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The contribution of ultrasonography to the diagnostic-therapeutic triage of the bilio-pancreatic emergencies

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Abstract:

Objectives: the study proposes the evaluation of the emergency ultrasonography role (24 hours of 24) in the diagnostic-therapeutic triage of bilio-pancreatic emergencies.

Material and method: In the Emergency Department 351 patients interpreted clinically as bilio-pancreatic emergencies, aged between 18 and 90, were ultrasonographicaly evaluated between December 6th, 2005 – June 6th, 2006. The contribution of ultrasonography to the diagnostic triage of the patients was analyzed and adequate emergency therapy was established.

Results: Analyzing correlatively the diagnostic contribution of ultrasound examination in emergency cases of patients who present clinical characteristics of biliary colic, we can observe the improvement in the curative decision with the objective selection of the patients who can be sent home and of the indication of immediate surgery in 45.8% of the cases. Regarding the icterus syndrome, emergency ultrasound examination is an important element for the differentiation of the obstructive icterus from the hepatocellular one, allowing the diagnostic triage and the guidance towards the specialized consultations necessary for the clarification of other etiologies.

Conclusions: Ultrasonography is the examination of first intention in emergency having a role in the diagnostic triage of patients with severe bilio-pancreatic symptomatology. The ultrasound examination allows the immediate curative decision (immediate surgery/intensive care) or the guidance towards other specialized services for supplementary investigations.

Key words: emergency ultrasonography, diagnostic-therapeutic triage, bilio-pancreatic emergencies

Rezumat

Obiective: Studiul a avut ca şi obiectiv primar evaluarea rolului ecografiei de urgenţă ("24 de ore din 24") în triajul diagnostic şi terapeutic al urgenţelor bilio-pancreatice

Material şi metodă: In perioada 6 decembrie 2005 - 6 iunie 2006 în Unitatea de Primire a Urgenţelor au fost examinaţi ecografic 351 de pacienţi consideraţi urgenţe bilio-pancreatice, cu vârsta cuprinsă între 18 şi 90 de ani. S-a analizat contribuţia ecografiei la triajul diagnostic şi la stabilirea conduitei terapeutice.

Rezultate: Analizând corelativ contribuţia examinării ecografice la pacienţii cu simptomatologie de colică biliară s-a observat îmbunătăţirea deciziei terapeutice în selecţia pacienţilor trataţi conservativ sau operaţi de urgenţă- 45,8%. In sindromul icteric ecografia de urgenţă a permis diferenţierea icterului obstructiv de cel hepatocelular, cu ghidarea eficientă a pacienţilor spre consulturile de specialitate necesare.

Concluzii: Ecografia este examinarea de primă intenţie în triajul diagnostic al pacienţilor cu simptomatologie bilio-pancreatică severă. Aceasta permite luarea imadiată a deciziei terapeutice (chirurgie de urgenţă/terapie intensivă) sau îndrumarea în servicii de specialitate pentru investigaţii de specialitate.

Cuvinte cheie: ecografia de urgenţă, triaj diagnostic şi terapeutic, urgenţe bilio-pancreatice

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Introduction

Retrospective studies on cholelithiasis frequency in the world have evidenced a high dominance reaching a 10-30%. In Romania, a significant increase of the cholelithiasis frequency has been observed, its dominance in

a study from Timisoara and published by Sporea *et al* [1] showing values up to 10.9% (12.% in women and 6.1% in men). The clinical expression most often met in emergency in patients with cholelithiasis is biliary colic, a series of symptoms (discomfort, nausea, cephalalgia, vomits) dominated by severe pain of the colic type (continuous, cramp, discomfort) at the level of the abdominal right upper quadrant (with sub scapular/right shoulder irradiation), provoked by the increase of the intraluminal pressure and the distension of the biliary segment retrograde by an obstacle. This clinical manifestation appears in 80% of patients who request medical care for cholelithiasis [2]. Biliary colic can be the clinical expression of other physiopathological modifications as well, for example: biliary dyskinesia, cholecystoses (cholesterolosis, adenomyomatosis, intramural diverticulosis, polyposis).

