The clinical and echographic diagnostics of acute nonspecific deferentitis in adults

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**Introduction.** Acute nonspecific deferentitis (AND) or inflammation of the vas deferens (VD), known in English literature as acute nonspecific vasitis, is poorly understood and not sufficiently addressed in the literature disease. As shown by personal experience, in contrast to the well-known post-vasectomy vasitis nodosa (resp., sperm granulomas VD), the AND is unfamiliar to a wide circle of radiologists and practical urologists. To prove the above stated it should be noted that in many domestic and foreign guides for radiology and urology the AND, as a separate nosology, are not considered (for example, Russian National Manual of Urology by edited N.A. Lopatkin, 2009; Emergency Radiology by edited B. Marineck and R.F. Dondelinger, 2007; Campbell-Walsh Urology 9th ed, 2007 and others).

Based on aetiology and pathogenesis of the AND, it can be divided into primary and secondary forms. Primary AND occurs very rarely, in the literature there are only sporadic observations of the primary AND [1 - 7]. Primary AND proceeds as an inguinal funiculitis with sepsis caused by hematogenic pyogenic microflora. In clinical practice significantly more common secondary AND, which occurs in association with epididymo-orchitis or acute prostatitis at urogenital infections in sexually active patients [8].

Among the radiological methods of diagnosis AND have been applied ultrasound, CT [6,7,9]. The main method of diagnosis AND is the high resolution ultrasound, which allows us to examine the structure and vascularization of all the anatomical parts of the VD, except pelvic division VD. However, in PubMed was found only one publication in ultrasonic diagnostics AND, based on a retrospective analysis of 12 cases of AND [9]. In this connection, this paper focuses on clinical and ultrasound diagnostic aspects the secondary AND.

**The practical relevance** of this study caused by the following reasons:

a) the AND is manifested syndrome "acute scrotum" in both children and adults and can be a reason for emergency hospitalization and temporary disability;

b) the AND has non-specific clinical and laboratory picture similar to other sharp urological and surgical diseases of the urinary tract and groin area, as a consequence of the AND in a clinical study usually not recognized;

c) timely unrecognized AND usually ends obliteration VD. Therefore the bilateral AND can lead to obstructive azoospermia, which is one of the most common causes of male infertility;

d) timely unrecognized complication of the AND, such as abscess VD, for example, during epididymectomy in a patient with acute destructive epididymitis, may be the cause of
re-extended surgical intervention, namely orchifuniculectomy. It can lead to additional physical and mental traumatization in patient.

**The purpose of this study** was to improve the quality of diagnosis AND using high-resolution ultrasound. During the work consistently were solved the following tasks:

1) to study of normal ultrasound anatomy VD in the control group;

2) to study of clinical and ultrasound manifestations AND in adult patients;

3) to evaluate of the comparative efficacy of clinical-laboratory and ultrasonic diagnostic methods AND.
Methods and materials

Prospective comprehensive investigation of urogenital organs, including traditional clinical and laboratory examinations, high-resolution ultrasound and Doppler performed in 86 patients admitted to hospital with diagnosis of acute epididymitis. Terms of admission to hospital from the beginning of disease amounted to 2,5 (0,5 - 7,5) days. Ultrasound performed at the apparatus of the expert class "Voluson E8" and "Voluson 730 exp" (GE, USA) using linear probe high-resolution (6 - 16 MHz) and transrectal probe (5 - 9 MHz). All anatomical parts of the VD were studied, except pelvis parietal part its. Dimensions and structure of the VD were assessed at grey scale ultrasound. The studying sonographic structure VD included an assessment of level-by-level differentiation of the wall and the lumen of the VD. Vascularization of the VD was studied in the scrotum part of the VD by energy Doppler, using the criterion vascular density VD, which reflects the number of vascular signals attributable to the cross-sectional area of the VD. Qualitative and quantitative evaluation of blood flow in the artery VD was made using the spectral Doppler. Pathomorphological examinations of the testis, epididymis and elements of the spermatic cord after orchiectomy for destructive acute epididymitis were performed in 32 (37,2%) patients. The control group consisted of 60 patients aged 18 to 85 years, without a history of inflammatory infectious diseases of the urethra, prostate gland, seminal vesicles and of the scrotum. For analysis of the study results were used non-parametric statistical methods using package "Statistica 10,0". Statistical analysis results are presented in the form M (min - max), where M is the median. Correlation between parameters was studied by Spearman's method and is expressed by the correlation coefficient (r), reliability of statistical hypotheses were evaluated on criteria p.
Results

In the control group VD identified as incompressible, hypoechoic and layered tubular anatomical structure, which occupies a marginal position in the spermatic cord, having a clear external contours and regular sizes. Outer diameter and internal structure of the VD does not depend on the age, body mass index, sizes the testicles and prostate. Visualization were available all the anatomical parts of the VD, except in the pelvic region. Density intraductal blood flow at Power Doppler was 0 (0 - 1) signals to cross-sectional area of VD. Blood flow in the artery VD characterized as a low speed and high-resistance (Fig 1 - 5).

