Review

Impact of Imaging Techniques in the Assessment of Gallstone Pancreatitis

SUZANA MĂCEȘ[1], ȘTEFAN PĂTRAȘCU[2], CRISTIANA IULIA DUMITRESCU[3], MARIAN RĂZVAN BĂLAN[1,6], LUANA CORINA LASCU[4,5,6], ADRIANA ROXANA LAZAROVICI[4,6], TUDOR CONSTANTIN BRATILOVEANU[2], SARMIS MARIAN SĂNDULESCU[2], SILVIU IULIAN BORDU[2], MĂDĂLIN CRISTIAN MORARU[1], MARIN VALERIU ȘURLIN[2], DANIELA DUMITRESCU[4,5,6]

[1]*PhD student, Doctoral School, University of Medicine and Pharmacy of Craiova, Romania.*

[2]*Department of Surgery, Faculty of Medicine, University of Medicine and Pharmacy of Craiova*

[3]*Department of Pharmacology, Faculty of Medicine, University of Medicine and Pharmacy of Craiova*

[4]*Department of Radiology and Medical Imaging University of Medicine and Pharmacy of Craiova, Romania*

[5]*Department of Radiology and Medical Imaging, University Emergency County Clinical Hospital, Craiova, Romania*

[6]*SPAD IMAGING INTERNATIONAL Center Craiova, 200352 Craiova, Romania*

ABSTRACT. From the category of biliary disease, gallstones registered an increase during the last years, approximately 6% of men and 9% of women being affected by the pathology in the United States only. In western countries between 10-20% of the adult population is suffering from cholelithiasis. Although increasing age is a major risk factor for their formation, late studies correlate gallstones appearance with an age decrease for the onset of symptoms. We therefore face a younger population manifesting pain and sometimes functional disability. In accordance with statistical analysis, the economic impact of gallstones in highly industrialized countries such as United States produces costs of up to 6.5 billion dollars annually. In this context, the appropriate timing for intervention becomes a factor of major interest. The present review uses 28 articles and specialized literature. Article selection was based on keywords and followed the effectiveness of imaging investigation such as ultrasound, CT and MRI for patients diagnosed with cholelithiasis. Since a direct comparison between the imaging investigation techniques is not concluding we have tried to establish the sensitivity and specificity offered by each imaging assessment. The comparative analysis revealed a p Kruskal-Wallis <0.001 for sensitivity and p Kruskal-Wallis=0.474 for specificity.

KEYWORDS: *Gallstones, cholelithiasis, acute pancreatitis, imaging investigation.*

Introduction

Gallstones are concretions that develop in the gallbladder and biliary system, consisting of a mixture of cholesterol and bilirubin.

The size and number of gallstones might vary.

Gallstone prevalence is on the rise in Western countries as a result of escalating obesity rates.

Among the population in the United States, 8.6% males of Caucasian descent and 16.6% of females are affected by gallstones.

The majority of gallstones do not show any symptoms and do not need further monitoring.

However, around 10-15% of gallstones start causing symptoms within a period of 10-15 years.

The symptoms of gallstones vary widely, ranging from mild symptoms like biliary colic to severe acute conditions like pancreatitis, which can cause serious pathologies and even death [1].

The annual occurrence rate of a new clinical manifestation in a patient who previously suffered gallstones is rated to 3%.

The chance of developing gallstone-related pathology is directly correlated with the quantity and size of the stones.

As the number of gallstones increases, so does the likelihood of experiencing symptoms.

Therefore, in numerous circumstances, it is recommended cholecystectomy once the patient's symptoms manifest.

The aetiology of acute pancreatitis can be attributed to the presence of gallstones in 40-60% of cases.

The cause of acute gallstone pancreatitis is the obstruction of the common bile duct (CBD) by gallstones that migrated from their original location [2].

10.12865/CHSJ.50.02.04

Accurate diagnosis and immediate treatment of biliary choledocholithiasis are crucial in cases of acute pancreatitis resulting from gallstones.

The ability to identify choledocholithiasis varies depending on the imaging techniques used [3].

Abdominal pain commonly manifests in the epigastrium and may radiate to the posterior thoracic region.

However, it can also be localized to certain regions, such as the top quadrants on either side or the posterior region.

Nausea and vomiting are often noticed symptoms. In addition to the usual clinical signs of abdominal sensitivity, there may also be specific clinical symptoms of ileus, such as a distended abdomen, as well as features of systemic inflammatory response syndrome (SIRS) [4].

The presence of biliary obstruction symptoms such as dark colored urine, acholic stools, icteric sclera, pruritus excoriations, and jaundice might provide important indications that gallstones are the underlying cause of an episode of acute pancreatitis.

Having risk factors for gallstones, such as older age, female sex, obesity, experiencing rapid weight loss, pregnancy, or using oestrogen hormone therapy, can increase the likelihood of acute biliary pancreatitis.