Imaging explorations and their hierarchy in the diagnosis of bilio-pancreatic emergencies have the role of: establishing a positive diagnosis and confirming the ethio-pathogenetic substrate; clarifying the problems of differential diagnosis; evaluating the seriousness of the diagnostic disease and staging it; emphasizing the associated pathologies; allowing the evaluation of complications; observing the evolution of the detected entities; excluding a certain diagnosis and guiding it towards the most useful exploration for its specification according to the method's complexity and sensitivity.

Ultrasonography represents the examination of first intention and election in the diagnosis of cholelithiasis and its complications. The ultrasound examination in emergency brings information about the morphopathological substrate of the clinical characteristics often in disagreement with the imagistic aspect especially at extreme ages and patients with morbid associations. The evidence of cholelithiasis complications at emergency ultrasound examinations permits the patients' sorting which is an important element for the use of medical resources. Echography offers the opportunity of choosing the surgical emergency therapy for biliary patients and, at the same time, allows the identification of the risk factors of complications, in the case of patients that need clinical-imaging monitoring.

Bilio-pancreatic emergencies come for medical care as a consequence of the complex symptomatology: pain in the superior abdominal quadrant, and the association of icterus, fever and shock support the clinical suspicion of affecting the bilio-pancreatic level. The frequency of the bilio-pancreatic emergencies at Emergency Department (ED) of the "O. Fodor" Emergency Hospital is high. The diagnostic-therapeutic management problems led to the initiation of the study of the ultrasound examination contribution to the therapeutic triage and the emphasizing of emergencies of 0 and 1 degree, as well as of different risk factors for the patients' evolution.

Material and Method

The study was evaluating the role of echography in patients with severe clinical bilio-pancreatic characteristics presented in the ED of the "O. Fodor" Emergency Hospital. The goal of the evaluation was to evaluate the contribution of the access to the emergency ultrasonography (24 hours of 24) in the diagnostic-therapeutic management of the bilio-pancreatic emergencies. The role of the echographic examination in the triage of severe bilio-pancreatic pathology was analyzed.

The frame and investigated population: the emergency ultrasonography was performed on all the patients arriving at the ED with clinical characteristics of: biliary dyskinesia, biliary colic, biliary colic associated with icterus syndrome, icterus syndrome and acute pancreatitis. During December 6th, 2005 – June 6th, 2006 351 patients aged between 18 and 90 (average age 56.6 years old) were ultrasonographically examined in ED.

The study protocol consisted of the patients' examination during a maximum one hour period from their arrival at the ED. The technique of transabdominal ultrasonographic examination was practiced, using a convex transducer of 3 – 5 MHz belonging to the PICO SONOACE portable echograph. The examination was made by doctors specialized in emergency/internal medicine/gastroenterology/radiology with competence in echography and a minimum 2-year experience in examination. The images' saving was made electronically under the jpeg. form. The examination of the *gall bladder* was done in left dorsal and lateral decubitus using the examination in postinspiratory apnea (in special cases, in sitting position or procubitus). The following was considered as a normal aspect [3,4,5]: organ with the characteristical form of pear, with liquid content of anechogenic aspect (transonic); preprandial dimensions: longitudinal diameter < 10 cm, transversal < 4 cm; thin walls: thickness =< 3 mm, with tristratified aspect (mucous, muscular, serous); the Heister valve that can be observed in the infundibuluim of echogenic aspect with posterior umbra that has to be differentiated from microgallstones. The following aspects were observed in the examination protocol: a. the aspect of the gall bladder – walls, content, size, fluid collections in the neighbourhood; b. the aspect of the biliary tracts; c. the pancreas aspect; d. abdominal general screening for morbid associations.

The statistical analysis was made using the statistical processing of Excel Windows 1998 and the Odds Ratio test.

Results

In 351 patients examined ultrasonographicaly at ED, the dominance of biliary colic clinical characteristics was observed in 55% of the cases (fig1), the ratio on age groups showing a high frequency at over 60 years (43.7%) and 36% between 40 and 60 years (fig 2). It is important to note that most of the cases originated from the urban area, the urban/rural ration being 1.9 (fig 3).