AND was diagnosed in 54 (63%) of 86 patients with acute scrotum. The age distribution of patients had a bimodal character (Fig. 6). The 1st subgroup (n = 42) comprised patients young and middle-age, in the 2nd subgroup (n = 12) consisted of patients of elderly and senile age. In the 1st subgroup the AND mainly developed at sexually transmitted infections (trichomoniasis, chlamydiasis and other), in the 2nd subgroup the AND often occurred after various transurethral surgery and manipulations on prostate and bladder at gram-negative infection (E. coli, Proteus mirabilis and other). In both subgroups development AND preceded inflammatory diseases of the urogenital organs: acute urethritis - in 8 (15%) patients, acute prostatitis - in 13 (24%), acute seminal vesiculitis - in 18 (33%) or a combination of these diseases - in 15 (28%) (Fig 7 - 8).

Clinical laboratory signs of the AND were non-specific and they simulated acute epididymitis. They included acute pain in the scrotum - in 54 (100%) patients, swelling and hyperemia scrotum - in 28 (52%), asymmetric increase scrotum - in 14 (26%), general signs of inflammation (fever, leukocytosis, increase ESR) - in 51 (94%). Palpation the VD was non-informative test because of the expressed pain and swelling of the scrotum in 52 (96%) patients. When clinical and laboratory evaluation of patients the AND was detected only in 6 (12%).

According to high-resolution ultrasound the AND characterized by:

a) indistinct external outlines the VD in 54 (100%) patients;

b) thickening the VD over 5 mm - in 52 (96%);

c) poor differentiation of the layers VD - in 54 (100%);

d) heterogeneous structure the VD - in 42 (78%);

e) intraductal and periductal hyoervascularization - in 54 (100%).

Blood flow in the artery of the VD was high-speed and low-resistance. Vascular density the VD was 5,6 (3 - 8) (Fig. 9 - 13).
The AND usually combined with the acute epididymitis in 40 (74%) patients, less often the AND preceded the acute epididymitis - in 8 (15%). Very rarely it has developed in isolation as an independent disease - in 6 (11%) patients (Fig. 14).

As a rule, the AND limited to defeat by epididymal part of the VD. In 2 (4%) cases was noted involvement in the inflammatory process of the terminal and of the inguinal parts the VD.

Destructive form of the AND was observed in 8 (15%) patients. In these patients, ultrasound were found small abscesses the VD dimensions of 3,2 (2,6 - 5,3) mm in diameter. Abscesses of the VD combined with destructive changes of the epididymis and testis in all cases and treated surgically. In 2 (25%) patients with destructive forms of the AND the abscesses VD identified previously by ultrasonography, however, in during the operation they were not found, the operation was limited to only by epididymectomy. In the postoperative period, the status of the patients are not improved. The ultrasonography confirmed the presence of the abscess VD with the spread of the inflammatory process on the testicle. It was rescheduled forced and advanced surgical intervention: orchietomy (Fig. 15 - 17).

The clinical and ultrasound differencial criteria the AND are presented in figures 18 -19.

The sensitivity, the specificity and the diagnostic accuracy of high-resolution ultrasound at the AND were 100%, 96% and 98%, respectively (Fig. 20).
Fig. 1: High-resolution ultrasound scrotum. Mode “Zoom”. Normal vas deferens

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Fig. 2: High-resolution ultrasound ingunal canal. Mode "Zoom". Normal vas deferens

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Fig. 3: High-resolution ultrasound scrotum. Color Doppler. Normal artery deferentiales

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**Fig. 4:** Transrectal ultrasound. Normal seminal vesicles and ampoules of vas deferens (arrows)

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Fig. 5: 3D transrectal ultrasound. Coronal plane. Normal prostate, ducts seminal vesicles and ducts deferens (arrows)

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Fig. 6: The age distribution of patients with the acute nonspecific deferentitis

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<table>
<thead>
<tr>
<th>Characteristics of clinical groups with acute nonspecific deferentitis</th>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (min – max)</td>
<td>32 (23 – 54)</td>
<td>67 (62 – 82)</td>
</tr>
<tr>
<td>Predisposing factors</td>
<td>hyperactive irregular sexual life</td>
<td>transurethral surgery and manipulations</td>
</tr>
</tbody>
</table>

**Fig. 7:** Clinical characteristics the groups of the acute nonspecific deferentitis

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**Fig. 9:** High-resolution ultrasound scrotum. Mode "Zoom". Longitudinal plane. Acute nonspecific deferentitis (arrows). Non-destructive stage

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Fig. 10: High-resolution ultrasound scrotum. Transversal plane. Acute nonspecific deferentitis (arrow). Non-destructive stage. T - normal testis, E - normal epididymis

