of 1962 articles available. On the other hand, congress or conference proceedings, theses, duplicate articles, research available only in the form of abstracts and works that did not address the proposed topic were excluded. Thus, the filters

available in the databases were used, reading the titles of the works, reading the abstracts of the publications and, finally, reading the articles in full, we selected a total of 7 works used in this study.

Thus, the articles selected for analysis and final study addressed the proposed topic, while those that did not contain information on inflammatory aneurysms in the common iliac arteries were excluded.

RESULTS AND DISCUSSION

In this section, we will address the results and discussions found in databases on the inflammatory porcelain-like aneurysm in the common iliac artery. In Figure 01, we can observe the flowchart of the articles found after applying the aforementioned methodology. We found that 1962 articles were found, of which 1828 were excluded for not addressing the proposed topic. Of the remaining 134, 52 came from congress or conference proceedings, and 75 from research that was only available in abstract format. Thus, 7 articles were selected that gathered information about inflammatory aneurysms in the common iliac arteries, identifying the main differences between inflammatory aneurysms of the other types.

Finally, these articles were selected to compose the final sample and were organized in Table 1, which presents the characteristics evaluated in this study.

Most of the works (about 85%) are case reports ($n = 6$) and retrospective review studies (about 15%; $n = 1$). In these studies, it is possible to determine that the pathogenesis of iliac artery aneurysms is multifactorial and similar to that of AAA. As seen in the case reports, etiologies that have been reported to contribute to iliac aneurysmal dilation include atherosclerotic changes, inflammation, wall stress and tension, and proteolytic degradation of arterial wall tissue, as well as

molecular genetics, other less common causes include infection, trauma, arteritis, collagen vascular diseases and pregnancy. These data are in direct agreement with the literature, in which, histologically, an iliac aneurysm is characterized by macrophage degradation of the middle elastic lamellar architecture by metalloproteinases (BUSCH et al., 2017).

In the case reports of this synthesis, most patients with iliac artery aneurysms presented the symptom of abdominal pain. On the other hand, Magliocca et al (2005) presents a patient with severe right hydronephrosis and inflammatory aneurysm of the right common iliac artery with intramural thrombus, focal calcification and periarterial inflammation through a CT scan. In the study, it is reported that episodic and heterogeneous inflammatory processes are important for the progression of aneurysms.

The AAI are predominantly male. Depending on the study, it is estimated that the difference is somewhere around 90:1 for men versus 30:1 for women. The age range is reported at around 65 to 75 years (FERREIRA et al, 2010). The patients in this study were diagnosed through imaging and physical examination, as can be seen in the study by Mieog et al. (2008) the physical examination of patients with inflammatory aneurysms in the common iliac artery are generally difficult and undetectable, due to their location deep within the pelvis, unless they are larger than 4 cm and the examination is performed in patients with a favorable body morphology (Figure 2). Another point raised by this study is that the disease can mimic the symptoms of appendicitis, making diagnosis difficult through physical examination. Therefore, abdominal imaging tests are often used to aid in the diagnosis.

Generally, ultrasonography is used as the diagnostic screening study of choice for iliac artery aneurysms due to its availability and

