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## RESEARCH ARTICLE

### GASTRODUODENAL ARTERY PSEUDOANEURISM SIMULATING PANCREATIC NEOPLASIC INJURY: CASE REPORT AND LITERATURE REVIEW. GASTRODUODENAL ARTERY PSEUDOANEURISM: A SECONDARY VASCULAR COMPLICATION TO CHRONIC PANCREATITIS.

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#### ABSTRACT

Visceral artery aneurysms are uncommon conditions and, depending on the mechanism of formation and etiological factors, they can be divided into pseudoaneurysms and true aneurysms. Pseudoaneurysms are mainly caused by pancreatic inflammatory and infectious processes (pancreatitis), which allow the dissemination of proteolytic enzymes that promote vessel wall weakening and erosion. A 44-year-old male patient was admitted to our hospital with abdominal complaints. He underwent ultrasound and computed tomography that diagnosed vascular pseudoaneurysm adjacent to the head of the pancreas and biliary tract. Endovascular technique has currently been the strategy of choice for the treatment of pseudoaneurysms, as it is a safe and effective method, less aggressive, generally as a shorter hospital stay.

#### INTRODUCTION

Visceral artery aneurysms are uncommon conditions and, depending on the mechanism of formation and etiological factors, they can be divided into pseudoaneurysms and true aneurysms (Budzyński, 2016; Habib, 2013). Pseudoaneurysms differ from true aneurysms in that they are not covered by the three layers of the arterial wall (intimal, middle, and adventitial) (Prette Junior, 2018) and usually develop due to rupture of the intimal and middle layers, containing no epithelialized walls (Madhusudhan et al., 2016).

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True visceral artery aneurysms have an incidence of less than 0.8% and pseudoaneurysms are even less frequent (Prette Junior, 2018). The splenic artery is the most involved visceral artery, accounting for up to 50% of cases, especially due to its proximity to the pancreas (Patel, 2003). Other affected branches are the renal artery, hepatic artery, pancreaticoduodenal artery and gastroduodenal artery. The gastroduodenal artery, for example, is affected in approximately 1.5% of all visceral arteries, mostly pseudoaneurysms due to its common association with pancreatitis (Habib, 2013).

**Case Report:** A 44-year-old male patient was admitted to the emergency room of our hospital with abdominal pain on the upper floor, with back radiation that worsens with eating, associated with weight loss and jaundice, progressing with worsening pain and episodes of hematemesis.

Physical examination revealed palpable abdominal mass. History of smoking and chronic alcoholism. Laboratory studies have shown the presence of normochromic and normocytic anemia and a slight increase in bilirubin at the expense of direct bilirubin. The patient had undergone abdominal ultrasound in another hospital, which showed a heterogeneous expansive lesion, with debris inside, this lesion located in the right epigastrium / hypochondrium, as well as intra and extrahepatic bile duct dilation and free fluid in the abdominal cavity. A new ultrasound and Doppler evaluation were performed (in our hospital) in the region described above, and an anechoic rounded image with thickened walls was identified, presenting a central area with the presence of flow and a characteristic "yin-yang" signal to the color Doppler method, suggestive of pseudoaneurysm vascular (Figure 1, 2,3). In view of the findings, a contrast-enhanced computed tomography of the abdomen was requested for investigation of alleged pancreatic neoplasia, pancreatitis and biliary tract neoplasia, where we visualized aneurysmal dilation with areas of mural thrombosis and true light inside, in topography of the gastroduodenal artery, determining compression over the portal vein and over the pancreatic head, as well as dilation of the main pancreatic duct and the intra and extrahepatic bile ducts (Figures 4,5,6,7). The opinion of the vascular surgeon was requested, and an endovascular procedure was performed with embolization of the pseudoaneurysm without complications. After 10 days of hospitalization, the patient presented hemodynamic stability, without complaints, and was chosen to be discharged for outpatient follow-up.

