REVIEW ARTICLE

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ULTRASOUND FINDINGS IN PATIENTS WITH PANCREATIC TRAUMA AND THEIR CORRELATION WITH COMPUTED TOMOGRAPHY

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ABSTRACT

INTRODUCTION: Pancreatic trauma is a rare event that is characterized by being difficult to diagnose. This is due to its retroperitoneal and intimate location with several important structures, making its clinical picture extremely nonspecific, being associated with great morbidity and mortality. Considering this, diagnostic imaging aims to try to reduce late damage control and, therefore, improve the outcome of patients. Among the diagnostic methods, ultrasonography and computed tomography stand out.

OBJECTIVE: To study the ultrasound findings in the diagnosis of pancreatic trauma and their correlation with computed tomography.

METHODOLOGY: It is a narrative review with emphasis on the collection of images. The databases were MEDLINE via PubMed, LILACS and Scielo via VHL (Virtual Health Library). The health descriptors (MeSH terms) in English are "pancreatic trauma", "ultrasonography", "ultrasound", "computed tomography", "diagnostic imaging", in the following search strategy: (pancreatic trauma) AND (ultrasonography OR ultrasound OR computed tomography OR diagnostic imaging). Studies (clinical trials, pictorial essays, literature reviews, among others) that had images of diagnostic methods that were in accordance with the research objective and available online in full text, published in the last 20 years, in English, Spanish and Portuguese.

RESULTS AND DISCUSSION: In the diagnosis of pancreatic trauma, it is known that ultrasound, despite being the screening test in trauma patients, has little accuracy in detecting parenchymal injuries, depending on the location of the lesion. In addition, the use of contrast improves the accuracy for detecting parenchymal lesions, allowing the detection of changes in perfusion (anechoic or hypoechoic region), contrast extravasation, edema, irregularities in the pancreatic borders, visualization of peripancreatic fluids. Computed tomography is considered the gold standard for diagnosing pancreatic trauma. Lesions are usually seen as a heterogeneous region accompanied by a region of low attenuation, in addition to an area of hypoperfusion when using intravenous contrast.

CONCLUSION: Ultrasonography is accurate in diagnosing traumatic pancreas lesions; however, with nonspecific or subtle findings, many times. The use of contrast plays a very important role in the initial detection of pancreatic trauma, even in small lesions. Computed tomography stands out in this diagnosis, as it was possible to observe in all the cases presented.

KEYWORDS: PANCREATIC TRAUMA, COMPUTED TOMOGRAPHY, ULTRASOUND, DIAGNOSTIC IMAGING

INTRODUCTION

Trauma is the leading cause of death in people between 1 and 44 years old[1]. Currently, according to data collected by the 10th edition of Advanced Trauma Life Support (ATLS), it is responsible for the death of about 5.8 million individuals per year, of all ages and economic groups in the world, totaling 18% of deaths by diseases in world reference[1].

Major trauma, also known as multiple trauma or polytrauma, is defined as a potentially fatal injury to more than one region of the body[2]. In the United States, around 10% of all deaths from trauma are due to abdominal injuries[3]. In cases of this type, the initial and fundamental objective for a good evolution of the patient is a quick and accurate diagnosis of the respective injuries so that it is possible to manage the polytraumatized patient in an efficient way, avoiding unfavorable clinical evolution [2,4]. Pancreatic injuries account for 2% of all major trauma and 10% of abdominal trauma [5].

The pancreas is a long, "J-shaped" retroperitoneal organ, positioned transversely in the upper abdominal wall, at the level of the 1st and 2nd lumbar vertebrae. It is surrounded by several important structures: it is located posterior to the stomach, on the left from the spleen, to the right of the duodenum and anterior to the great vessels. Anatomically, it is divided into: head (divided into uncinate process and omental tubercle), neck, body and tail[6].

In adults, its retroperitoneal position relatively protects it from most blunt abdominal trauma, the main etiology of traumatic pancreatic injury being penetrating abdominal trauma (mainly from a firearm). In children and young adults, this is reversed, as they have much thinner protection

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by abdominal adipose tissue[7].