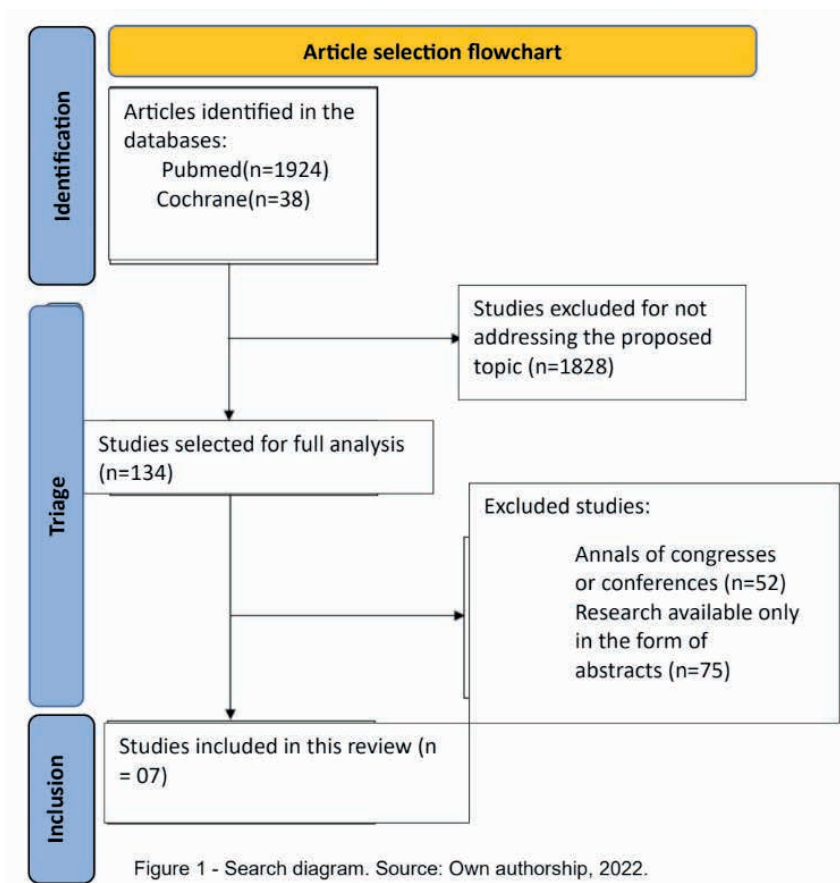


Figure 1 - Search diagram. Source: Own authorship, 2022.

Study	Kind of study	Epidemiology	Diagnosis	Handling of the case	Therapeutic choice
FERREIRA et al, 2010.	Case review	11 patients with 16 isolated iliac artery aneurysms (IAAs), representing 12.8% of all repaired intra-abdominal aneurysms. Most located in the common iliac artery, and 27.3% were multiple. The patients were men, with a mean age of 69.0±6.0 years. Degenerative atherosclerosis was the cause in ten patients, and infection in one.	The diagnosis was made through imaging tests and physical examination in some cases.	Patients were treated with open or endovascular repair, depending on the location and extent of the aneurysm.	It varied according to the location and extent of the aneurysm. Patients with smaller aneurysms were treated electively, larger aneurysms or rupture were treated on an emergency basis. Endovascular repair was an option in some cases. Most patients had a good postoperative evolution, with low mortality and morbidity.

HOPE et al., 2015	Case report	A 53-year-old male who presented with a related ureteral obstruction	Using a multimodality imaging approach to assess the inflammatory component of an iliac artery aneurysm	Combining PET and RN imaging with the use of ferumoxytol as a contrast agent. The distribution of PET findings overlaps but is not identical with late ferumoxytol imaging, suggesting that complementary approaches are able to assess different stages of the inflammatory process. These techniques can help identify vascular inflammation and disease progression of the aneurysm.	Not reported
MAGLIOCCA et al., 2005	Case report	49-year-old woman with a 1-week history of right flank and right lower quadrant abdominal pain	She was diagnosed with severe right hydronephrosis and inflammatory aneurysm of the right common iliac artery with intramural thrombus, focal calcification and periarterial inflammation through a computed tomography (CT) scan of the abdomen and pelvis.	An open repair of the aneurysm was performed with a polytetrafluoroethylene (PTFE) graft. The patient had an uneventful postoperative course and recovered well.	Due to the short neck of the proximal right common iliac artery, we opted for open repair with PTFE interposed between the graft and the right ureter to provide a tissue partition between the two structures.
MIEOG et al., 2008	Case report	A 43-year-old man presented to the emergency department with acute, severe abdominal pain.	After physical examination and initial laboratory evaluation, the possibility of appendicitis was suspected and watchful waiting was chosen. However, after further evaluation, a pulsatile mass was identified in the lower right region of the abdomen and the diagnosis of inflammatory aneurysm was confirmed through imaging and histopathological analysis.	A resection of the aneurysm and an anastomosis of a bifurcated graft were performed. The patient recovered without complications and had good peripheral circulation during long-term follow-up.	Surgery was chosen despite technical difficulties due to extensive fibrosis. Although endovascular repair is an alternative, it has not been performed due to the lack of evidence on its long-term effects, especially in young patients without comorbidities, and the need to cover the internal iliac artery.
ZAHDI & LEKEHAL, 2021	Case report	Male, 67 years old, with history of abdominal pain for one month. Smoker and hypertensive.	Isolated aneurysm of the right common iliac artery, measuring 40 mm in diameter, without a proximal neck and extending to the iliac bifurcation, confirmed by angiogramography.	Surgical indication due to the high risk of rupture. An open surgical repair was performed via a transperitoneal approach using a bifurcated polytetrafluoroethylene graft with end-to-end proximal aortic anastomosis below the inferior mesenteric artery and two distal end-to-end anastomoses in the left common iliac artery and right hypogastric artery, with reimplantation of the external artery laterally in the right leg of the graft.	Open surgical repair, due to the anatomy of the aneurysm.