## DISCUSSION

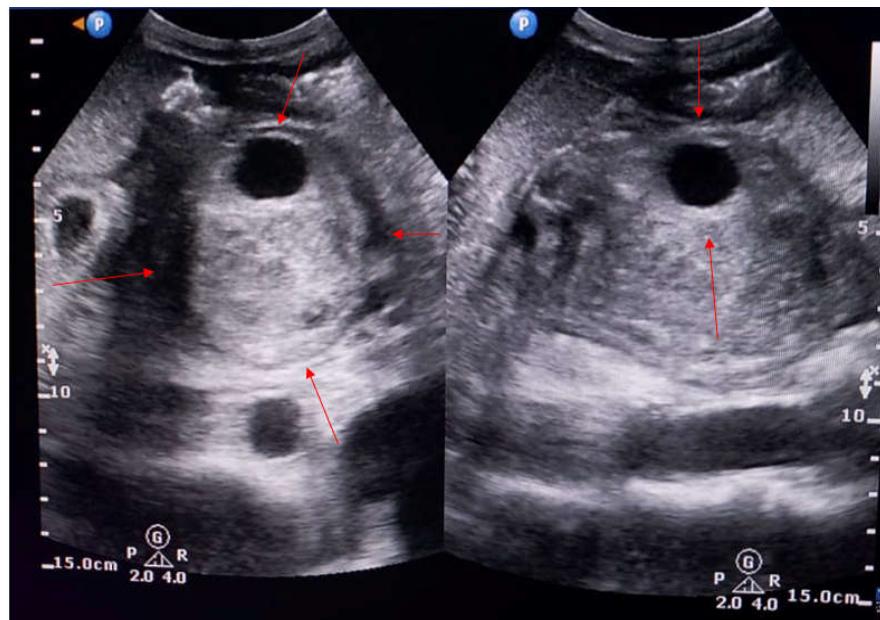
Visceral arteries pseudoaneurysms are rare, occurring mainly in middle age, especially in the age group of 50 to 58 years (Habib, 2013) and constituting a potentially life-threatening condition due to the high risk of rupture with intraperitoneal or gastrointestinal bleeding (Chen, 2018). True aneurysms have a risk of rupture of around 20%, while pseudoaneurysms, because they have one less arterial layer, spontaneously rupture in up to 70% of cases (Prette Junior, 2018; Chen, 2018). Importantly, the risk of rupture does not depend on the size of the aneurysm (Rocio Santos-Rancaño, 2015). Several factors are involved in the pathogenesis of aneurysms and pseudoaneurysms. Hypertensive patients with atherosclerotic disease, collagen disorders and fibromuscular dysplasia are predisposing factors for the formation of true aneurysms (Habib, 2013; Jesinger, 2013). Pseudoaneurysms are mainly caused by pancreatic inflammatory and infectious processes (pancreatitis), which allow the dissemination of proteolytic enzymes that promote vessel wall weakening and erosion (Habib, 2013; Barge, 2012). Patients undergoing pancreatic surgical procedures, such as Whipple procedure, also constitute a risk group for the development of vascular lesions, especially in cases of postoperative complications with enzymatic leakage and / or anastomotic dehiscence (Rocio Santos-Rancaño, 2015; Barge, 2012).

Clinically, pseudoaneurysms may present in multiple forms, often with nonspecific symptoms making diagnosis difficult, and may even be asymptomatic in 7.5% of cases (Habib, 2013). The most common clinical presentation is gastrointestinal bleeding, which may present as hematemesis or melena, which leads most doctors to initially investigate visceral pathologies through endoscopy and colonoscopy (Prette Junior, 2018).

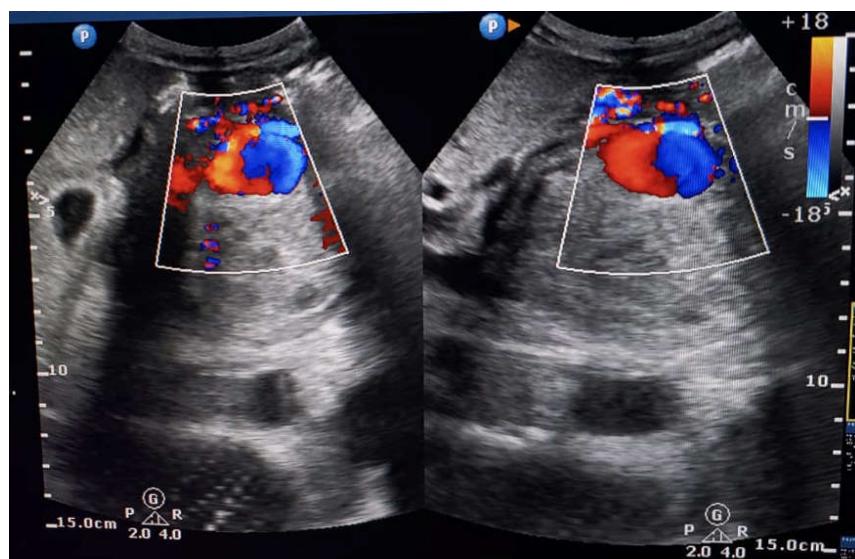
The second most common symptom is abdominal pain, observed in one third of patients, which may be associated with other nonspecific symptoms such as vomiting, diarrhea and jaundice secondary to pseudoaneurysm compression (Madhusudhan, 2016). Eventually, blood may rupture and leak into the Wirsung duct, characterized by hemosuccus pancreaticus (Habib, 2013; Barge, 2012). Vascular lesions, therefore, should be remembered and valued in the differential diagnosis in patients with acute abdominal pain (especially if hypotension and history of pancreatitis), report of recent abdominal surgery, injury that compresses adjacent organs and / or biliary structures, as well as in cases of digestive or intra / retroperitoneal bleeding without apparent causal factors (Budzyński, 2016).