At the ultrasound examination the absence of echographic modifications was observed in 99 patients (28% of the patients arrived in emergency with acute symptomatology of bilio-pancreatic type), while 12% of the patients evidenced uncomplicated cholelithiasis (fig 4).

Analyzing the frequency of the ultrasound modifications the following aspects were observed in 190 patients with clinic characteristics of biliary colic (fig 5): 37 patients did not have modifications at biliary level; 36 patients (19%) had cholelithiasis or modifications of

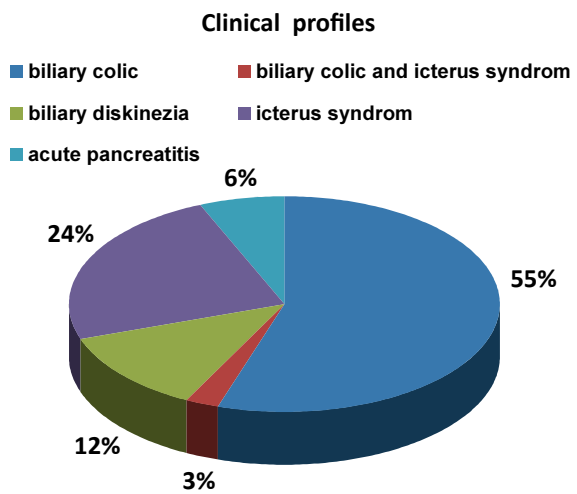


Fig 1. The profile of the clinic characteristics at the arrival in the Emergency Department (ED)

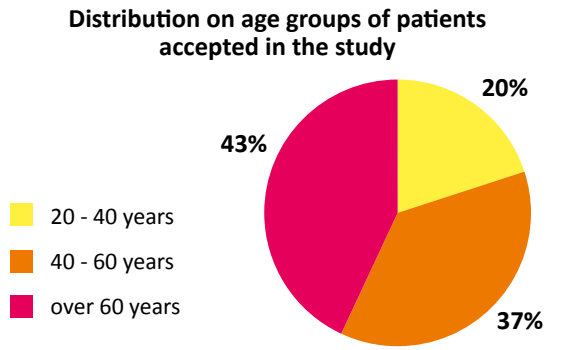


Fig 2. Distribution on age groups of the patients with acute bilio-pancreatic pathology accepted in the study

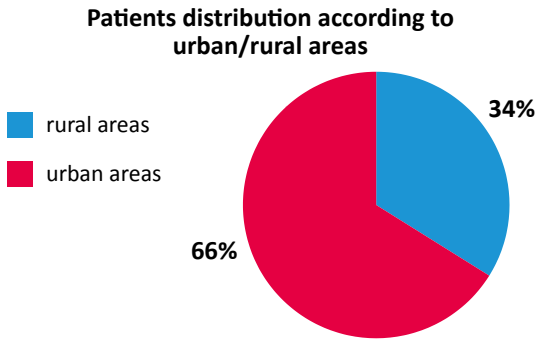


Fig 3. Distribution of patients with acute bilio-pancreatic pathology included in the study, according to urban/rural areas

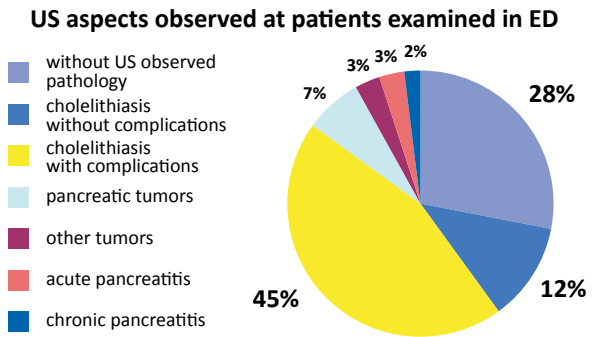


Fig 4. Ultrasonographic (US) aspects observed at patients examined in ED, structured on pathology groups: normal, cholelithiasis without complications/with complications, tumoral modifications (pancreatic, other), acute/chronic pancreatitis.