JENSEN et al., 2021	Retrospective review	Patients with common iliac artery (CIA) or internal iliac artery (IIA) aneurysms at least 3 cm in diameter and at risk of rupture. All patients were treated between March 2016 and December 2017 at two institutions in San Diego, United States.	Diagnosis was made based on follow-up computed tomography (CT) scans, performed at intervals according to Society for Vascular Surgery guidelines and analyzed for radiographic findings.	Patients were treated with the “eyelet” technique, which uses a balloon-expandable stent to maintain blood flow in the hypogastric arteries and minimize complications.	The “eyelet” technique was used as an alternative to preserve blood flow in the hypogastric arteries in patients with anatomy incompatible with the techniques approved by the Food and Drug Administration (FDA). The study suggests that the technique has high patency rates and clinical advantages over techniques that do not incorporate hypogastric patency, such as embolization and graft exclusion for the treatment of ASD.
FOKOU et al., 2011	Case report	Farmer, 62 years old, non-smoker and consumed alcohol moderately. There was no report of other past medical illnesses or vascular risk factors.	The patient had pain and swelling in the left lower abdominal quadrant. An abdominal ultrasound examination was performed, which revealed the vascular nature of the mass. The diagnosis was confirmed by angiographic computed tomography, which showed an inflammatory aneurysm of the left iliac artery with 13.3 cm in anteroposterior diameter and 21 cm in cephalocaudal length.	Underwent reconstructive surgery using a 16/8/8 mm Dacron bifurcated graft. Before the 65 minutes of clamping time, intravenous heparin was administered. An end-to-end anastomosis was performed with the infrarenal aorta. Distally, a left common femoral anastomosis was performed and the right branch of the graft was inserted through the right common iliac artery, preserving the right internal iliac artery. Ureterolysis was impossible due to the extension of the fibrous tissue, therefore, a left to right ureteral transposition was performed.	A bifurcated Dacron graft was used in this case due to the high risk of endoleak related to the size of the aneurysm and the difficulty of preserving the right hypogastric iliac artery. A surgical approach was performed with bilateral exposure of the groin and left-to-right ureteral transposition.

TABLE 1 – ANALYSIS OF SELECTED ARTICLES.

Source: Own authorship, 2022.