Historically, most aneurysms were not diagnosed before the rupture occurred, mainly due to the scarcity of exams that would help in its detection. Currently, the advent of multiple imaging modalities has allowed the early, often incidental, diagnosis of visceral pseudoaneurysms (Chen, 2018). Color Doppler ultrasonography is usually the initial imaging exam used to evaluate pseudoaneurysms, especially those with larger and superficially located pseudoaneurysms (Prette Junior, 2018; Madhusudhan, 2016). Its advantages are the fact that it is not invasive, with low cost and easy access, and does not require the use of ionizing radiation and intravenous contrast (3,9). Some factors limit its evaluation, reducing its sensitivity, such as obesity, intestinal gases and deep localized lesions (Madhusudhan, 2016). Pseudoaneurysms classically present as an anechoic, thin-walled lesion with characteristic central flow ("yin-yang sign") (Madhusudhan, 2016; Barge, 2012). Computed tomography angiography is the most commonly used exam for the evaluation of pseudoaneurysms, with high sensitivity and rapid acquisition, allowing through its multiplanar reconstructions to determine the location / extension of the pseudoaneurysm, the presence of associated thrombosis and its relationship with adjacent structures (Barge, 2012). It also allows the identification of other associated pathologies such as the presence of pseudocyst or pancreatic necrosis, as well as the basis for preoperative planning (Prette Junior, 2018).

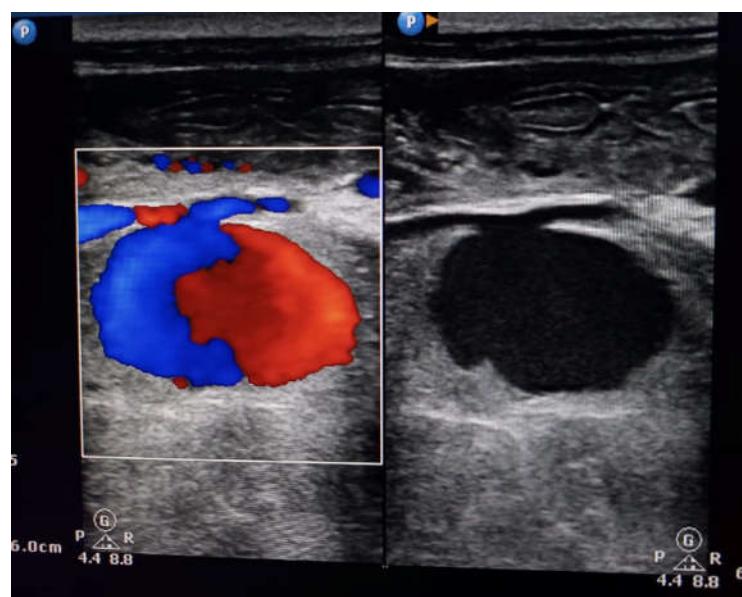
Angiography is considered the golden standard, presenting high sensitivity (which can reach 100%), allowing concomitant diagnostic confirmation and therapeutic intervention (Habib, 2013). Real-time evaluation allows quantification of pseudoaneurysm size and neck size, essential data for therapeutic planning, as well as diagnostic confirmation in cases where imaging aspects cannot differentiate between pseudoaneurysm, true aneurysm or arteriovenous fistula (Barge, 2012). Therefore, angiography in general will be requested, especially when there is a confirmed pseudoaneurysm in imaging examination and indication of embolization or in cases where there is a strong suspicion of vascular lesion with normal imaging findings (Madhusudhan, 2016). Among the main disadvantages of the endovascular procedure are the risk of aneurysm rupture and vascular thrombosis, puncture site bruising, exposure to ionizing radiation, and limitation of thrombus-containing pseudoaneurysm evaluation (Barge, 2012). Due to the high risk of rupture and associated mortality, pseudoaneurysm treatment is usually indicated as soon as it is detected (Chen, 2018). The choice of the best therapeutic approach should be individualized for each patient, depending on several factors such as evaluation of the location / size of the lesion, the