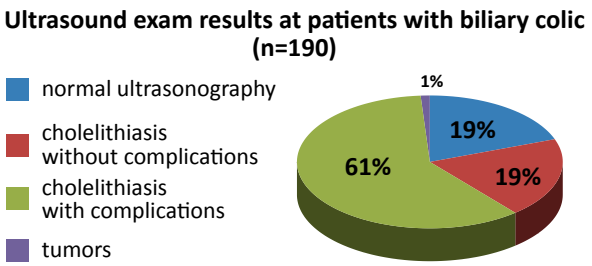


Fig 5. Distribution of ultrasonographic aspects met at patients with clinic characteristics of biliary colic

cholesterolotic type without echographic modifications that would support complications.

The observed ultrasound aspects were cholesterolotic polyps in 7 patients (fig 6, fig 7), cholelithiasis with a single gallstone in 11 patients (fig 8, fig 9) or several gallstones in 18 patients (fig10, fig11). In 114 patients we observed cholelithiasis complications of severe cholecystitis type (fig 12, fig 13), parietal efraction with pericholecystic collection (fig 14, fig 15) or aspect of inundibular inclavated calculus with vesicular hydrops (fig16).



Fig 6. Intercostal oblique section in the abdominal right upper quadrant: at parietal level, the gall bladder shows an echogenic image which looks posterior artifact like comet tail, representing a cholesterolotic polyp.



Fig 7. Intercostal oblique section in the abdominal right upper quadrant: the gallbladder shows a polypoid formation of 4,8 mm adherent to the wall



Fig 8. Intercostal oblique section in the abdominal right upper quadrant: the gallbladder shows a big medio-corporeal calculus

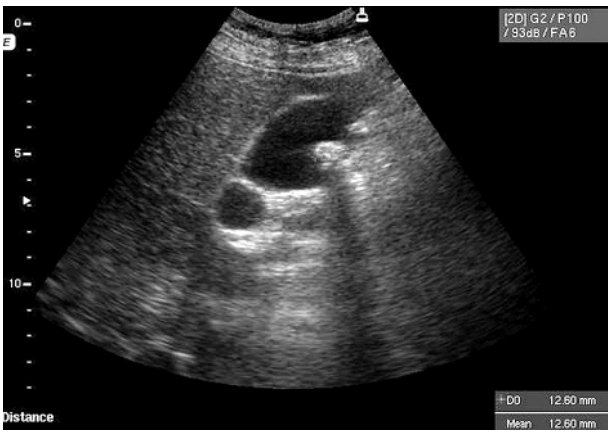


Fig 9. Subcostal section in the abdominal right upper quadrant: the gallbladder shows a small medio-corporeal calculus



Fig 10. Subcostal section in the abdominal right upper quadrant: the gallbladder shows 2 calculi at corporeal level



Fig 11. Intercostal oblique section in the abdominal right upper quadrant: the gallbladder shows multiple calculi of small dimensions

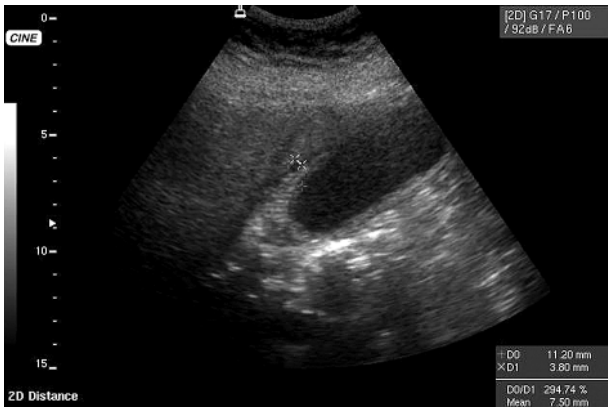


Fig 12. Intercostal oblique section in the abdominal right upper quadrant: aspect of acute cholecystitis with pericholecystitis



Fig 13. Intercostal oblique section in the abdominal right upper quadrant: aspect of acute cholecystitis and infundibular inclavated calculus;



Fig 14. Intercostal oblique section in the abdominal right upper quadrant: aspect of acute cholecystitis and infundibular inclavated calculus; at fundus parietal level we can observe an area of parietal efraction with minimum of pericholecystic collection