Concomitantly, lesions in retroperitoneal structures are usually difficult to diagnose, since physical and laboratory examinations often show unreal and non-specific results, with characteristic clinical manifestations not appearing, in most cases (such as peritonitis), delaying their discovery [1,8]. In addition, its close relationship with different structures increases the chance of simultaneous injuries, making the diagnosis even more complex and significantly increasing morbidity and mortality rates [4,6].

Given the nonspecific clinical picture in the vast majority of these cases, imaging tests play an essential role in the identification of organ injury, including the retroperitoneal ones [8]. The standard screening test for multiple trauma patients is the so-called Ultrasound (US) through the protocol FAST ("Focused Assessment with Sonography for Trauma")[2]. This exam allows a quick general analysis of the abdomen (especially intraperitoneal) detecting free fluid, which is an indirect sign of lesions in visceral structures[2]. Computed tomography is the gold standard imaging test for evaluating the abdominal cavity in general in hemodynamically stable patients, even being able to analyze the retroperitoneum. Pancreatic lesions are suspected when there is free fluid in the anterior region of the pararenal space[4].

OBJECTIVES

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METHODOLOGY

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RESULTS AND DISCUSSION

Next, cases of pancreatic trauma evaluated by ultrasound and computed tomography will be presented, making it possible to relate the findings between the methods. It is not a comparison of accuracy, but a learning opportunity, necessary for good professional practice.

The images below are examinations of a 26-year-old male patient involved in a motorcycle-car collision. In image "a", the conventional ultrasound examination of the epigastric region does not show changes in the pancreatic head and body, shown by the arrows. In the computed tomography image ("b"), there is an area of edema in the pancreatic parenchyma, evidenced by the arrows, indicating a grade II2 pancreatic contusion – figure 1.

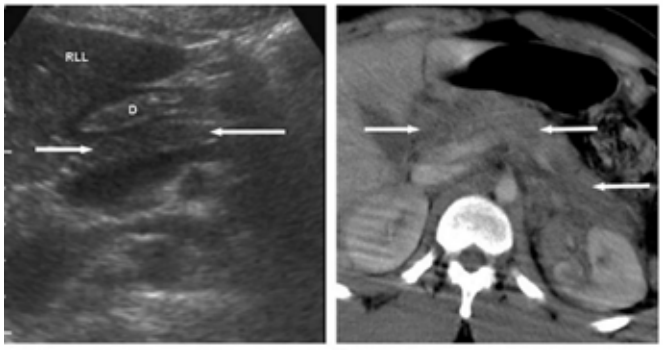

Figure 1 – Pancreatic trauma in adults. Image "a" is from an ultrasound, image "b" is from a computed tomography[2].

The images below are of a 38-year-old man who was involved in a serious traffic accident, being conventional ultrasound in "a", ultrasound with contrast in "b" and tomography with contrast in "c". Conventional ultrasound showed pancreatic edema and heterogeneous texture with ill-defined border and peripancreatic fluid collection, as shown by the arrow. On contrast-enhanced ultrasound, the lesion region appears as an anechoic and hypoechoic perfusion defect with an irregular border in the pancreatic neck, as shown by the arrow. The contrast-enhanced computed tomography image exposes the lesion site as a heterogeneous, low-attenuation region in the pancreatic neck, as shown by arrow[4] – figure 2.