The spontaneous resolution of the duodenal tract obstruction occurs in about 70% of patients, while approximately 3-7% of individuals will experience chronic obstruction, resulting in the onset of acute pancreatitis.

Prompt identification and therapy in such circumstances can significantly decrease the occurrence of severe pancreatitis.

If left untreated, severe pancreatitis can result in serious complications such as imbalances in bodily fluids and electrolytes, as well as sepsis.

The death rate for severe pancreatitis can reach up to 9%, and there is a 29-67% chance of recurrence of pancreatitis.

The definitive treatment options for cholelithiasis include laparoscopic cholecystectomy and/or endoscopic retrograde pancreatography (ERCP).

Blood tests are an essential diagnostic technique for identifying biliary pancreatitis. Increased concentrations of particular pancreatic enzymes, such as amylase and lipase, suggest the presence of inflammation in the pancreas.

Liver function tests can be used to identify the presence of bile duct obstruction, as increased levels of bilirubin can indicate biliary obstruction.

In order to diagnose acute pancreatitis, it is typically necessary for at least two out of the following three criteria to be gathered: experiencing abdominal pain that is characteristic of pancreatitis, elevated serum lipase or amylase levels which are at least three times higher than the upper normal range, or having imaging results from a CT scan, MRI, or ultrasound that show signs of pancreatitis.

If both the initial two conditions are met, imaging is typically unnecessary.

Nevertheless, since gallstones continue to be the primary cause of acute pancreatitis, imaging can be crucial in directing initial treatment [5].

In this context, we will try to summarize, based on the specialized literature, which is the imaging evaluation technique characterized by the highest degree of sensitivity and specificity, which, translated practically, leads to an appropriate management of the patient diagnosed with acute biliary pancreatitis [6].

Objective

The study settled the following main objectives:

1. To determine the contribution of imaging modalities in subsequent therapeutic management.
2. To validate the accuracy of imaging information in current practice

Material and Methods

The documentation process was performed by consulting the following databases MEDLINE, EMBASE, AMED and CINAHL.

In addition, databases were accessed, with information specific to the imaging field, such as Radiopaedia, etc.

As a search strategy, MEDLINE was used using combinations of terms and free text.

The study adhered to the principles outlined in the Declaration of Helsinki and obtained approval from the Committee of Ethics and Academic and Scientific Deontology of the University of Medicine and Pharmacy of Craiova (No. 87/19.02.2024).

Inclusion and exclusion criteria:

Admission criteria included: articles that used for assessment imaging investigation techniques, articles that used both experimental and observational studies as well as reviews, articles that included patients diagnosed with acute biliary pancreatitis, articles that had been

related to specificity and sensitivity parameters of the imaging technique.

Exclusion criteria comprised articles that did not make reference to human subjects, articles that contained self-reported outcomes and not objective measures, articles that were published in any other international language than English and French.

Because the study involved a numerical comparison between more than two groups of patients that didn't have a normal (gaussian) distribution, the non-parametric Kruskal-Wallis test was primarily used, followed by multiple pairwise comparisons using Dunn's procedure, in case of a significant result.

Search strategy keywords:

1. Imaging OR Ultrasound OR MRI OR CT
2. Pancreatitis OR Acute Pancreatitis OR Acute Biliary Pancreatitis
3. Specificity OR Sensitivity
4. 1 AND 2 AND 3

Selection of Studies

A summary of the specialized literature is presented in Figure 1.

Initially, 240 articles (full text) were identified, of which 130 remained available in English.

60 articles were reviewed, of which 12 were excluded for duplicating the theme. 48 eligible articles remained, of which 28 were included in this synthesis, and the remaining 20 did not address information relevant to the topic.

The selection of articles was based on aspects focusing on the evaluation of acute biliary pancreatitis through the lens of imaging investigations.

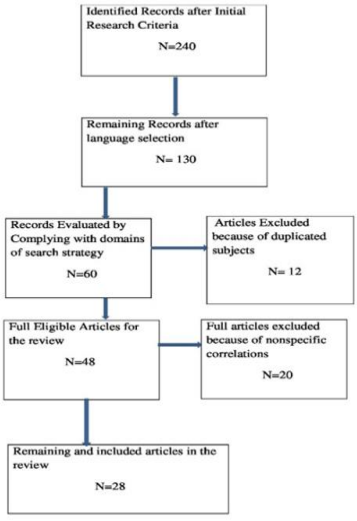

Figure 1. PRISMA Diagram.

Results

Evaluation of acute biliary pancreatitis by ultrasonography

Ultrasonography (US) has a high sensitivity of over 95% in detecting gallstones in uncomplicated cases.

However, in the event of acute biliary pancreatitis (ABP), the sensitivity in detecting gallstones is decreased due to the presence of ileus and abdominal flatulence, which account for approximately 80% of cases.