Fig 15. Intercostal oblique section in the abdominal right upper quadrant: aspect of acute cholecystitis with pericholecystitis and infundibular inclavated calculus; at fundus parietal level we can observe aerial elements suggesting gangrenous cholecystitis; minimum of pericholecystic inomogenous collection towards the 5th segment

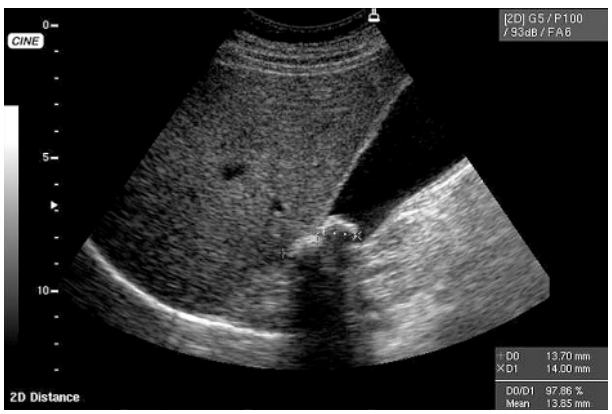


Fig 16. Intercostal oblique section in the abdominal right upper quadrant: infundibular inclavated calculus with retrograde distension and aspect of vesicular hydrops



Fig 17. Intercostal oblique section in the abdominal right upper quadrant: cholecyst contracted with a calculus; from fundus level towards the 4th and 5th segments we can observe an inomogenous parenchymatous mass, suggesting a proliferation process of gallbladder



Fig 18. Cross section in epigastrium: the choledoch lithiasis (arrow) associated with collection in the cephalic area in the pancreatic bed



Fig 19. Cross section in epigastrium: the choledoch lithiasis associated with volume growth of the pancreatic bed in the cephalic area

In 2 of the patients we observed the aspect of cholecystic tumoral formation associated with cholelithiasis (fig17). The association of the ultrasound aspect with acute pancreatitis at patients with cholelithiasis (fig18, fig19) was observed in 13.1% of patients with complicated cholelithiasis, 75.6% of these showing gallstones smaller than 10 mm.

An increased frequency of cholelithiasis in patients from the urban area (fig 20) was also emphasized. In accordance with the data in the literature, the dominance of cholelithiasis was observed in women (74%) compared with the male patients where the frequency was 6% [6].

In patients arriving in ED with biliary dyskinesia, the frequency of the cholelithiasis was low (2%), no lithiasis complications being observed.

In patients admitted to ED with icterus syndrome (92 patients), associated with colic (35 patients) and/or clinical phenomena of acute angiocholitis (7 patients) an increased frequency of the lithiasis etiology was observed at the emergency ultrasound examination (fig 21, fig 22, fig 23) of icterus (45%), subsequently tumoral etiology (22%) (fig 24). The frequency of the ultrasonographic diagnosis of icterus tumoral etiology (fig 25, fig 26) was high in the age group of over 60 years old, where it registered at the study patients group a value of 25%, higher than the data of the literature [7].

Analyzing correlatively the diagnostic ratio of the emergency ultrasonographic examination in patients with clinical characteristics of biliary colic, we observe (fig 27) the improvement of therapy decisions by the objective selection of patients who can be released from the hospital and of the immediate surgery indication at 45.8%.

In the case of icterus syndrome, the emergency ultrasonographic examination is an important element for the differentiation of the obstructive icterus from the hepa-

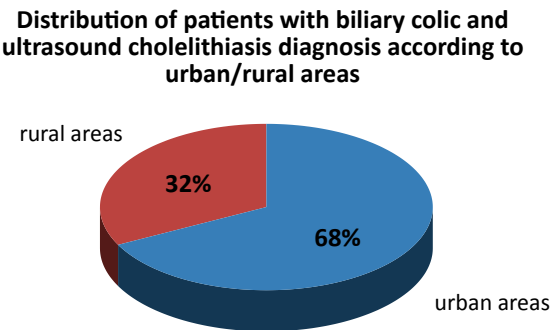


Fig 20. Distribution of the patients with biliary colic included in the study, at whom the cholelithiasis was echographically emphasized, according to urban/rural areas