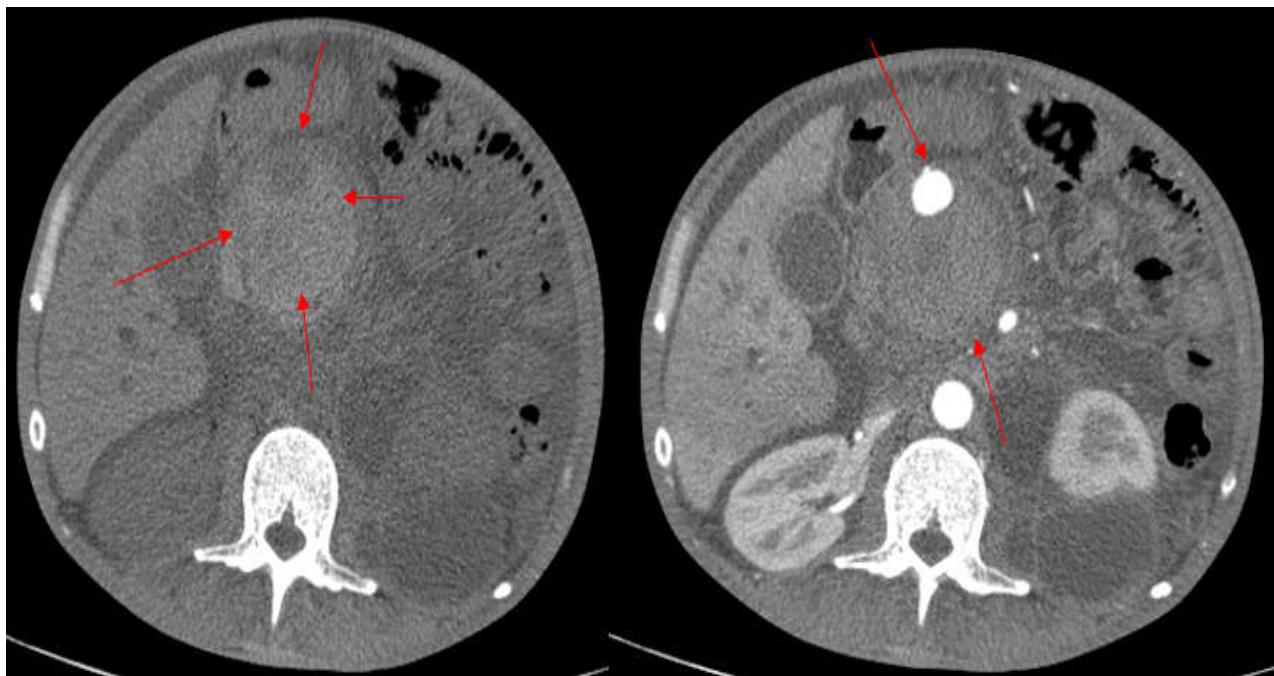
**Figure 1.** Ultrasonography (Mode B) of the epigastric / hypogastric region on the right, showing a heterogeneous expansive lesion, with debris inside and anechoic eccentric area. The lesion has an intimate contact with the pancreatic head



