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*Limitations in ultrasonographic evaluation of the abdominal
aortic aneurysms*

The frequency of the abdominal aortic aneurysms (AAA) increases in older population, especially in men over 50. In most cases the AAAs are revealed occasionally in routine ultrasound examination or in CT performed due to other reasons.

The aim of the study was the assessment of the diagnostic value and limitations of ultrasound examination in the evaluation of the abdominal aortic aneurysms.

MATERIAL AND METHODS

Material comprises a group of 26 patients with aortic abdominal aneurysms, in whom ultrasound examination was performed. The examination was made with 3.5 MHz ultrasound header. In all cases the diameter of the dilated aorta, the length of the dilatation, proximal and distal aortic necks and involvement of the iliac arteries were evaluated. In patients with thrombus within the aneurysm, its sizes and the diameter of the patent lumen were assessed.

RESULTS

The planned ultrasound examinations were performed in 20 previously prepared patients. In other six patients the emergency examinations were performed. In a group of planned examination only in six cases all elements were assessed. In eight patients the bifurcation of the aorta was not visible, and assessment of the iliac arteries involvement was impossible. In other patient no iliac arteries were involved (Fig. 1). In 12 cases the thrombus inside the lumen of the aorta was seen (Fig. 2), and in five cases the patent lumen was narrowed (Fig. 3). In one patient the thrombus forms the parietal nodule (Fig. 4). In other cases there were no thrombi inside the dilated aorta. The proximal neck of the aneurysm was invisible in 10 cases. The length of the aneurysm could not be measured in five cases (Fig. 5). In three of the six emergency patients the aorta was completely invisible in ultrasonography – the presence of the aneurysm was confirmed in future CT examination – because of the bowel gas and obesity. In other two cases only the proximal and distal necks of the aneurysms were not visible.



Fig. 1. Abdominal aortic aneurysm above the aortic bifurcation. The normal right iliac artery is visible (arrows)

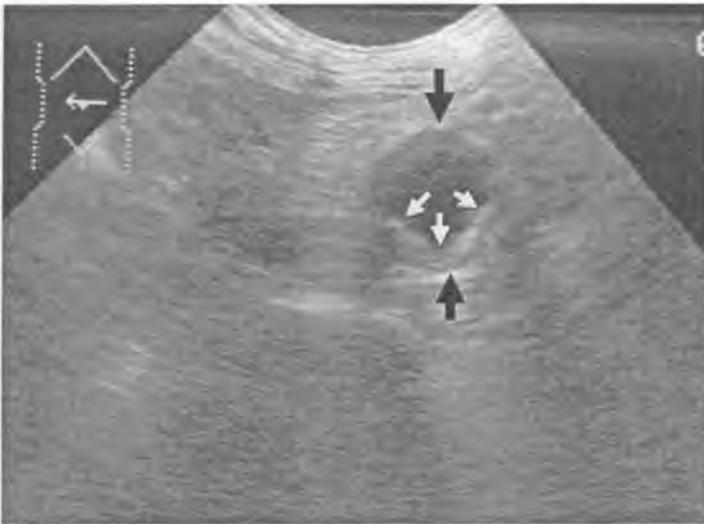


Fig. 2. Abdominal aortic aneurysm (black arrows). Thin parietal thrombus inside the aorta (white arrows)



Fig. 3. Abdominal aortic aneurysm (black arrows). The parietal crescent-shaped thrombus inside the aorta narrowing its lumen (white arrows)

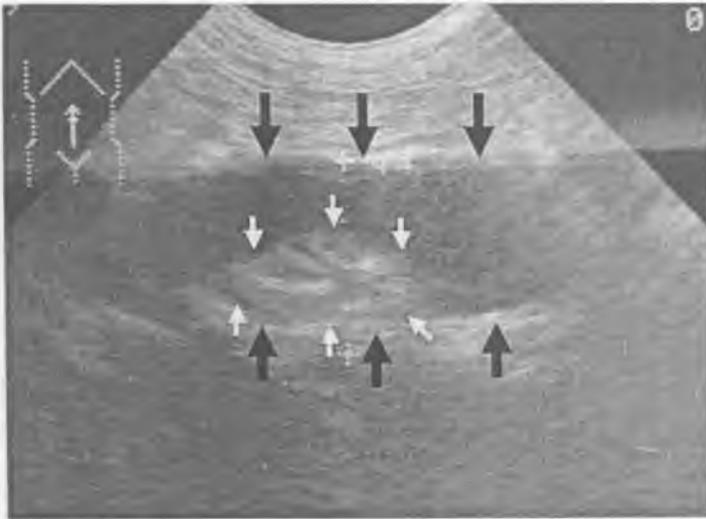


Fig. 4. Abdominal aortic aneurysm (black arrows). The thrombus forms the parietal nodule inside the aorta narrowing its lumen (white arrows)