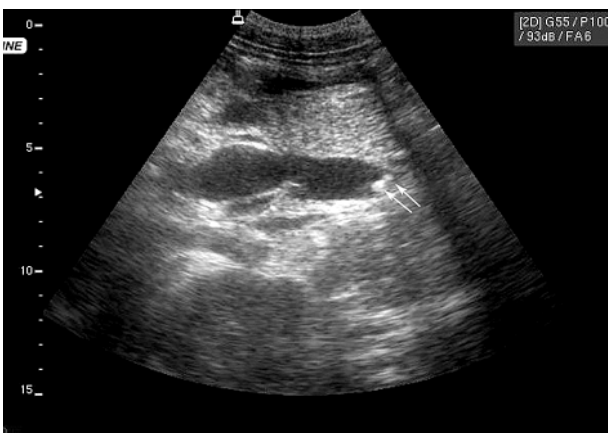


Fig 21. Cross section in epigastrium: 2 images of calculi in the final choledoch (arrows), with retrograde dilation of the main biliary tract



Fig 22. Cross section in epigastrium: large choledoch calculus (arrow)

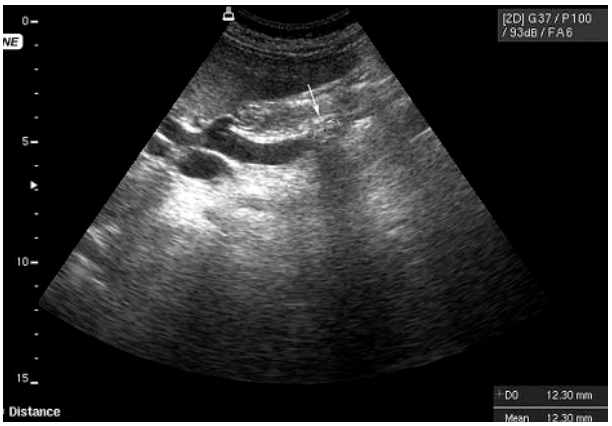


Fig 23. Cross section in epigastrium: lower choledoch calculus (arrow)

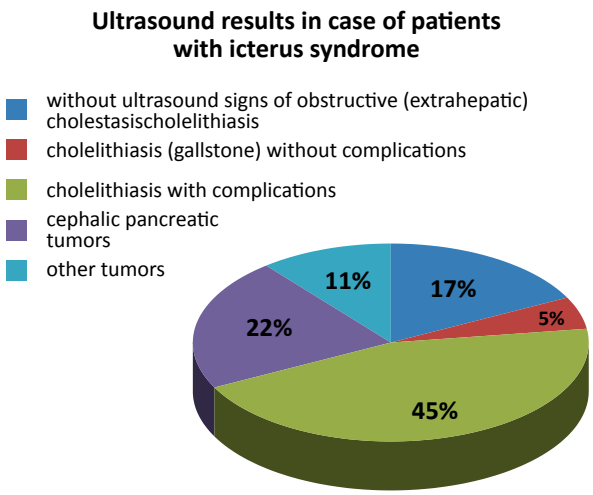


Fig 24. Distribution of the ultrasonographic aspects met at patients with clinic characteristics of icterus syndrome in emergency

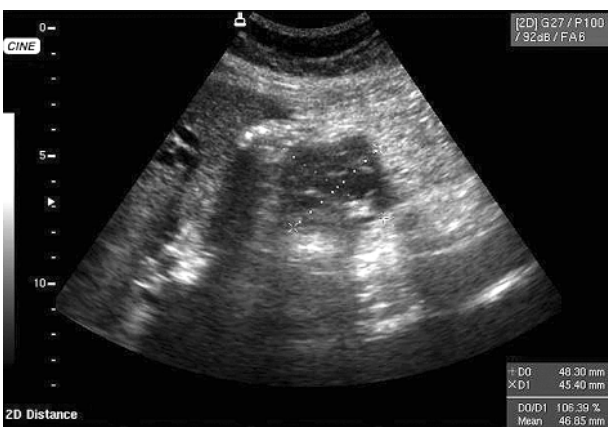


Fig 26. Cross section in epigastrium: pancreatic cephalic tumoral formation, dilation of intrahepatic biliary tract in the left lobe

tocellular one, allowing the diagnostic selection (triage) and guidance towards the specialized consultations necessary for the clarification of etiology (fig 28).