The sensitivity of transabdominal ultrasonography (TUS) for choledocholithiasis varies between 50% and 80%, whereas the specificity reaches a maximum of 95% [7].

Endoscopic ultrasonography (EUS) outperforms transcutaneous ultrasonography in terms of accuracy, with a sensitivity over 90% and an even higher specificity [8].

The objective of this study was to determine the diagnosis of acute biliary pancreatitis in patients by comparing the effectiveness of MRI and US imaging studies.

Ultrasonography is a highly convenient, efficient, and economical imaging technique for diagnosing choledocholithiasis.

This approach has a good diagnostic accuracy for extrahepatic cholestasis, with a sensitivity of 94% and a specificity of 100%.

A comparative study was conducted on a cohort of 50 patients, consisting of 24 women and 26 males, with an average age of 57 years.

The study aimed to evaluate imaging exams, specifically MRI and EUS endoscopic ultrasonography.

Two radiologists conducted a retrospective analysis of the MRI pictures, while a gastroenterologist examined the EUS images.

There was no significant distinction observed in the ability of MRI and EUS to accurately categorize gallstone-induced lesions (accuracy, 90-98% vs. 88%; $p > 0.05$).

However, EUS testing demonstrated a sensitivity of 78-90.5% and a specificity of 86.2%.

MRI and EUS demonstrate similar capabilities in characterizing biliary pancreatic lesions and predicting the stage of the disease. [9].

Out of the 79 patients who received an ultrasonographic test, gallstones were detected in 68 of them (86%), and 24 of them (30%) had either intrahepatic or extrahepatic bile duct dilatation.

10.12865/CHSJ.50.02.04

Out of the overall number of patients, specifically 4 out of 79 (5%), were diagnosed with choledocholithiasis by USS.

However, one out of these four individuals (25%) later had MRCP, which did not verify the presence of choledocholithiasis.

The ultrasonography's sensitivity ranges from 22% to 55% [3].

Table 1 provides a concise overview of the sensitivity and specificity of ultrasonography in the evaluation of patients with sudden biliary pancreatitis.

Table 1. Sensitivity and specificity of ultrasonography in the detection of acute gallstone pancreatitis.

Author and study year	Study Type	Bile Duct dimension	Stone prevalence	USS/EUS	
				Sensitivity SEU Mimim Maxim	Specificity SPU
Șurlin et al., 2014	review	≥4 mm	7,7%	67% 78%	95%
De Ledinghen et al., 1999	11 patients	≥7 mm	72,7%	100%	95,4%
Kim et al., 2010	50 patients	≥5mm		78% 90,5 %	86,2%
Chen et al., 2023	79 patients	≥7mm	86,07%	22 % 55%	90%

Evaluation of acute biliary pancreatitis by MRI

Magnetic resonance cholangiography (MRCP) was first established in the early 1990s as a non-invasive method for examining the biliary tract.

The examination was initially conducted using T2-weighted sequences, which produced a clear distinction between fluid and tissue, resulting in a detailed map of the biliary tree and pancreatic duct, similar to ERCP.

This technique was later enhanced by 3D reconstructions.

One of the main advantages of this technique is that it does not involve the use of ionizing radiation or bile contrast, making it even more beneficial.

MRI can play a significant role in determining the stage of acute pancreatitis by evaluating its severity criteria.

Additionally, MRI may be more effective than other imaging modalities in accurately defining peripancreatic collections (Figure 2).

Likewise, it is possible to identify vascular complications such as pseudoaneurysms and venous thromboses.

Nevertheless, certain patients have medical conditions that make them unsuitable candidates for MRI scans.

Thus, the effectiveness of MRI in examining patients with severe pancreatitis remains uncertain.

This is due to the fact that the compromised health of these patients hinders effective communication between the patient and the examiner, particularly in following instructions to hold their breath and maintain prolonged periods of breathlessness.

These instructions are essential for obtaining clear and diagnostically valuable images.

Furthermore, the exorbitant expense of the examination can provide an extra challenge [10,11].

Magnetic Resonance Cholangiopancreatography (MRCP) has a high level of accuracy in determining both the source and degree of biliary blockage, with a sensitivity of 96% and a specificity of 99%.

In the context of a biliary obstruction, the small bile ducts, which are challenging to observe in healthy individuals, expand and become readily apparent.

MRCP provides real-time visualization of the ducts under normal physiological settings, accurately representing their actual size.

ERCP, in contrast, may overstate the size of the ducts as a result of the induced pressure related to the use of contrast agent.

Utilizing paramagnetic contrast sequences can improve the identification of a cancerous entity [12].

The examination of 40 MRCPs conducted on patients with acute biliary pancreatitis revealed the following findings: out of the 40 patients, 34 (85%) had gallstones, 15 (37.5%) had dilated bile ducts, and 12 (30%) were diagnosed with choledocholithiasis.