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**Fig. 12:** High-resolution ultrasound scrotum. Power Doppler. Longitudinal plane. Acute nonspecific deferentitis. Non-destructive stage. Hypervascularization vas deferens

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Fig. 13: High-resolution ultrasound scrotum. Impulse Doppler. Artery deferentiales. Acute nonspecific deferentitis. Non-destructive stage. High-speed and low-resistance flow

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Fig. 14: Stages of the acute nonspecific deferentitis (working classification)

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**Fig. 15:** High-resolution ultrasound scrotum. Longitudinal plane. Acute nonspecific deferentitis. Destructive stage. Immature abscess vas deferens (arrow). E - normal epididymis

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Fig. 16: High-resolution ultrasound scrotum. Longitudinal plane. Acute nonspecific deferentitis. Destructive stage. Mature abscess vas deferens (arrow). AE - acute epididymitis

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Fig. 11: 3D transrectal ultrasound. Coronal plane. Terminal part of vas deferens. Acute nonspecific deferentitis (arrow). ASV - acute seminal vesiculitis. Top and to the right. Power Doppler. Acute seminal vesiculitis. Hypervascularization right seminal vesicle

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Fig. 8: Transrectal ultrasound. Transversal plane. A background disease at acute nonspecific deferentitis. Acute nonspecific focal prostatitis (arrow). Top and to the right. Power Doppler. Acute nonspecific focal prostatitis. Hypervascularization right lobe prostate

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**Fig. 17:** Correlation between results of pathomorphological and ultrasound studies at acute nonspecific deferentitis. Destructive stage. Abscess vas deferens (arrows)

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<table>
<thead>
<tr>
<th>Method</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
<th>Diagnostic accuracy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical and laboratory</td>
<td>34</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>100</td>
<td>96</td>
<td>98</td>
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</tbody>
</table>

**Fig. 20:** Comparative evaluation of methods of diagnosis of the acute nonspecific deferentitis
<table>
<thead>
<tr>
<th>Diagnostic criteria</th>
<th>Acute nonspecific deferentitis</th>
<th>Dilatation deferentopathia</th>
<th>Control group</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Outer diameter vas deferens, mm</td>
<td>&gt; 5</td>
<td>&gt; 5</td>
<td>&lt; 2.5</td>
<td>&lt; 0.05</td>
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<tr>
<td>2. Inner diameter vas deferens, mm</td>
<td>&lt; 2</td>
<td>&gt; 2</td>
<td>&lt; 1</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>3. Differentiation of wall layers vas deferens</td>
<td>--</td>
<td>+</td>
<td>+</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>4. Vascular density vas deferens</td>
<td>&gt; 5</td>
<td>0 - 1</td>
<td>0 - 1</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>5. V max deferential artery, cm/s</td>
<td>&gt; 15</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>6. RI deferential artery</td>
<td>&lt; 0.5</td>
<td>&gt; 0.5</td>
<td>&gt; 0.5</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>7. Resistance blood vas deferens</td>
<td>low-resistance</td>
<td>high-resistance</td>
<td>high-resistance</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>8. Periductal inflammatory infiltration vas deferens</td>
<td>+</td>
<td>--</td>
<td>--</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>9. Association with acute scrotum</td>
<td>+</td>
<td>--</td>
<td>--</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

**Fig. 18:** Differential diagnostics criteria acute nonspecific deferentitis

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Fig. 19: High-resolution ultrasound scrotum. Longitudinal plane. To the question of differential diagnostics acute nonspecific deferentitis. Dilatation deferentopathia with benign hyperplasia prostate

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Conclusion

1. AND is one of the commonest complications of urethritis, prostatitis and seminal vesiculitis with urogenital infections in adults.

2. As a rule, the AND is combined with acute epididymitis. In some cases, AND can be preceded by acute epididymitis or proceed in isolation as an independent disease.

3. In most cases, the AND is limited to defeat scrotal part of the VD.

4. AND refers to surgical diseases requiring urgent diagnostics and, if necessary, surgical treatment strategy. Underestimation of the AND stage may be the cause of repeated surgical intervention on the scrotum organs.

5. Clinical and laboratory manifestations of the AND are non-specific. The AND often simulates acute epididymitis and therefore usually not recognized in time.

6. High-resolution ultrasound of the VD is a reliable and accessible method of diagnosis of the AND. It allows: a) to evaluate the amount of inflammatory lesions of the scrotum; b) to clarify the stage of AND (destructive or non-destructive); c) to exclude acute inversion, injury and testicular tumor; d) to define the strategy of treatment of AND (medical or surgical); e) to evaluate the effectiveness of treatment; f) to determine the tactics (the volume) of surgical intervention in the development of destructive stage AND.

7. High-resolution ultrasound the VD should be an integral part of the routine protocol ultrasound of the scrotum all patients with suspected inflammatory diseases of the urogenital organs.
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References