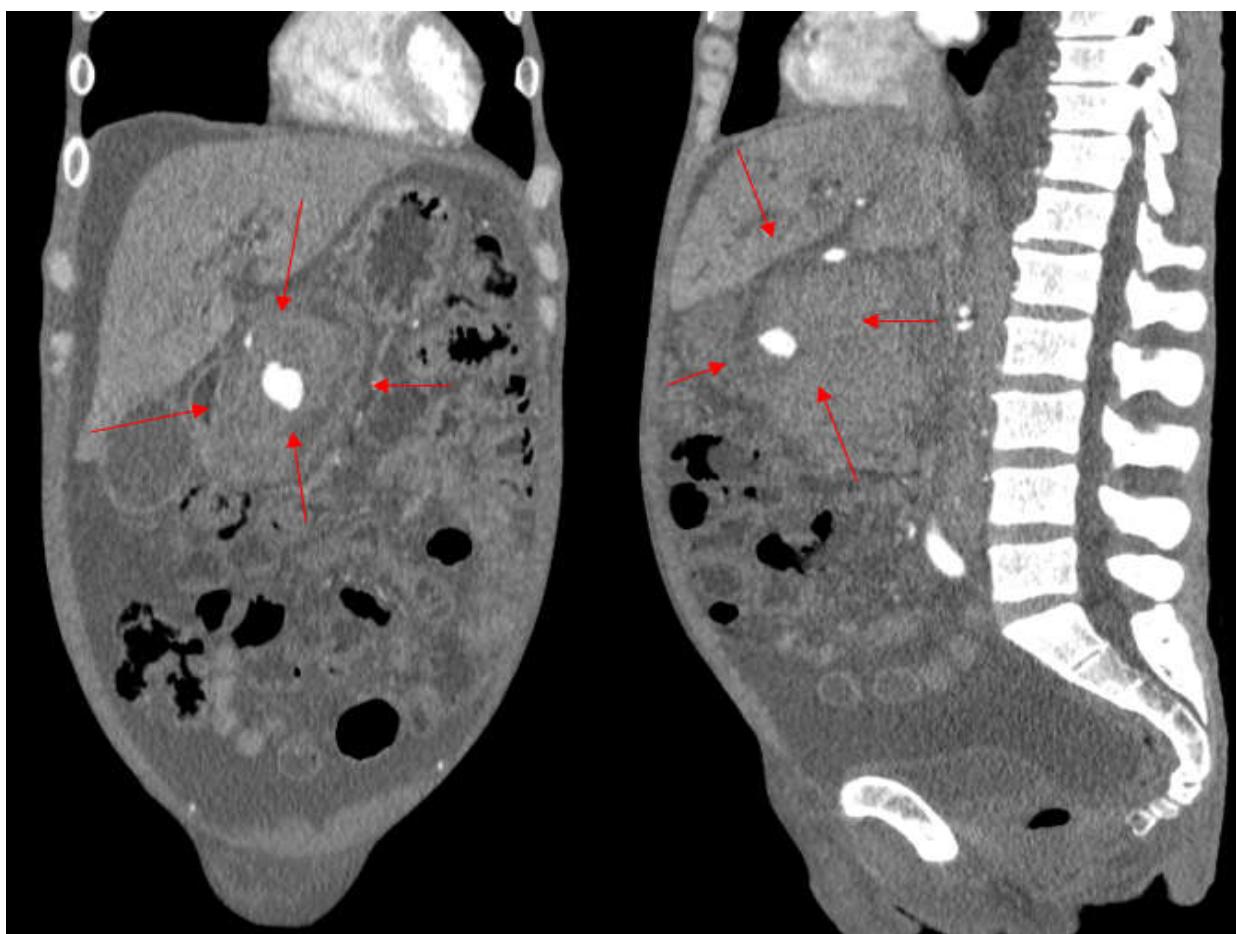
**Figure 2.** Ultrasonography (Mode Doppler) of the epigastric / hypogastric region on the right, showing flow in the lesion described in figure 1