Among the 12 patients with choledocholithiasis, four did not have dilated bile ducts since their stones were smaller than 7 mm in diameter.

The sensitivity is 93% and the specificity is approximately 96% [3].

MRI is also very useful and sensitive in identifying and quantifying haemorrhagic outbreaks, which appear hyperintense in T1WI weightings, both in the acute phase and in subacute forms when haemoglobin degradation products can be identified.

It can also have a role in the orientation of the aetiology (ethanolic or biliary), especially MRCP.

In this respect it provides superior skills to CT by highlighting small ductal stones, regardless of their structure, evaluating the pancreatic duct and the biliary tree, hence demonstrating raised sensitivity and specificity [13] (Figure 3).

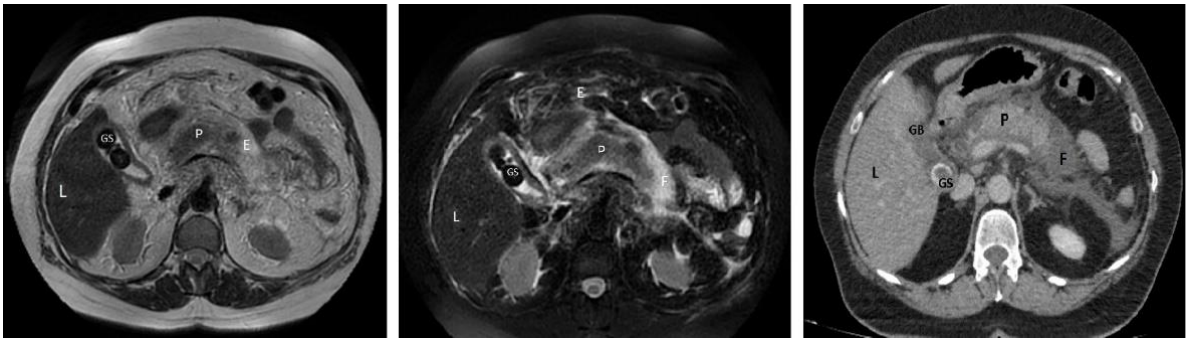

Figure 2. Axial MRI an CT findings: Gallstones, acute inflammatory changes of the pancreas and peripancreatic soft tissue (Authors' unpublished data).

In summary, Table 2 describes the impact that MRI produces in terms of specificity and sensitivity in the analysis of patients with sudden onset of biliary pancreatitis.

Table 2. Sensitivity and specificity of MRI in the detection of acute biliary pancreatitis.

Author and study year	Study Type	Bile Duct dimension	Stone prevalence	USS/EUS	
				SENSITIVITY SER	SPECIFICITY SPR
Baillie et al., 2003	review	≥7 mm	85%	96%	99%
Chen et al., 2023	40 patients	≥7 mm	85%	93%	96%
Tang et al., 2018	539 patients	≥ 7 mm	60%	94 %	88%

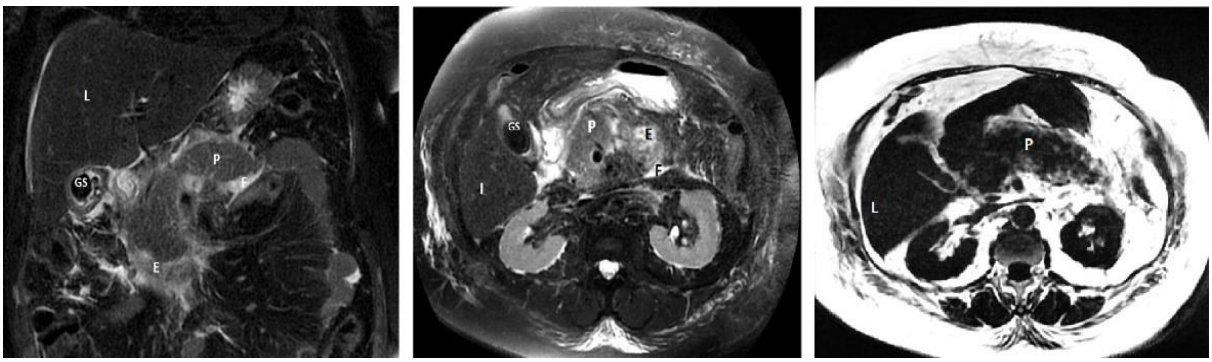

Figure 3. Axial and coronal sections of an MRI examination depicting inflammatory changes of the pancreas and peripancreatic soft tissue consisting of fluid and edema, gallbladder inflammatory changes and gallstones. (Authors' unpublished data).

Evaluation of acute biliary pancreatitis by CT

Computed tomography is widely recognized as the preferred imaging method for diagnosing and determining the severity of acute biliary pancreatitis.