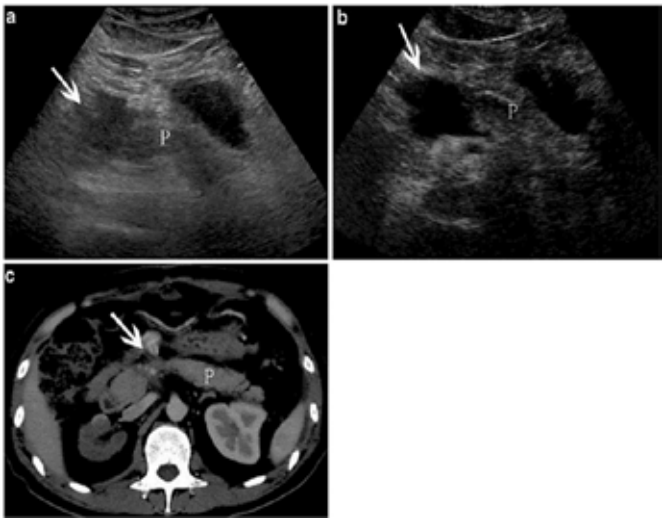

Figure 2 – Pancreatic trauma in adults. Images "a" and "b" are from ultrasound, image "c" is from the computed tomography [4].

A 47-year-old female patient who was involved in a serious crash accident. Figure 3 shows a pancreas without

changes in "a", with a homogeneous texture and without collection of peripancreatic fluid. Image "b", without alterations, shows a homogeneously perfused pancreas and regular borders. In contrast-enhanced computed tomography "c" image, the lesion site is seen as a region of low attenuation in the pancreatic tail, indicated by the arrow [4] – figure 3.

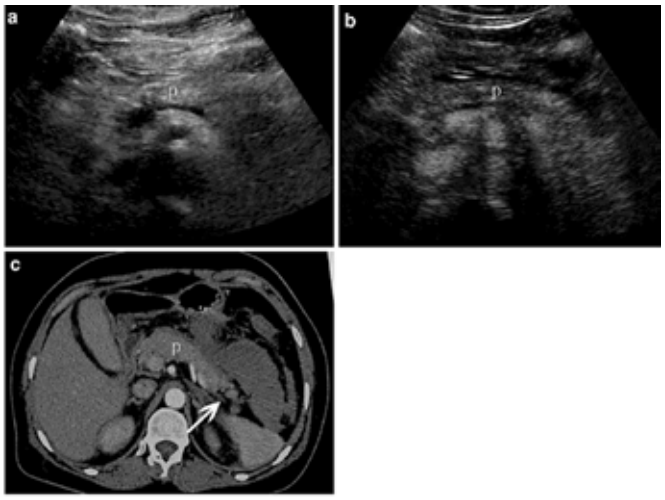

Figure 3 - Conventional ultrasound images ("a'), contrast ultrasound ("b") and contrast computed tomography ("c") [4].

In Figure 4, images of a 35-year-old woman who suffered a car collision, resulting in a fracture in the neck of the pancreas. Contrast-enhanced computed tomography images ("a" and "b") show an extensive liver laceration and a fracture in the neck of the pancreas, shown by the arrowhead in image "b". The conventional ultrasound image ("c") shows fluid separating the pancreatic fragments at the fracture site, evidenced by the arrowhead[9].

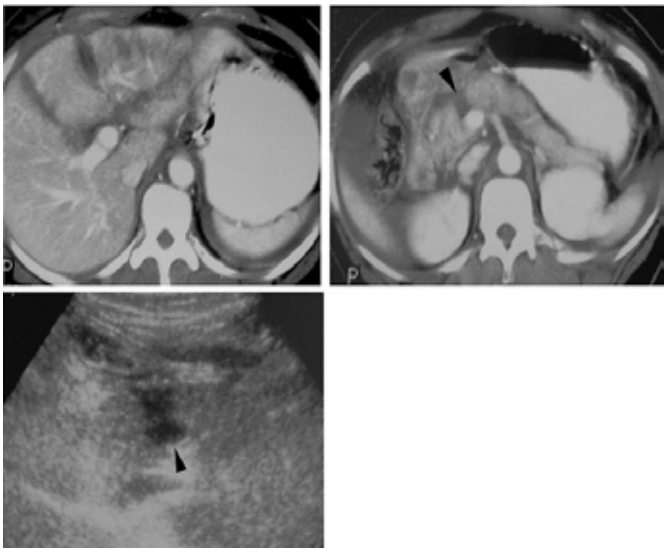

Figure 4 – Pancreatic trauma in adults. Images "a" and "b" are from contrast--enhanced computed tomography. Image "c" is from ultrasound [9].