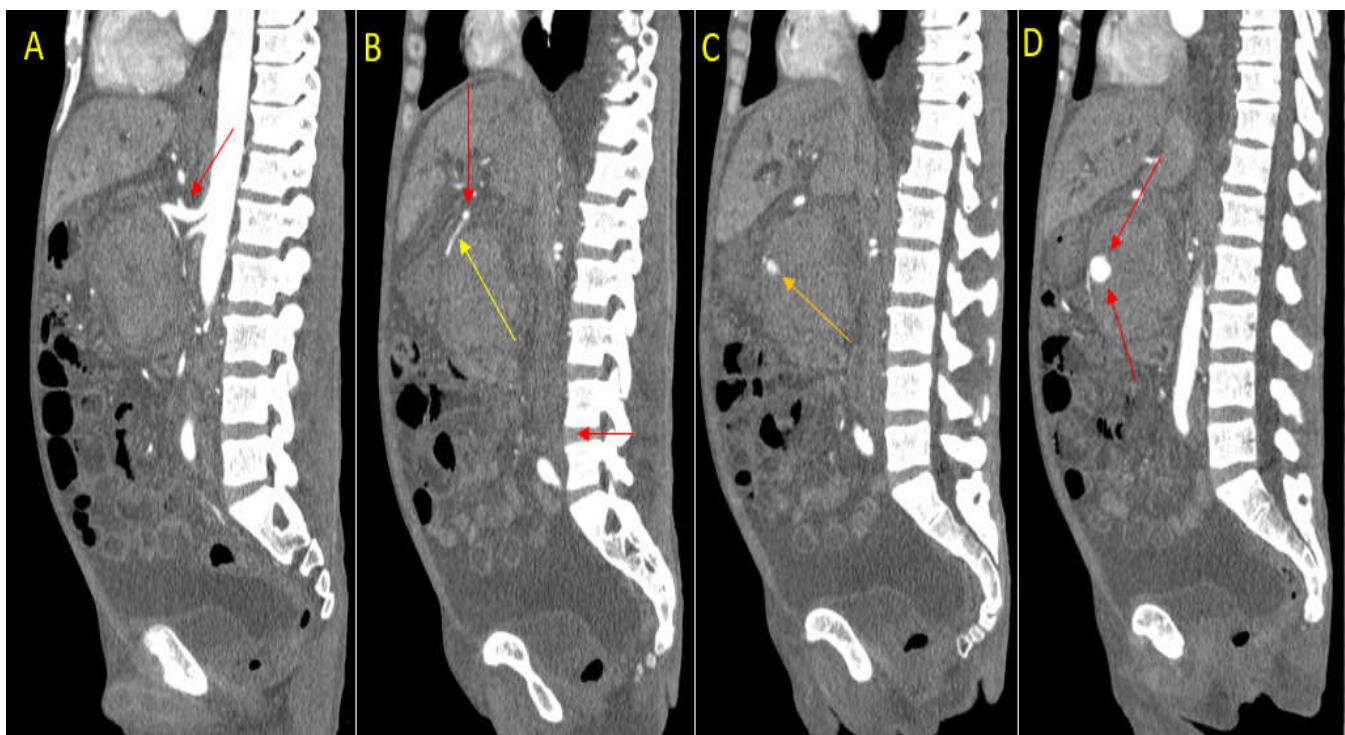
**Figure 3.** Doppler ultrasonography of the lesion depicted in figures 1 and 2, showing bi-directional flow within it (yin-yang signal), characteristic of pseudoaneurysm



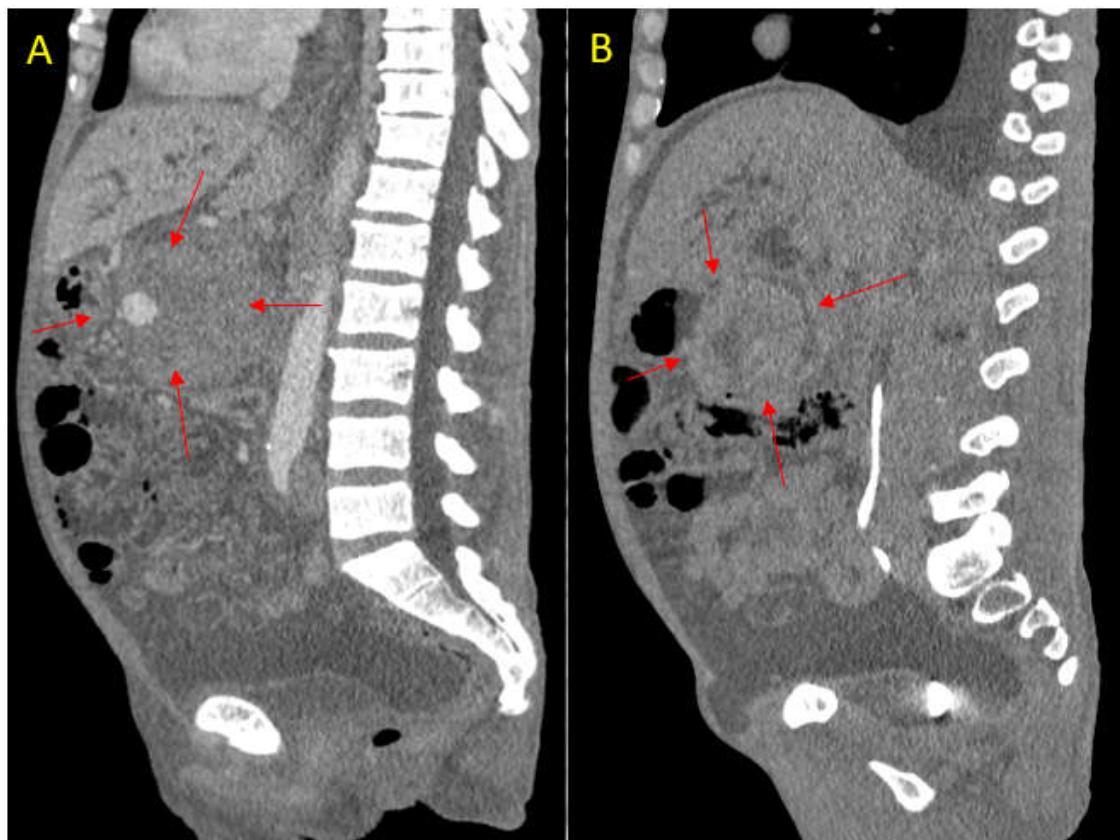
**Figure 4:** Axial section computed tomography, before and after contrast agent administration, in the arterial phase, showing heterogeneous expansive lesion, with significant vascular enhancement in its true luminal portion, in close contact with the adjacent vascular arterial segment. The lesion is located in the epigastrium / hypogastrium on the right, in close contact with the pancreatic head and bile duct structures