An analysis of 86 people investigates both acute gallstone pancreatitis and non-biliary pancreatitis.

All participants in the research received imaging investigation using computed tomography.

10.12865/CHSJ.50.02.04

For patients with acute biliary pancreatitis, whose common bile duct width measures more than 8mm, the study found that the sensitivity is 76.7% (23 out of 30), the specificity is 94.6% (53 out of 56), and the total diagnostic accuracy is 88.3% (76 out of 86) [14].

Computed tomography (CT) is essential for identifying acute pancreatitis, since it has a sensitivity and specificity that surpasses 90%.

CT scanning is typically advised for patients with acute pancreatitis after the initial 48-72 hours surpassed, and the effectiveness of CT scans conducted within the first 48 hours is still a subject of debate.

The reason for this is the complexities that arise within this time frame, during which the severity of necrosis may be overestimated.

Therefore, it is not advisable to utilize CT scans as a standard diagnostic tool for acute cases of the disease.

A study including 56 participants, 54 of whom had acute pancreatitis and 23 of whom had acute biliary pancreatitis, found that CT investigation had a sensitivity ranging from 82% to 91.7% and a specificity of 96.9% [15].

Out of the 46 individuals who underwent a CT scan, 17 (37%) showed signs of gallstones, while another 17 (37%) exhibited dilatations in either the intrahepatic or extrahepatic bile ducts.

Out of the 46 patients, 5 (11%) were diagnosed with choledocholithiasis on CT.

However, one of these five patients (20%) later had MRCP, which did not show any signs of choledocholithiasis.

For CT examinations, the diagnostic sensitivity ranges from 25% to 90%, with a specificity of 90% [3].

Computed tomography is a highly precise method for accurately diagnosing and assessing the severity of biliary pancreatitis.

Computed tomography (CT) enables the detection of inflammation, fluid accumulation, and cysts in the area surrounding the pancreas.

It also allows for the evaluation of disease severity by identifying complications such as pseudocysts, abscesses, necrosis, hemorrhage, and thrombosis.

According to Baron et al's studies, the sensitivity of CT in detecting common bile duct stones (CBD) can reach up to 80%.

They studied 69 individuals with biliary obstruction, and later discovered that 12 of them had stones in the CBD, with CT scans identifying 10 of them.

However, according to the findings of numerous gastroenterologists, CT scans often show an inferior level of sensitivity when compared to transabdominal ultrasonography [16].

In summary, Table 3 describes the impact of computed tomography in terms of sensitivity as well as specificity in the analysis of subjects with acute biliary pancreatitis.

Table 3. Sensitivity and specificity of CT in the detection of acute biliary pancreatitis.

Author and study year	Study Type	Bile Duct dimension	Stone prevalence	USS/EUS		
				SENSITIVITY SEC		SPECIFICITY SPC
				Mimim	Maxim	
Yie et al., 2011	86 patients	≥8mm	7,7%	76,7%		94,6%
Yoon et al., 2019	23 patients	≥7mm	72,7%	82%	91,7%	96,9%
Baron et al., 1983	12 patients	≥5mm		78%	80 %	86%
Chen et al., 2023	46 patients	≥7mm	37%	25%	90%	90%

In order to establish an overview of the conducted research, we have synthesized values of the specificity and sensitivity for each of the 3 types of imaging investigation.

In accordance to the above-mentioned values and considering the minimum, maximum and median values for Sensitivity and by applying the Kruskal-Wallis test we may conclude, as per Table 4, that the null hypothesis is rejected; $p<0.001$ underlines a highly significant difference between the 3 methods of imaging investigation (US, CT, MRI with significant differences found by conducting multiple pairwise comparisons using Dunn's procedure between MRI vs. US, $p=0.0265$ and MRI vs. CT, $p=0.0485$).

Figure 4 describes the sensitivity for all imaging techniques in a comparative diagram.

Table 4. Relevant values for imaging techniques.

Method Sensitivity	US	CT	MRI
Minimum	22.00%	25.00%	93.00%
Median	78.00%	80.00%	94.00%
Maximum	90.50%	90.00%	96.00%
p Kruskal-Wallis<0.001-Highly significant difference among methods			

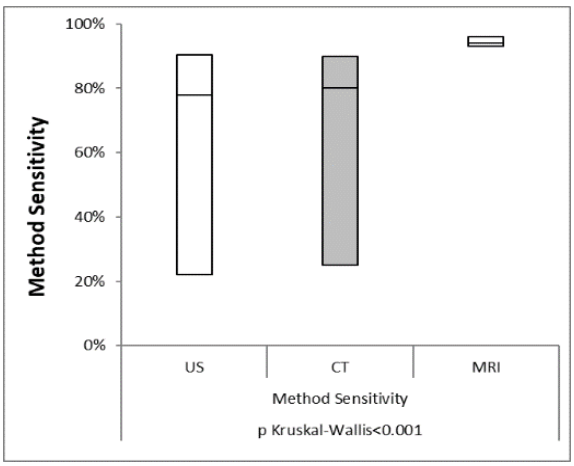

Figure 4. Comparative diagram of Sensitivity for US, CT and MRI techniques.