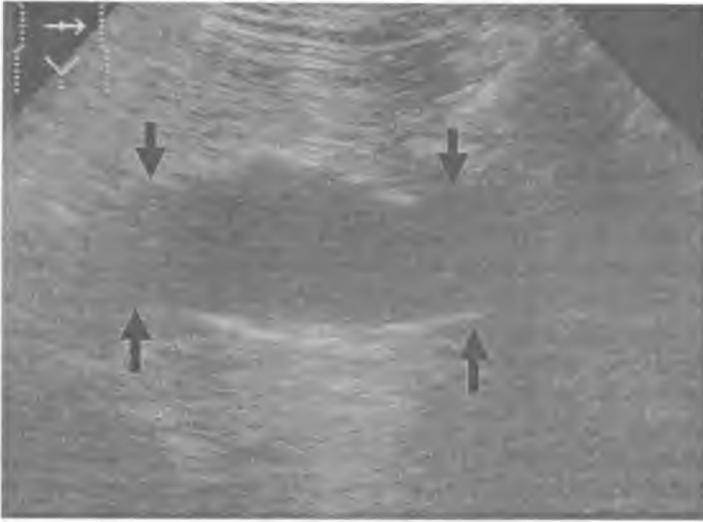


Fig. 5. Abdominal aortic aneurysm. The lower and upper ends of the aneurysm are invisible, therefore the assessment of the aneurysm length is not possible

DISCUSSION

The clinical assessment of abdominal aortic aneurysms is not precise. The aortic diameter may be more precisely assessed in ultrasonography or CT. Ultrasonography is quick and convenient diagnostic modality in screening of abdominal aortic aneurysms. Moreover, in ultrasonography the diameter of the tortuous aorta is more accurately measured than on CT sections (4, 9).

The rupture of the AAA is almost always fatal. To prevent the death due to the AAA rupture, early detection and subsequent surgical treatment are necessary. Several imaging modalities may be used in diagnosing the AAA, including plain radiography, aortography, CT and ultrasound examination (11). Abdominal aortic aneurysm requires mass screening because it is common and serious pathology, often symptomless until rupture (3).

Palpation is not reliable in diagnosing the AAA. Almost all AAAs larger than 5 cm are revealed by this method, but some AAAs from 4 to 5 cm in diameter usually are not palpable, and smaller than 4 cm are not palpable at all (5).

During the evaluation of the aortic aneurysm, the decision about surgery must be made, to avoid unnecessary operations, because up to 2/3 of the patients with AAAs do not die due to aneurysm rupture. Therefore, the measurements of the AAAs should be accurate, because the decision of surgery often relies on them (1, 9).

Ultrasonography is believed to be a valuable diagnostic modality in the screening of the AAAs. Because of its accessibility the frequency of the diagnosed AAAs is still increasing (9, 11). Ultrasonography is a useful diagnostic method in evaluating the aortic dilatation. It is widely accessible, cheap, accurate, quick, repetitive and safe (3, 9).

Unfortunately there are several limitations of ultrasound examination in the evaluation of the aortic aneurysm. In emergency patients it is often impossible to imagine aorta, because of the bowel gas or obesity. In some cases the evaluation of the iliac arteries is not possible even in previously prepared patients.

Interobserver variability in measurements of aneurysms may result in misdiagnosis, but may also lead to missing the aneurysms in mass screening. Interobserver variability in measurements of the

distal aorta is about 4 mm, but variability in measurements of the proximal part depends on the diameter of the aorta (11). In measurements of antero-posterior aortic diameter it is about 2.2 mm while for transverse diameter is 5.3 mm. Some authors suggested interobserver variability in measurements of the antero-posterior diameter between 5 and 8 mm (1).

The antero-posterior aortic diameter is more accurately evaluated than the transverse diameter. The diameter of the aneurysms in ultrasonography is higher than that measured on CT sections (4).