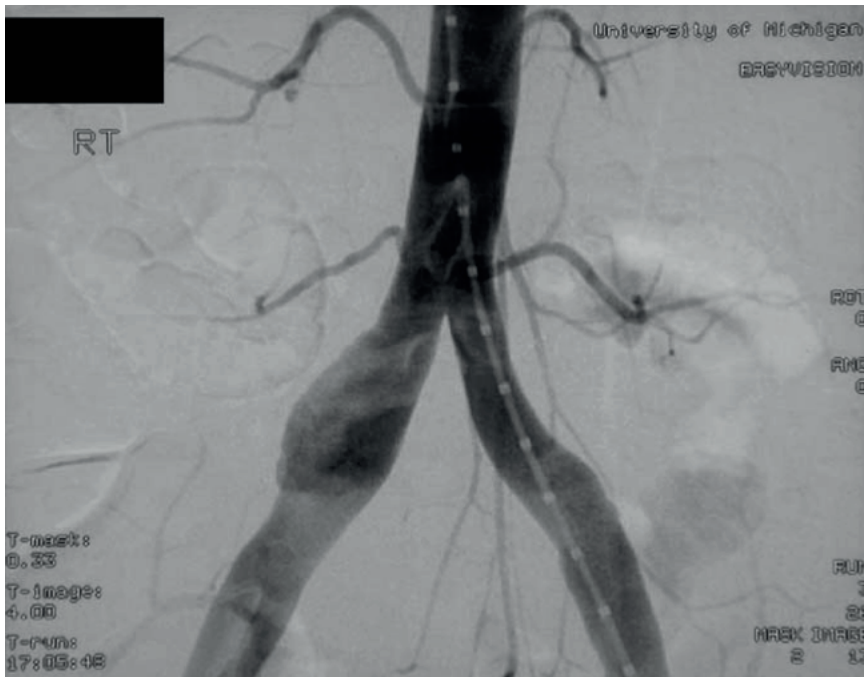


Figure 2 – Anatomy of a common iliac artery with aneurysm. Source: MAGLIOCCA et al., 2005.

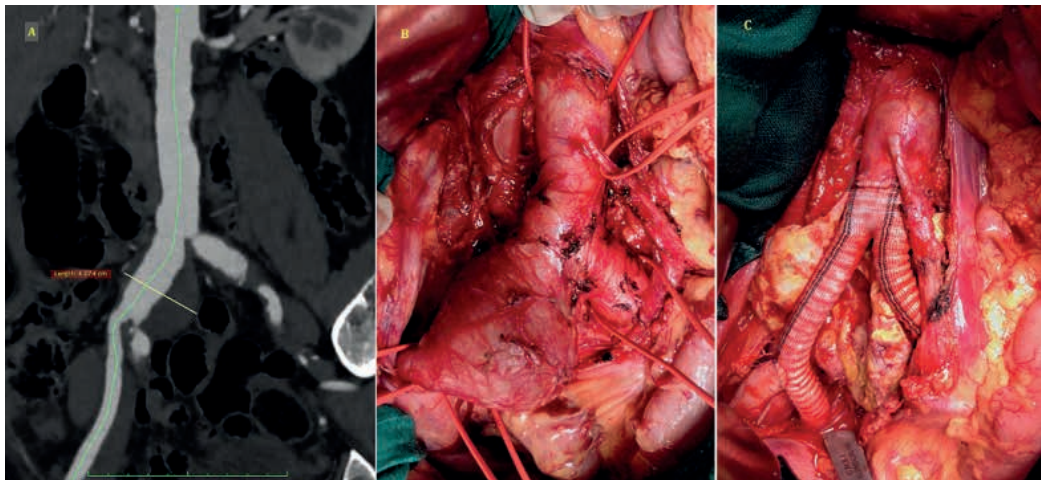


Figure 3 - A) Computed angi tomography image showing aneurysm in the right common iliac artery; B) Intraoperative observation of the isolated aneurysm with monitoring of the aorta and distal iliac arteries; C) Surgical view of restoration of arterial circulation. Source: Zahdi & Lekehal, 2021.

relatively low cost compared to Computed Tomography (CT) or Magnetic Resonance Imaging (MRI). However, CT provides a more accurate diagnostic image, allowing for exact measurements and locations of an aneurysm, aiding in operative planning. Magnetic angioresonance is also an effective tool, although its cost is higher compared to CT, and is generally reserved for patients with contrast allergies or at risk of dye-induced nephrotoxicity.