Considering the minimum, maximum and median values for Specificity and by applying the Kruskal-Wallis test we may conclude, as shown in Table 5, that the null hypothesis is rejected. P=0.474 underlines non-significant difference between the 3 methods of imaging investigation (US, CT, MRI).

Figure 5 describes the specificity for all imaging techniques in a comparative diagram.

Table 5. Relevant values for imaging techniques.

Method Specificity	US	CT	MRI
Minimum	86.20%	86.00%	88.00%
Median	92.50%	92.30%	96.00%
Maximum	95.40%	96.90%	99.00%
p Kruskal-Wallis=0.474-Non significant difference among methods			

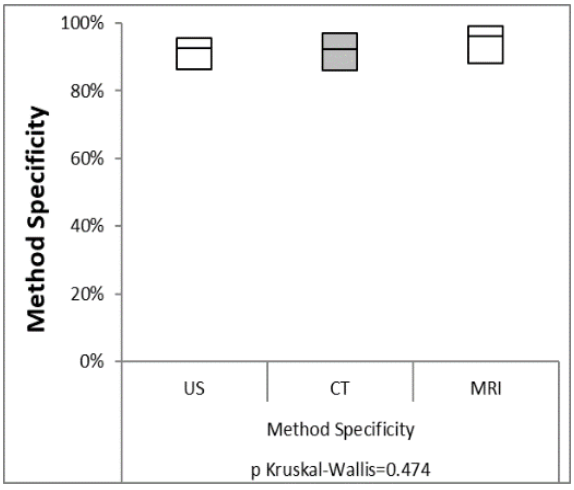

Figure 5. Comparative diagram of Specificity for US, CT and MRI techniques.

Discussion

Ultrasound has a similar level of accuracy as magnetic resonance cholangiography (97.7%) in detecting gallstones.

However, magnetic resonance cholangiography is better in diagnosing biliary sludge or microlithiasis [17].

Ultrasonography is widely recognized as the primary diagnostic imaging technique for gallstone complications, particularly in cases of acute cholecystitis, including emphysematous and haemorrhagic variations.

Due to the presence of gallbladder wall thickening, which is a significant indicator for diagnosing acute cholecystitis, ultrasound's specificity is diminished as it can also be observed in other conditions such as chronic cholecystitis, cirrhosis, hepatitis, and congestive heart failure.

To enhance specificity, researchers have conducted studies on the vascularity of the gallbladder wall, which is found to be heightened during acute inflammation [18].

Ultrasonography is the preferred method for diagnosing gallstones and acute pancreatitis due to its numerous advantages.

It is a non-invasive procedure that can be done at the patient's bedside, does not use ionizing radiation, is relatively inexpensive, and allows the assessment of nearby organs [19].

Magnetic Resonance Imaging (MRI), successfully detected persistent stones in the common bile duct (CBD) in all cases of biliary pancreatitis except for one, and played a significant role in diagnosing choledocholithiasis, acute cholecystitis, and biliary pancreatitis.

Magnetic resonance imaging (MRI) is required for the diagnosis of acute pancreatitis and involves the use of T1, T2, and MRCP (magnetic resonance cholangiopancreatography) sequences in conjunction. Their attributes can be described as follows:

Fat-suppressed T1-weighted sequences improve the delineation of the interfaces and outline of the pancreas and thus imply a better evaluation of the pancreatic tissue itself [20].

T2-weighted sequences provide a notable benefit in emphasizing fluid-like abnormalities located in or around the pancreas (such as peri- and intrapancreatic collections) as well as the bile ducts and pancreatic ducts [21].

The primary benefit of MRCP lies in its non-invasive nature, which eliminates the requirement for intravenous contrast material or

10.12865/CHSJ.50.02.04

exposure to ionizing radiation, as well as the accompanying dangers of renal failure.

Additionally, it possesses the benefit of being essentially unaffected by the operator's proficiency, unlike other imaging techniques such as ultrasonography, which can exhibit substantial variation based on the operator's expertise and competence.

Furthermore, the MRI examination offers the benefit of precisely illustrating the anatomy of both the intrahepatic and extrahepatic biliary tree, together with aspects of nearby anatomy and pathology.

The primary contraindications for undergoing an MRI scan are extreme obesity (beyond the weight capacity of the MRI machine), intense claustrophobia, and the presence of incompatible magnetic devices like pacemakers or some types of stents.

In general, the MRI is a secure and uniform method of examining the biliopancreatic system.

Gallstones have been identified with a level of sensitivity comparable to that of ultrasonography.

