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Peculiarities of the structure and blood supply vas deferens depending on some anthropometric data, sexual activity, sizes of the testicles and prostate gland

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Aims and objectives

Various diseases of the vas deferens (VD) may lead to infertility, acute and chronic scrotal pain. Anatomical characteristics VD (for example, deep location VD in the pelvis, inside the inguinal canal and into the scrotum), individual characteristics of patients (for example, obesity), some clinical situations (for example, the presence of hydrocele, inguinoscrotal hernia) in most cases prevent physical research VD. Among the existing methods of visualization VD, high-resolution ultrasound is leading. Unlike conventional x-ray vasography, high-resolution ultrasound is a safe, non-invasive and non-traumatic, and when compared with the CT and MRI it is affordable. Ultrasound examination makes to study the structure and the blood VD. Main limitations of this method are inability to explore the pelvic part and install the patency of the VD. In the previous few publications has been shown the possibility of application of ultrasonic method in the study of normal anatomical structure of the VD, it has been studied main ultrasonic biometrics VD depending on sexual activity and body mass index patient [1 - 8]. However, not all aspects of ultrasound picture of the VD have received adequate coverage in the literature.

The aim of this study was to identify the characteristics of the structure and blood supply VD depending on some anthropometric data, sexual activity, and also the size of the testicles and prostate gland. Objectives of the study were the following:

1) to study normal echoanatomy of the VD;

2) to study of the peculiarities of the topography VD;

3) to study the normal vascularization of the VD;

4) to study the interrelation of sizes, level-by-level differentiation VD with age, body mass index, the size of the prostate and testicles, sexual activity.

Methods and materials

In a group of volunteers consisting of 70 people is studied structure and vascularization of the VD using B-mode ultrasound, Doppler angiography and spectral Doppler. The age of volunteers was 50,7 (15 - 92) years, growth - 1,76 (1,62 - 1,90 m), weight - 81 (55 - 120 kilograms), body mass index- 26,2 (19,0 - 35,4), timing of sexual abstinence - 177 (1 - 7300) days, the total volume of testicular - 28,0 (5,8 - 45,6) cm3, the prostate gland is 19,6 (13,6 - 32,3) cm3. Scrotum and inguinal segments of the VD were studied using linear probe (6 - 16 MHz), terminal segment of the VD studied using transrectal probe (5 - 9 MHz). Vascularization VD expressed indicator of vascular density, which was estimated using energy Doppler and reflect the quantity of vascular signals attributable to the cross-sectional area of the VD. Correlation between parameters was studied by the method

Spearman and is expressed by the correlation coefficient (r). Statistical analysis results are presented in the form M (min - max), where M is median [Fig. 1].

Images for this section:

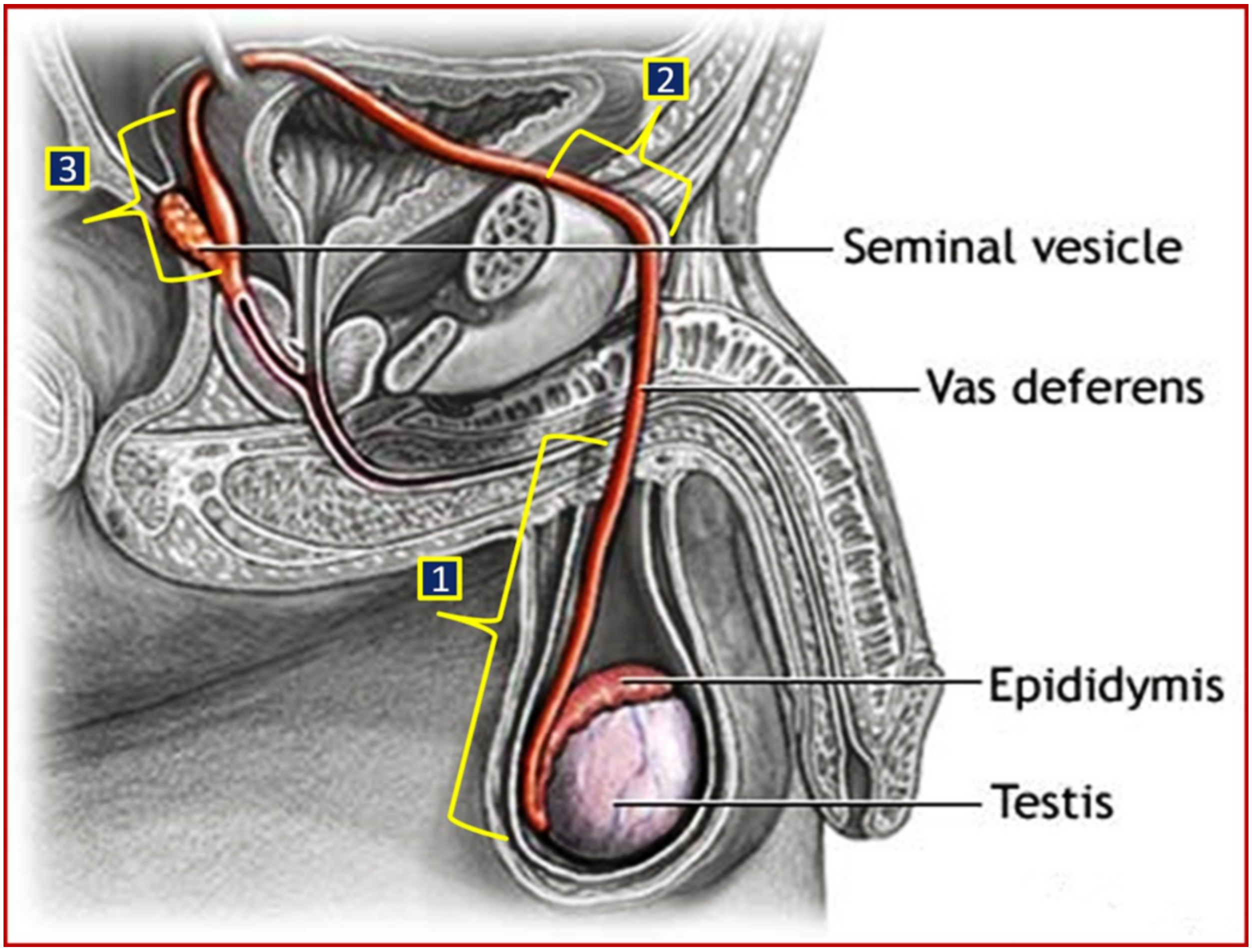

Fig. 1: Areas of the vas deferens available for ultrasonic examination. 1 - scrotum, 2 - canalis inguinalis, 3 - ampoule' vas deferens

Results

1. In scrotum and inguinal segments of the VD identified as tubular, with clear external outlines, incompressible, hypoechogenic structure, which occupies a marginal position in the spermatic cord. Wall of the VD had three-layer structure. External and mucous membranes were hyperechogenic, muscular layer - hypoechogenic. Outer diameter of the VD in scrotum and inguinal segments was similar ($p > 0,05$) and amounted to 2,3 (1,2 - 3,7) mm, internal diameter of 0,5 (0 - 1,5) mm, total wall thickness - 1,2 (0,8 - 1,6) mm, the thickness of the mucous membrane of 0,6 (0,4 - 0,8) mm, thickness of the muscle layer - 0,6 (0,4 - 1,0) mm, thickness of the external membrane - 0,4 (0,3 - 0,6) mm. Ampoule of the VD had layered structure width 5,7 (3,4 - 13,2) mm, inner diameter of 0,4 (0 - 0,8) mm. Assessment of the internal structure of the VD in the inguinal part was hampered or unavailable for obese patients [Fig. 2 - 7].

2. It has identified 2 anatomical variants of location testes in the scrotum: normoposition and longitudinal inversion (testes turn around the vertical axis to 180 degrees). Normoposition testes was observed in 26 (34,3%) Mediastinum testes took the medial position in relation to the septum of the scrotum. The VD was located along the rear edge testes, on the inner surface, in front of the mediastinum In spermatic cord VD with its accompanying the artery and vein were located in the back portions, occupying posteriomedial position. Mediastinum testes took lateral wall of the scrotum. The VD was located along the rear edge testes, on the outer surface, posterior to the mediastinum In spermatic cord VD with its accompanying the artery and vein located in the front portion of spermatic cord, occupying anteriolateral position. 40 (57%) patients had various anatomical variants of the VD. They were presented anteroposition VD (the location of the VD on the lateral surface of the testes), centroposition VD (location VD in the middle third of the diameter of the testes), and lateroposition VD (location VD at the front edge testes) [Fig.8 - 9].

3. Vascular density of the VD was 0 (0 - 1), was the same for all anatomical departments VD and did not depend on age, weight, height, body mass index, the duration of sexual abstinence, the testicles and prostate cancer ($p > 0.05$). Artery of the VD is identified in scrotum portion of the VD in 32 (45,7%) cases. Diameter artery of the VD was 0,8 (0,6 - 1,1) mm. In the bloodstream artery of the VD characterized as high-resistance and monophasic with severe depression or complete lack of diastolic component of the spectrum. Pulsative index amounted to 2,2 (1,4 -3,2), resistive index - 0,89 (0,80 - 0,99), the maximum speed of the blood flow - 10,3 (5,8 - 14,2) cm/s, minimum blood flow velocity - 1,1 (0,2 to 1,8) cm/s, and the mean maximum blood flow velocity - 4,4 (2,1 - 6,6) cm/s. Venous bloodstream of the VD is not identified [Fig.10].