In the study by Hope et al. (2015), the researchers went further and used a combination of positron emission tomography (PET) and MRI images, which demonstrated considerable growth of the iliac aneurysm over two years. Due to the patient's renal failure, iodinated contrast was not administered. However, five days after ferumoxytol administration, focal regions of signal abandonment through the thickened aneurysm wall were revealed on MRI, indicating macrophage deposits.

The main objective of surgical intervention for iliac artery aneurysms is to eliminate aneurysmal flow and wall tension, preventing future dilation and rupture. Several reconstruction options have been proposed based on the size, location and etiology of the aneurysm, including resection of the aneurysm with reconstruction of the artery using prosthetic material, aneurysmorrhaphy and reconstruction using a venous or prosthetic graft (Figure 3).

In the case of inflammatory drugs, Fokou et al. (2011) argues that due to the high risk of rupture and entrapment of adjacent structures, surgical treatment in a smaller diameter is perhaps the best choice. As with patients with AAA, it is important to critically assess the patient's operative risk prior to any intervention. This includes assessing the patient's anatomy, specifically location, size, and surrounding structures.

In patients considered for elective repair, the surgeon must determine the best approach based on the patient's overall health status, life expectancy, aneurysm location, branch involvement and the repercussions of branch occlusion, bilaterality of aneurysms, aortic involvement, devices available for endovascular repair of the specific anatomy, along with the risks and benefits of both open and endovascular repair for the specific patient.

An open surgical repair through a midline incision or retroperitoneal approach, depending on the location of the aneurysm, with the insertion of an interposition graft has long been the standard of care. However, as described by Ferreira et al. (2010), the endovascular treatment of aneurysms or pseudoaneurysms of the iliac artery has been increasingly used. Endoluminal methods allow the surgeon to access the arterial system from the femoral arteries, rather than requiring deep and extensive pelvic dissection, with its associated potential complications.

This approach is even more useful in patients at high operative risk due to significant medical comorbidities, previous abdominal or pelvic surgery, abdominal or pelvic radiotherapy, lower abdominal stomas, or morbid obesity. In addition, other advantages of the endoluminal approach are decreased blood loss, minimal trauma to the patient, faster recovery, and shorter hospital stays. However, Mieog et al. (2008) disagrees with the use of endovascular treatment in patients with inflammatory aneurysm at a young age and without comorbidities in the case of the study by Zahdi & Lekehal (2021), due to the anatomical layout of the aneurysm, open surgical repair was preferable, demonstrating once again that it is not always possible to use the endoluminal approach, due to its limitations either because of the anatomy of the vessel, the surgeon's ability to handle the

devices and the possibility of a late endoleak (blood flow in the aneurysm after treatment, usually caused by the presence of a weak spot or malformation in the stent seal).

In the study by Jensen et al. (2021), some techniques were developed to be used as an alternative in patients with anatomy incompatible with the techniques approved by the Food and Drug Administration (FDA) to preserve blood flow in the hypogastric arteries. The endovascular technique involved placement of stents in the internal and external iliac arteries, with balloon expansion to minimize gutters between the endografts.

Primary outcomes included technical success, limb patency, and presence of leaks. This technique was performed with excellent safety in the short and medium term in patients with varied anatomy of the aneurysm. The high technical success rates and low pelvic ischemia rate represent an improvement over conventional techniques that sacrifice the hypogastric artery, which justifies additional testing in a larger series of patients with long-term follow-up.

CONCLUSION

Inflammatory iliac artery aneurysms have multifactorial causes, including atherosclerotic changes, inflammation, stress, arterial wall tension, and other conditions. Symptoms include abdominal pain, hydronephrosis, intramural thrombus, focal calcification, and periarterial inflammation. They are most common in men between the ages of 65 and 75 and are diagnosed through imaging tests. Surgical treatment is indicated to prevent future dilation and rupture of the aneurysm, which may be open or endovascular. The endovascular approach has advantages over the open approach, such as decreased blood loss, minimal trauma to the patient, faster recovery, and shorter hospital stays.

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