Furthermore, valuable diagnostic data for establishing the diagnosis of acute cholecystitis were collected by magnetic resonance imaging, as previously presented.

Acute pancreatitis was identified with the use of magnetic resonance imaging (MRI) in 75% of patients, and these findings were strongly consistent with the data obtained from computed tomography [22,23].

CT has become the undisputed first-line imaging modality for the evaluation of the acute abdomen; CT allows visualization of the gallbladder in the usual way regardless of whether an additional pathology is suspected at this level.

In addition, the advances recorded in the CT scanning technique have facilitated the ability to visualize both the gallbladder and some conditions with this location (inflammatory-lithiasis/allithiasis cholecystitis or tumours) [24].

Attention must be given to several features when diagnosing acute pancreatitis using abdominal CT. 95% of patients with acute cholecystitis present with gallstones, but the sensitivity of CT for detecting these stones is approximately 75%.

Stones containing calcium are usually easily visible; however, stones with predominantly cholesterol content can have densities similar to the contents of the gallbladder, which makes their detection difficult, sometimes impossible.

Low-kV imaging and substance-based imaging, such as calcium or lipids, have been found to be more effective in detecting gallstones compared to typical high-kV imaging, as demonstrated by spectral computed tomography [25].

Nevertheless, CT scans can be highly efficient in assessing additional non-biliary conditions related to gallstones, as well as problems linked with pancreatitis and cholecystitis in the presence of gallstones [26].

According to the guidelines set by the British Gastroenterological Society, it is necessary to perform imaging of the biliary tract for all patients with acute pancreatitis caused by gallstones.

However, the most effective imaging modality has not yet been established.

An effective strategy involves utilizing MRCP in a targeted manner, relying on ultrasound results and liver function tests, to detect individuals who are susceptible to cholelithiasis [27,28].

Conclusions

The usual method of imaging investigation, applicable to patients presenting symptoms specific to acute biliary pancreatitis, is ultrasonography.

Ultrasonography can have a high sensitivity. Nevertheless, the investigation's reliability heavily relies on the examiner's knowledge, resulting in varying assessments of its diagnostic significance based on the doctor's skill, experience, and the quality of the equipment employed.

The MRI investigation outlines its precision, having according to the specialized literature the highest sensitivity and specificity.

However, limitations can also be observed in the case of MRI investigations, which are much more expensive and require a much longer examination time.

In acute cases, the investigation risks losing its accuracy, a fact due to artefactual acquisitions caused by uncontrolled patient movement

Computed Tomography (CT) scans are very sensitive and specific imaging tests commonly used to diagnose acute biliary pancreatitis.

Nevertheless, the utilization of CT within the initial 48 hours following the onset of symptoms remains controversial, as the complications that occur during this timeframe may be underestimated.

