Peptic ulcer perforation is an urgent, life-threatening condition that requires prompt diagnosis and emergency surgical treatment. It is a focal defect of the pylorobulbar zone that affects all the layers and allows intraluminal contents to leak into the peritoneal/retroperitoneal cavity. The aim of this study is to point to ultrasonography as a good diagnostic modality in identifying peptic ulcer perforation when it is clinically unrecognized. Case Report. We report a case of a 36-year-old man who came to the Emergency Center of the Clinical Center of Vojvodina complaining of a sudden severe pain in the entire abdomen. The patient reported previous dyspeptic symptoms. Emergency transabdominal ultrasonography was performed, and a peptic ulcer perforation was suspected. It significantly shortened the time to urgent surgical treatment and the diagnosis was confirmed. Conclusion. Pneumoperitoneum, collection of extraluminal free fluid with gas bubbles around the lesion, inflammatory thickening and discontinuity of the pylorobulbar wall, with or without focal hyperechogenic line (perforation zone) are ultrasonography findings suggestive of peptic ulcer perforation. Key words: Peptic Ulcer Perforation; Ultrasonography; Diagnosis; Stomach Ulcer; Duodenal Ulcer; Signs and Symptoms

Summary

Introduction. Peptic ulcer perforation is an urgent surgical, life-threatening condition with a high risk of mortality and morbidity (10 – 40%), especially in the elderly patients and patients with comorbidities, as well as in patients who presented late, i.e., 12 hours or later, after the onset of symptoms. The annual incidence of peptic ulcer disease in the world is 1.5 – 3%, and perforation occurs in 2 – 14% of patients with active ulcer. The 30-day mortality rate reaches 20% and 90-day mortality rate is over 30% [1]. It presents a focal defect which penetrates all the layers of the gastric or duodenal wall, allowing food and digestive juices to leak into the peritoneal or retroperitoneal cavity [1, 2]. The perforation usually occurs in small curvatures on the posterior wall of the pylorus, or in the anterior wall of the duodenal bulb. It is most commonly caused by the bacterium Helicobacter pylori. It may also occur due to excessive use of nonsteroidal anti-inflammatory drugs. Today, the incidence of perforated ulcer is in decline, because of the improvement in the eradication of Helicobacter pylori and peptic ulcer therapy [3]. Clinical manifestations of peptic ulcer perforation largely depend on the time when the first symptoms begin, on the size of the perforation, and whether there is leakage of luminal content into the peritoneum/retroperitoneum. The clinical symptoms may be nonspecific: severe pain in the upper abdomen that mimics acute pancreatitis, cholecystitis, pyelonephritis, appendicitis, as well as acute abdomen with abdominal wall rigidity. Due to these nonspecific symptoms, abdominal ultrasonography is often the initial diagnostic modality, because it is noninvasive, available, and easy to perform. This procedure easily excludes many entities of differential diagnosis. Also, ultrasonography is often the first step to detect the free peritoneal fluid, wall thickening of pylorobulbar region and to suspect the presence of free extraluminal gas (large-

Sažetak

Uvod. Perforacija peptičkog ulkusa je urgentno, životno ugrožavajuće stanje koje zahteva brzu dijagnostiku i što raniji hirurški tretman. Predstavlja lokalni dežet koji zahvata sve slojeve zida pilorobulbarne regije i omogućava isticanje intraluminalnog sadržaja u peritonealnom/retroperitonealnom duplu. Cilj ovog članka je da podseti čitaoca da ultrasonografija može biti ponekad dobar dijagnostički modalitet u postavljanju sumnje na klinički neprepoznate perforacije peptičkog ulkusa. Prikaz slučaja. Predstavljamo 36-годишnjeg muškarca koji dolazi u Urgentni centar Kliničkog centra Vojvodine zbog naglo nastalih jakih bolova u celom tруbu. Od ranijih tegoba navodi dispeptičke tegobe. U sklopu urgentnog protokola načinjena je ultrasonografija abdomena zbog sumnje na perforaciju peptičkog ulkusa, što je značajno skrato vreme do urgentnog hirurškog tretmana koji je potvrdio postavljenu dijagnozu. Zaključak. Pneumoperitoneum, perileziona ekstraluminalna slobodna tečna kolekcija sa mehurićima gasa i inflamatorna zadebljana i prekid kontinuiteta zida pilorobulbarne regije sa/bez fokalne hiperechogene linije – zone perforacije su ultrazvučni kriteriji za postavljanje sumnje na perforaciju peptičkog ulkusa.

Ključne reči: perforacija peptičkog ulkusa; ultrasonografija; dijagnoza; ulkus želuca; ulkus duodenuma, znaci i simptomi

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ULTRASOUND DIAGNOSIS OF PEPTIC ULCER PERFORATION - A CASE REPORT

ULTRAZVUČNA DIJAGNOSTIKA PERFORIRANOG PEPTIČKOG ULKUSA – PRIKAZ SLUČAJA

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ly depends on the experience of the sonographer and condition of the patient [4, 5]. The definitive diagnosis is usually established by native abdominal X-ray and computed tomography (CT) of the abdomen. The CT scan is recommended, as its diagnostic accuracy is as high as 98% [6].

The purpose of this study was to point to ultrasonography as the first, only and irreplaceable diagnostic procedure in establishing peptic ulcer perforation, and not to diminish the importance of CT. Ultrasonography is a good diagnostic tool to identify patients with peptic ulcer perforation, especially in children and pregnant women, in order to reduce exposure to radiation [7]. Furthermore, “saving time” from the onset of symptoms and the surgical care of the patient is important in these patients, because it reduces potential complications [8, 9].