**Figure 5:** Coronal and sagittal computed tomography after contrast agent administration in the arterial phase, showing heterogeneous expansive lesion in multiplanes, with significant vascular enhancement in its true light, in close contact with the adjacent vascular arterial segment. The lesion is located in the epigastrium / hypogastrium on the right, in close contact with the pancreas head and bile duct structures.



**Figure 6.** Sagittal computed tomography after contrast medium administration in the arterial phase demonstrating heterogeneous expansive lesion in the right epigastrum / hypogastrum with the following vascular relationships: A: Arrow (red) indicates the origin of the celiac trunk in the abdominal aorta of the artery. B: The arrow (red) shows in transverse projection the common hepatic artery (celiac trunk branch). The arrow (yellow) shows the gastroduodenal artery, branch of the common hepatic artery. The gastroduodenal surrounds and has close contact with the lesion. C: The arrow (orange) shows the initial fill of the true light of the pseudoaneurysm. The pseudoaneurysm is in close contact with the gastroduodenal branch (afferent portion). D: The arrows (red) show the full luminal (true light) fill of the pseudoaneurysm. The pseudoaneurysm is in close contact with the gastroduodenal branch (efferent portion).



**Figure 7.** Sagittal plane computed tomography after contrast agent administration in the portal and excretory phases, showing the heterogeneous expansive lesion, with enhancement decay. The lesion is located in the epigastrum / hypogastrum on the right, in close contact with the pancreas head and bile duct structures

patient's clinical conditions and possible associated complications, such as ischemia of organs irrigated by the treated vessel (Habib, 2013; Prette Junior, 2018). Available therapeutic strategies include revascularization, endovascular and percutaneous surgical procedures. The main indications for conventional surgery would be patients with hemodynamic instability, suspected aneurysm rupture, ineffective embolization technique, and persistent bleeding or rebleeding (Prette Junior, 2018). The procedure consists of performing vessel ligation, aneurysmorrhaphy or bypass surgery (Habib, 2013). Endovascular technique has currently been the strategy of choice for the treatment of pseudoaneurysms, as it is a safe and effective method, less aggressive, generally as a shorter hospital stay (Habib, 2013; Barge, 2012). It consists in performing a distal percutaneous access, commonly in the femoral artery or vein, followed by catheterization of the affected artery, distal, proximal embolization and pseudoaneurysm sac through the placement of synthetic springs or polymers (Prette Junior, 2018; Jesinger, 2013). After embolization, it is essential to keep the patient under observation due to the risk of rebleeding, which occurs in about 20 to 40% of cases (Budzyński, Jacek, 2016).

## Conclusion

Visceral artery pseudoaneurysms are rare pathologies that should be valued and remembered in the differential diagnosis of abdominal injuries, especially in the context of patients with hemodynamic instability. Its recognition is of fundamental importance for early intervention, with evaluation of the best approach method, thus reducing the chance of rupture and death of the patient.

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