Conflict of interests

None to declare

References

1. Turkvatan A, Erden A, Turkoglu MA, Secil M, Yener O. Imaging of acute pancreatitis and its complications. Part 1: acute pancreatitis. Diagn Interv Imaging, 2015, 96(2):151-160.
2. Steer LM. Etiology and pathogenesis of acute pancreatitis. Ann Ital Chir, 1995, 66(2):159-163.
3. Chen SE, Iqbal Q, Mallappa S. Acute Gallstone Pancreatitis: If a Picture Is Worth a Thousand Words, How Many Images Do We Need? Cureus, 2023, 15(1):e33666.
4. Chowbey P, Sharma A, Goswami A, Afaque Y, Najma K, Baijal M, Soni V, Khullar R. Residual gallbladder stones after cholecystectomy: A literature review. J Minim Access Surg, 2015, 11(4):223-230.
5. Chang KJ. Identifying a Biliary Origin of Acute Pancreatitis Using CT. Radiology, 2022, 302(1):127-128.
6. Shea JA, Berlin JA, Escarce JJ, Clarke JR, Kinosian BP, Cabana MD, Tsai WW, Horangic N, Malet PF, Schwartz JS, Williams SV. Revised estimates of diagnostic test sensitivity and specificity in suspected biliary tract disease. Arch Intern Med, 1994, 154(22):2573-2581.
7. Șurlin V, Săftoiu A, Dumitrescu D. Imaging tests for accurate diagnosis of acute biliary pancreatitis. World J Gastroenterol, 2014, 20(44):16544-16549.
8. de Ledinghen V, Lecesne R, Raymond JM, Gense V, Amouretti M, Drouillard J, Couzigou P, Silvain C. Diagnosis of choledocholithiasis: EUS or magnetic resonance cholangiography? A prospective controlled study. Gastrointest Endosc, 1999, 49(1):26-31.
9. Kim YC, Choi JY, Chung YE, Bang S, Kim MJ, Park MS, Kim KW. Comparison of MRI and endoscopic ultrasound in the characterization of pancreatic cystic lesions. AJR Am J Roentgenol, 2010, 195(4):947-952.
10. Romagnuolo J, Bardou M, Rahme E, Joseph L, Reinhold C, Barkun AN. Magnetic resonance cholangiopancreatography: a meta-analysis of test performance in suspected biliary disease. Ann Intern Med, 2003, 139(7):547-557.
11. Xiao B, Zhang XM. Magnetic resonance imaging for acute pancreatitis. World J Radiol, 2010, 2(8):298-308.
12. Baillie J, Paulson EK, Vitellas KM. Biliary imaging: a review. Gastroenterology, 2003, 124(6):1686-1699.
13. Tang MY, Chen TW, Bollen TL, Wang YX, Xue HD, Jin ZY, Huang XH, Xiao B, Li XH, Ji YF, Zhang XM. MR imaging of hemorrhage associated with acute pancreatitis. Pancreatology, 2018, 18(4):363-369.
14. Yie M, Jang KM, Kim MJ, Lee Y, Choi D. Diagnostic value of CT features of the gallbladder in the prediction of gallstone pancreatitis. Eur J Radiol, 2011, 80(2):208-212.
15. Yoon S, Park SH, Jeong YM, Choi SJ, Shim Y, Hong MJ, Cho JH, Kim YS. Utility of Early CT in Patients with Suspected Acute Biliary Pancreatitis, J Korean Soc Radiol, 2019, 80(4):704-711
16. Baron RL, Stanley RJ, Lee JK, Koehler RE, Levitt RG. Computed tomographic features of biliary obstruction. AJR Am J Roentgenol, 1983, 140(6):1173-1178.
17. Calvo MM, Bujanda L, Heras I, Calderon A, Cabriada JL, Orive V, Martinez A, Capelastegi A. Magnetic resonance cholangiography versus ultrasound in the evaluation of the gallbladder. J Clin Gastroenterol, 2002, 34(3):233-236.
18. Paulson EK, Kliewer MA, Hertzberg BS, Paine SS, Carroll BA. Diagnosis of acute cholecystitis with color Doppler sonography: significance of arterial flow in thickened gallbladder wall. AJR Am J Roentgenol, 1994, 162(5):1105-1108.
19. Bortoff GA, Chen MY, Ott DJ, Wolfman NT, Routh WD. Gallbladder stones: imaging and intervention. Radiographics, 2000, 20(3):751-766.
20. Matos C, Cappeliez O, Winant C, Coppens E, Deviere J, Metens T. MR imaging of the pancreas: a pictorial tour. Radiographics, 2002, 22(1):e2.
21. Zhang XM, Feng ZS, Zhao QH, Xiao CM, Mitchell DG, Shu J, Zeng NL, Xu XX, Lei JY, Tian XB. Acute interstitial edematous pancreatitis: Findings on non-enhanced MR imaging. World J Gastroenterol, 2006, 12(36):5859-5865.
22. Lecesne R, Taourel P, Bret PM, Atri M, Reinhold C. Acute pancreatitis: interobserver agreement and correlation of CT and MR cholangiopancreatography with outcome. Radiology, 1999, 211(3):727-735.
23. Farrell RJ, Noonan N, Mahmud N, Morrin MM, Kelleher D, Keeling PW. Potential impact of magnetic resonance cholangiopancreatography on endoscopic retrograde cholangiopancreatography workload and complication rate in patients referred because of abdominal pain. Endoscopy, 2001, 33(8):668-675.
24. Grand D, Horton KM, Fishman EK. CT of the gallbladder: spectrum of disease. AJR Am J Roentgenol, 2004, 183(1):163-170.
25. Murphy MC, Gibney B, Gillespie C, Hynes J, Bolster F. Gallstones top to toe: what the radiologist needs to know. Insights Imaging, 2020, 11(1):13.
26. O'Connor OJ, Maher MM. Imaging of cholecystitis. AJR Am J Roentgenol, 2011, 196(4):W367-374.
27. Barlow AD, Haqq J, McCormack D, Metcalfe MS, Dennison AR, Garcea G. The role of magnetic resonance cholangiopancreatography in the management of acute gallstone pancreatitis. Ann R Coll Surg Engl, 2013, 95(7):503-506.
28. Stinton LM, Shaffer EA. Epidemiology of gallbladder disease: cholelithiasis and cancer. Gut Liver, 2012, 6(2):172-187.

Corresponding Authors: Cristiana Iulia Dumitrescu, Department of Pharmacology, Faculty of Medicine, University of Medicine and Pharmacy of Craiova, e-mail: dumitrescu.cristiana@gmail.com

Ștefan Pătrașcu, Department of Surgery, Faculty of Medicine, University of Medicine and Pharmacy of Craiova, e-mail: stef.patrascu@gmail.com

 10.12865/CHSJ.50.02.04