Figure 5 shows images of a 22-year-old male patient who was involved in a collision accident. In "a", conventional ultrasound examination does not show any changes in the organ. A small area of hypoechoic perfusion with an undefined border in the pancreatic neck is indicated by the arrow in image "b". The body and tail of the pancreas show mild hypoechoic enhancement. In image "c", the contrast-enhanced CT scan shows the patient's lesion as a small region of low attenuation without a clear border, as shown by the arrow.

Conventional ultrasound performed on the 16th day of the accident shows an increase in the lesion of the pancreatic neck, the parenchyma remained thin and a peripancreatic fluid collection appeared (in "d"). The computed tomography image, performed 16 days after the trauma, showed the extension of the lesion in the pancreatic neck, as indicated by the arrow (in "e")[4].

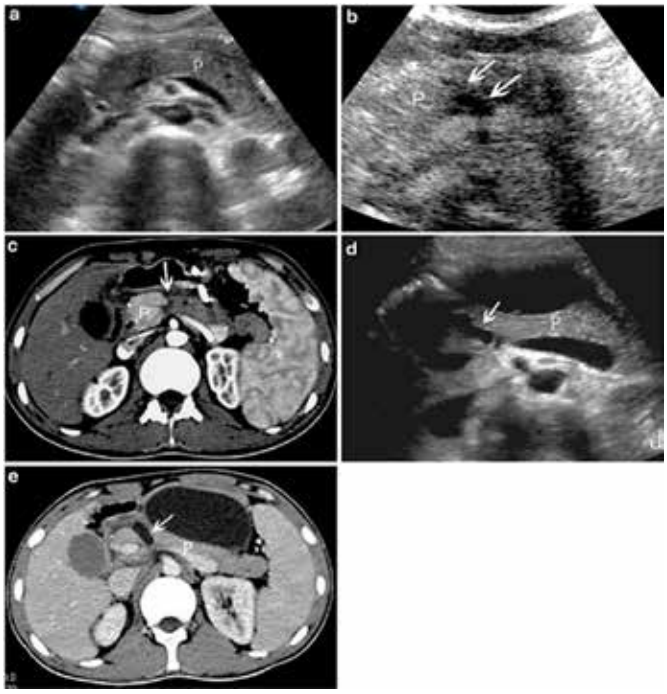

Figure 5 – Pancreatic trauma in adults. Images "a" and "d" are from ultrasound, "b" is from ultrasound with contrast, "c" and "e" are from computed tomography[4].

The images below (figure 6) show in "A" an axial section at the level of the celiac axis with visualization of the pancreas neck and the cranial portion of the tail and body, without visible changes. Image "B" is an ultrasound 6 hours after the trauma, with a small hypoechoic area detected on the ventral surface of the pancreatic neck. Image "C", shows 24 hours after the trauma, which evidenciates a hypoechoic area with a low-level, linear, low-density fracture in the region of the pancreatic neck in an oblique direction that approaches the splenic vessels. In image "D", a region of peripancreatic edema is detected, evidenced by the arrow. Computed tomography ("D" and "E"), performed after the third ultrasound, confirm the traumatic pancreatic transection (a clear low-density area at the level of the pancreatic neck) and the small liver lesion (arrow)[10].