Fig 25. Cross section in epigastrium: dilation of main biliary tract and pancreatic cephalic tumoral formation

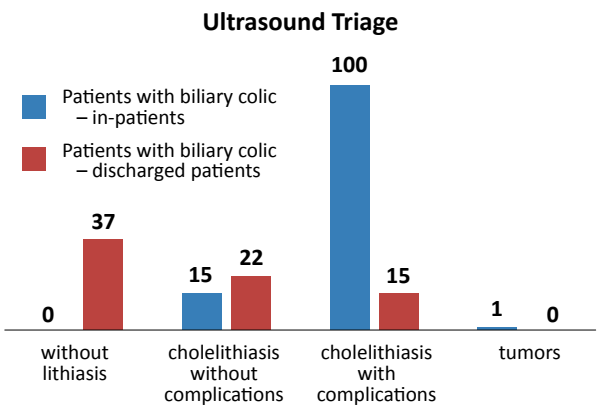


Fig 27. Distribution of the therapeutic diagnostic triage at the patients with biliary colic after the ultrasonographic examination

Discussion

The study presents an analysis of the contribution of ultrasonography to the etiology evaluation of the clinical characteristics of biliary emergency manifestations, having as the focus of the evaluation the influence of the imaging method on the therapeutic selection for a heterogeneous group, but statistically significant of patients. In the case of the subgroup of biliary colic with aspect of cholelithiasis detected at the ultrasonographic examination, the risk factors were evaluated for certain possible complications:

a. *the passage of the common bile duct* defined as value between 5–8.5 mm [8], without the dilatation of the intrahepatic biliary tract and in agreement with the normal aspect corresponding to the age [9] was emphasized in 8 patients with cholelithiasis without complications (21.6%), 6 of whom (16.2%) showed biliary gallstones smaller than 10 mm. The association of the growth of the biliary tract wall thickness over 2 mm [10] increases the suspicion of the passage (fig 29).



Fig 29. Intercostal oblique section: relaxed biliary tract with thickened walls, without dilations of intrahepatic biliary tract, suggesting passage choledoch



Fig 30. Intercostal oblique section: cholecystic with sludge, with echogenic elements and microcalculi

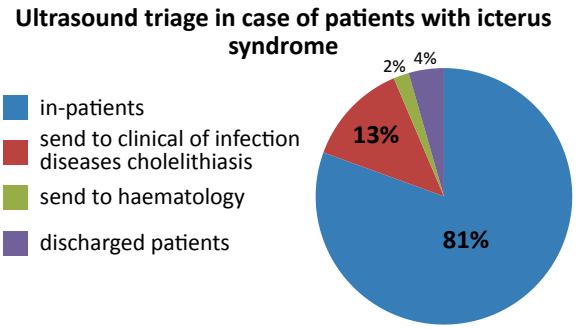


Fig 28. Distribution of the therapeutic diagnostic triage at the patients with icterus syndrome after the ultrasonographic examination

b. the *vesicular microlithiasis* (fig 30) emphasized ultrasonographically (27.5% of patients with simple cholelithiasis at the emergency ultrasonographic examination) draws attention to the possible passage. It requires monitoring and evaluation in the ultrasonographic, biologic dynamics and through retrograde endoscopic cholangiography especially in the association of main biliary tract of over 5 mm. The literature data emphasizes the fact that the main biliary tract lithiasis is possible even in the absence of its dilation [3,10], and its presence predisposes to the major complication of acute pancreatitis.

c. *the lithiasic gallbladder-scleroatrofic type* (10.8% of the patients with non-complicated cholelithiasis at the emergency ultrasonographic examination) or *porcelain vesicle* (5.4% of the patients with non-complicated cholelithiasis at the emergency ultrasonographic examination) are ultrasonographic aspects that need monitoring in dynamics due to the risk of developing neoplasic complications.