Ultrasonographic screening of AAA is becoming more and more popular, and is recommended as accurate procedure (4). Ultrasound examination may be useful in control examination of patients with AAA, enabling evaluation of increase in aneurysm diameter. Because of interobserver variability in measuring the aortic diameter, the increase in antero-posterior diameter of >8 mm suggest real growth (4, 10). Ultrasound examination performed by the experienced the examiner may be valuable, and the accuracy in measurements of the aortic diameter may be interpreted within ± 3 mm (11). Subrenal aortic dilatation may be defined as the aortic diameter of 23 mm in men and 19 mm and women, and the diameter of iliac arteries of 14 mm in men and 12 in women (10). The aortic dilatation exceeding 3 cm in diameter and at least one and a half time larger than suprarenal aortic diameter is called aortic aneurysm (8, 10).

The diameter of the abdominal aorta and iliac arteries tend to be larger in men than in women (10). In men AAA tends to be 6 times more frequent (5, 10).

Crescent sign was described in 1988 and is valuable, but it is usually visible in large AAAs, larger than 6 cm (6). However, thrombus to lumen ratio is more valuable, complete description, showing subsequent changes not only in the aneurysm size, but also the relation of the thrombus to lumen. The larger the aneurysm, the larger the ratio (6).

Isolated iliac aneurysms in 25% of cases are bilateral. Most of them affect common iliac artery (7). They may be invisible in standard ultrasound examination.

Some authors suggested that ultrasound examination is the diagnostic modality of choice in the preoperative assessment of AAA, qualified for endovascular treatment. They claimed that ultrasonography is more accurate than CT or aortography in the assessment of proximal and distal aneurysm necks, and iliac arteries (2). However, because the ultrasound examination is examiner-dependent, the ultrasonography should be supplemented by thin-section CT or aortography examination before introducing the stent (2).

CONCLUSIONS

The ultrasound examination is a quick, cheap diagnostic modality in revealing the abdominal aortic aneurysm. It may be useful in mass screening, and control examinations of patients with small aneurysms. But ultrasonographic assessment is not accurate enough in the evaluation of all critical features of the aneurysm and preoperative evaluation. In emergency and obese patients the ultrasound examination may fail in visualizing abdominal aorta. In long aneurysm in ultrasonography the assessment of the involvement of the thoracic aorta is impossible.

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SUMMARY

The frequency of the abdominal aortic aneurysms (AAA) increases in older population, especially in men older than 50 years. In most cases the AAAs are revealed occasionally in routine ultrasound examination or in CT performed due to other reasons. The aim of the study was the assessment of the diagnostic value and limitations of ultrasound examination in the evaluation of the abdominal aortic aneurysms. The ultrasound examination is a quick, cheap diagnostic modality in revealing the abdominal aortic aneurysm. It may be useful in mass screening, and control of patients with small aneurysm. But ultrasonographic assessment is not accurate enough in the evaluation of all critical features of the aneurysm and preoperative evaluation. In emergency and obese patients the ultrasound examination may fail in visualizing the abdominal aorta. In long aneurysm in ultrasonography the assessment of the involvement of the thoracic aorta is impossible.

Trudności w ultrasonograficznej ocenie tętniaków aorty brzusznej

Częstość tętniaków aorty brzusznej wzrasta w populacji ludzi starszych, szczególnie u mężczyzn powyżej 50 roku życia. W większości przypadków tętniaki są wykrywane przypadkowo w rutynowym badaniu USG lub badaniu TK wykonywanym z innych przyczyn. Celem pracy była ocena wartości diagnostycznej i ograniczeń badania USG w ocenie tętniaków aorty brzusznej. Badanie USG jest szybką i tanią metodą diagnostyczną w wykrywaniu tętniaków aorty brzusznej. Może być użyteczna w badaniach przesiewowych oraz kontroli pacjentów z małymi tętniakami. Badanie USG nie jest wystarczająco dokładne w ocenie wszystkich istotnych elementów tętniaków i w ocenie przed operacyjnej. W przypadkach nagłych u pacjentów bez odpowiedniego przygotowania uwidocznienie aorty brzusznej może być niemożliwe z powodu gazów jelitowych czy otyłości. W przypadku rozległych tętniaków badaniem USG nie ma możliwości określenia stopnia zajęcia aorty piersiowej.