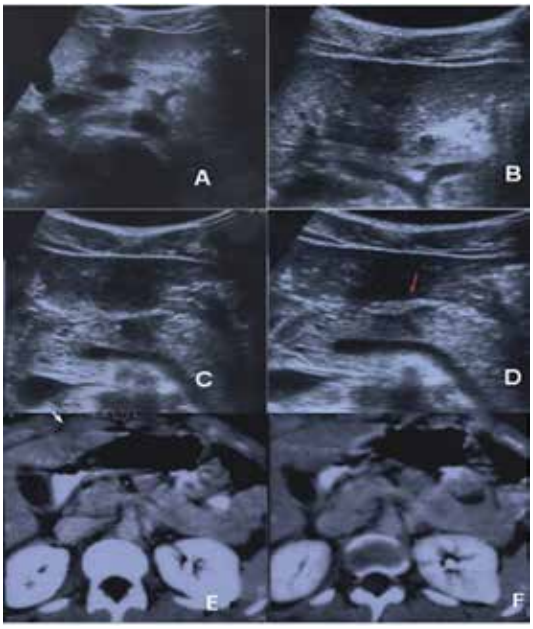

Figure 6 – Pancreatic trauma. Images "A", "B", "C", "D" are from ultrasound and "E" and "F" are from computed tomography with contrast[10].

Figure 7 shows images of a 51-year-old male patient who suffered a serious traffic accident. Conventional transverse ultrasound shows pancreatic edema and a heterogeneous texture with unclear edges (image "a"). Image "b" shows a contrast ultrasound, which presents the lesion site as a hypoechoic and anechoic area, indicating areas with hypoperfusion, in addition to showing an irregularity at the edge of the pancreatic body (indicated by the short arrows). Long arrows show edema of the pancreatic body. Image "c" shows contrast-enhanced computed tomography that reveals the lesion site as a heterogeneous, low-attenuation region in the pancreatic body (indicated by arrows)[4].

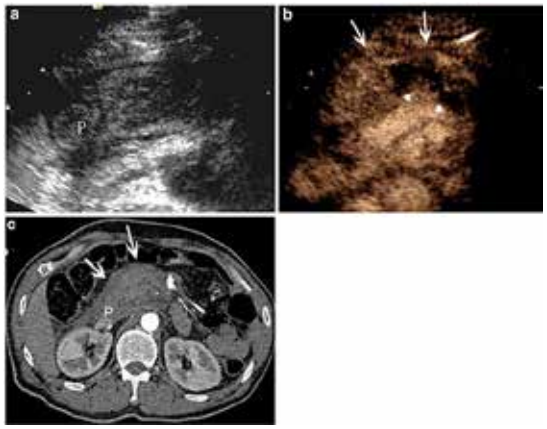

Figure 7 – Pancreatic trauma in adults. Images "a" and "b" are from ultrasound, image "c" is from computed tomography[4].

Figure 8 shows images of a child who suffered pancreatic injury. Image "a" shows a non-contrast ultrasound and "b" is a color Doppler ultrasound, both showing no changes. Then, image "c" is presented, an ultrasound with contrast. In it, edema in the pancreatic body, subtle lesions in the body and tail (shown by white arrows), associated with the existence of a peripancreatic fluid collection (indicated at the arrowhead) are noted. Images "d" and "e" are computed tomography images in the axial section. They confirm the lesion of the pancreatic tail, with the presence of fluid around the organ[11].

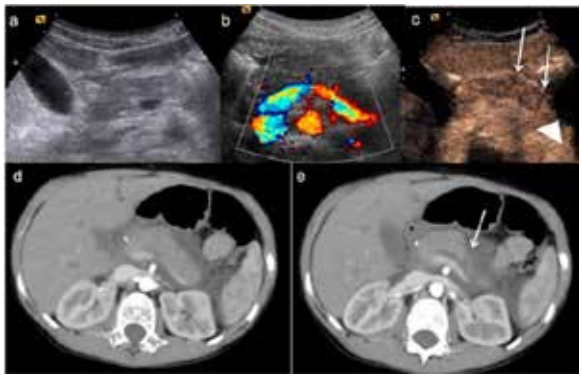

Figure 8 – Pancreatic trauma in a child. Images "a", "b" and "c" are from ultrasound, images "d" and "e" are from computed tomography[11].

CONCLUSION

Ultrasonography is accurate in diagnosing traumatic pancreas lesions, though frequently with nonspecific or subtle findings. The use of contrast plays a very important role in the initial detection of pancreatic trauma, even in small lesions. Computed tomography also stands out in this diagnosis, as it was possible to observe in all the cases presented.

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