Regarding the emphasizing of the cholelithiasis complication of the vesicular hydrops type (15.8% of the patients with complications of the cholelithiasis) we observed the association of acute cholecystitis in 61%, of whom 9% evidenced also the common bile duct lithiasis. In 91% of cases, the lithiasic hydrops was produced by the calculi inclavation in the infundibul. In 39% of cases with vesicular hydrops without echographic signs of acute cholecystitis were observed in 42.8% of patients with an association between hydrops and common bile duct lithiasis. Thus, we observed in the studied group that the prevalence of acute cholecystitis is more frequently associated with the hydrops produced by the inclavation of calculi in infundibul than to the one produced by obstructive lithiasis at the common bile duct level.

The case percentage in which the lithiasis of biliary tract was suspected but could not be ultrasonographically detected was 13.8%, a value lower than the one described in the literature (15 – 40%) [10].

In the case of the subgroup of patients with icterus syndrome with signs of extrahepatic cholestasis (dilations of common bile duct, intrahepatic bile ducts) at the ultrasonographic emergency examination, the cause of obstruction couldn't be found at 21.2%, at 13.6% of patients the common bile duct lithiasis being suspected, and at 7.5%, a pancreatic neoplasic cause.

It was observed that 33.3% of the patients with lithiasic acute cholecystitis showed co-morbidities of the diabetes mellitus type (7 patients – 10.1%), of sequelar cerebral vascular accident (5 patients – 7.24%), of heart insufficiency (8 patients – 11.6%), of kidney insufficiency (1 patient – 0.14%), of recent myocardial infarction (1 patient – 0.14%), of chronic lymphatic leukemia (1 patient – 0.14%).

The statistical analysis of the logistic regressive type, applying the Odds Ratio test showed that the use of ultrasonography as a selection method of the patients arriving with biliary colic helps significantly in the detection of complications and implicitly determines the increase of the number of patients hospitalized for complications of the biliary lithiasis (Odds Ratio = 9.87). The increased frequency of the etiologic substrate detected ultrasonographically in patients from the rural areas compared to the urban areas draws attention to two problems: the *reduced accessibility* of those from the rural area which could determine a false reduced frequency or the presence of *functional disturbances of the biliopancreatic type* especially in patients from the urban area. These aspects need evaluation representing a problem of the state health management.

Conclusions

• Emergency ultrasonographic examination allows the therapeutic approach in the clinical-biological context, according to the risk of biliar lithiasis complications detected by the echographic aspect of the lithiasis and biliary tract;

• Ultrasonography as a method of emergency diagnosis of patients with acute bilio-pancreatic symptomatology of the polymorph type is *the examination of first intention*, which can make the triage of the patients for: hospitalization in the *surgical unit (37.6%* of the patients arrived at the emergency unit) or *internal* (22.5% of the patients arrived at the emergency unit); guidance towards *consultations* in units of contagious diseases *(9.9%* of the patients arrived in emergency) or hematology *(0.6%* of the patients arrived at the emergency unit);

• Patients who, after the ultrasonographic examination do not show significant modifications (28% of the patients arrived at the emergency unit) will be guided towards the family doctor/gastroenterologist for an investigation of a functional pathology.

• Detection of uncomplicated vesicular lithiasis in 22% of the patients arriving at the emergency unit requires the evaluation of the complications risk in the context of the presence/absence of associated co-morbidities and the ultrasonographic monitoring in dynamics in the case of symptomatologic reappearance or according to the risk group.

As a final conclusion, ultrasonography represents a useful diagnosis method in emergency for the detection of biliary lithiasis complications. It allows, through the integration in the algorithm of the diagnostic triage of bilio-pancreatic emergencies management, an adequate therapeutic approach (the improvement of surgical intervention period, reduction of complications number) and the decrease of medical care costs through the differentiated application of the supplementary imaging examinations. It is more expensive with CT, MRI, ERCP, only in the cases undetected by echographic examination.

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