Case Report

A 36-year-old man came to the Emergency Center of the Clinical Center of Vojvodina complaining of a sudden severe pain in the abdomen that got worse in a supine position. The patient reported previous dyspeptic symptoms. The physical examination revealed a diffuse abdominal pain with abdominal wall rigidity, while the rest of the findings were unremarkable. Laboratory test results showed increased leukocytes (12.72 ... 22), while the remaining blood test results were within normal ranges. An emergency abdominal ultrasonography was performed using a 3.5 – 5 MHz convex probe, with the patient lying in a supine position. Right subcostal, right parasagittal and epigastric scans were made. A circumscript, uniformly thickened wall, 12 mm in diameter, of pylorobulbar region was established (Figure 1). In the locoregional area there was a small amount of free liquid. Also, in the liver hilum, free extraluminal gas was found with distal acoustic shadow (Figure 2).

After a short preoperative preparation, an emergent surgery was performed. The intraoperative findings showed a perforated ulcer in the front of the pyloric stomach, 5 mm in size, with about 1000 ml of serous fluid spilled into the peritoneal cavity.

Discussion

Direct signs of peptic ulcer perforation are inflammatory thickening and stratified appearance of the wall of pyloric or bulbar region (normal thickness of gastric wall is up to 7 mm, so peptic ulcer disease is suspected when the gastric wall exceeds 8 mm in thickness and has lost its five-layer structure on transabdominal ultrasound (TUS); duodenal ulcer is suspected if the duodenal wall thickness exceeds 5 mm) and there is a focal discontinuity of the affected portion of gastric/bulbar wall [10]. Indirect signs of peptic ulcer perforation are pneumoperitonem - presence of free extraluminal gas in the peritoneal cavity, localized around the pylorus, duodenum, liver, subdiaphragmatic and perirenal space, etc, presence of free fluid in the peritoneal cavity, focal or diffuse peritonitis, focal “striped form” inflammatory infiltration of perigastric fat or diffuse inflammatory infiltration of mesenteric fat - “dirty mesentery”, locoregional reactive lymph nodes [2, 9]. Free fluid is usually around the lesion, subhepatic, intraperito-

eal, etc. The pylorus is a 5-layer structure (mucosa,

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**Abbreviations**

CT – computed tomography
TUS – transabdominal ultrasound

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**Figure 1.** Abdominal transverse epigastric scan using 3.5 MHz transducer; Circular thickening of the duodenal wall points to peptic ulcer perforation (arrow)
**Slīka 1.** Sonogram sa transversalnim presekom epigastrične regije abdomena ultrazvučnom sondom od 3,5 MHz. Cirkularno zadebljanje zida bulbusa duodenuma koje može ukazivati na perforiran peptički ulkus (strelica)

**Figure 2.** Abdominal transverse epigastric scan using 3.5 MHz transducer; Pocket of shadowing gas and free fluid adjacent to porta hepatitis (arrow)
**Slīka 2.** Sonogram sa transversalnim presekom epigastrične regije abdomena ultrazvučnom sondom od 3,5 MHz. Inkluzija ekstraluminalnog gasa i slobodna tečnost u regiji porte jetre (strelica)
Ultrasound diagnosis of peptic ulcer perforation submucosa, muscularis, subserosa and serosa) that tapers in cross-section and passes into the duodenal bulb which has a thinner wall and several strains are less recognizable, but three main layers: serosa, muscularis and mucosa are enough to visualize it [11–14]. A perforated peptic ulcer is seen on TUS as a focal thickening or discontinuity of the wall of pyloric or duodenal bulb with or without hyperechoic bright line that passes through the firewall (perforation zone) [7, 8, 12]. Sometimes it is possible to see free peritoneal gas in the form hyperechogenic foci or lines, providing dirty distal acoustic shadow and “ring down” artifacts. Also, there may be bubbles of gas which together with the intraluminal content leak through the perforated wall into the perigastric space or diffuse into the peritoneum [15]. It is difficult to distinguish the intraluminal from extraluminal gas, but the gas location may be helpful: intraluminal gas is deeper relative to the surface of the peritoneum, while the free gas can be detected on subdiaphragmatic surface of the liver, epigastric, in the lodge of the gallbladder, and in the fissure of ligamentum teres [11, 16]. It is possible to establish focal thickening and discontinuity of gastric wall, as well as pneumoperitonem using ultrasonography, but as it is not entirely reliable, it is generally associated with a multidetector CT that has higher sensitivity to establish the cause of acute abdominal pain. Contrast enchanted CT is routinely used as an initial and portal-venous phase with multiplanar recontruction of images, and it evaluates emergency signs of acute abdomen: free intraperitoneal extraluminal gas, focal diffuse peritonitis, contrast enhanced parietal peritoneum and/or focal o diffuse hyperdense stranding infiltration of perigastric/mesenteric fat – “dirty mesenterium”, free intraperitoneal fluid, dilated bowel with gas–liquid level, extravalas leakage of blood, focal thickening or discontinuity of gastric/bulbar wall [19]. Ultrasound examination largely depends on the skills of a sonographer, ultrasonography machine, and preparation of the patient (meteorism, previous installment, constitution, etc.). The sensitivity of TUS in diagnosing peptic ulcer is 66.7%, 38.9% for duodenal ulcer, and 45.8% in total [9, 10, 20]. Peroral fluid-aided negative oral contrast or peroral cellulose-based gastric ultrasound contrast agent in TUS of the stomach and duodenum may increase the diagnostic sensitivity; it has recently been suggested as a valuable initial screening tool for evaluation of acute abdomen in group of patients such as children and pregnant women, to establish peptic ulcer perforation. Conclusion Ultrasound is used in the diagnosis of perforated peptic ulcer and that is in accordance with papers published in medical literature. Regardless of the type of diagnosis, earlier and more accurate diagnosis leads to faster therapy which reduces the number of serious complications and length of hospital stay.

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