4. Correlation between external diameter dimensions VD, severity level-by-level differentiation of the wall of the VD and dimensions of vascularization VD and the patient's age, the body mass index, duration of sexual abstinence, the size of the testicles and prostate were weak (r varied from «- 0,17+ 0,25» and averaged - «+ 0,07») and statistically insignificant ($p > 0.05$). Statistically unconfirmed ($p > 0.05$) age-related trends:

the deterioration of level-by-level differentiation VD (p = 0,233) and visualization of the internal lumen VD (p = 0,543), a reduction in the average values of maximum speed (p = 0,076) and increase of the indexes of vascular resistance in the arteries VD (p = 0,087) with increasing age. Individual differences in size, degree of layered differentiation and vascularization are not found.

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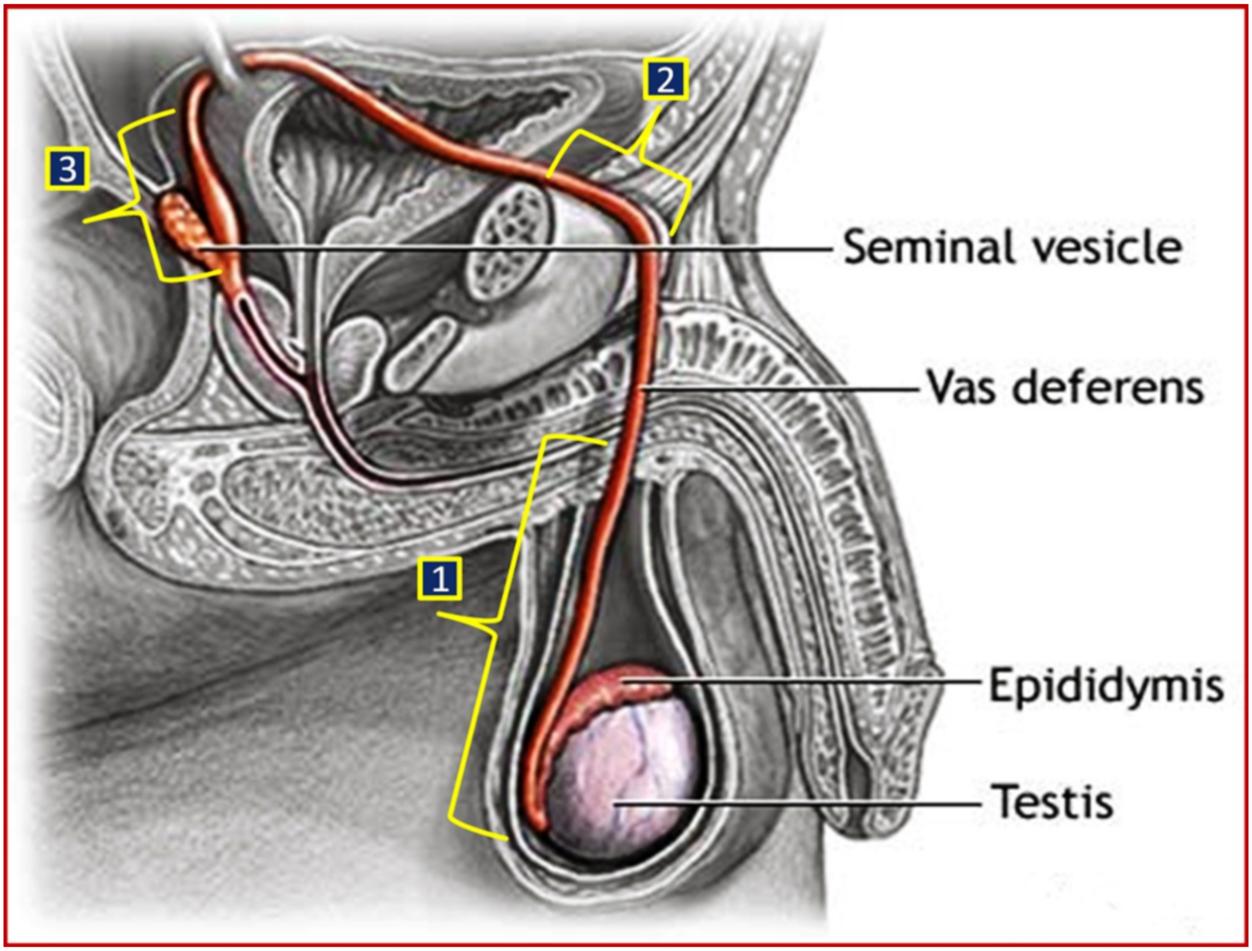

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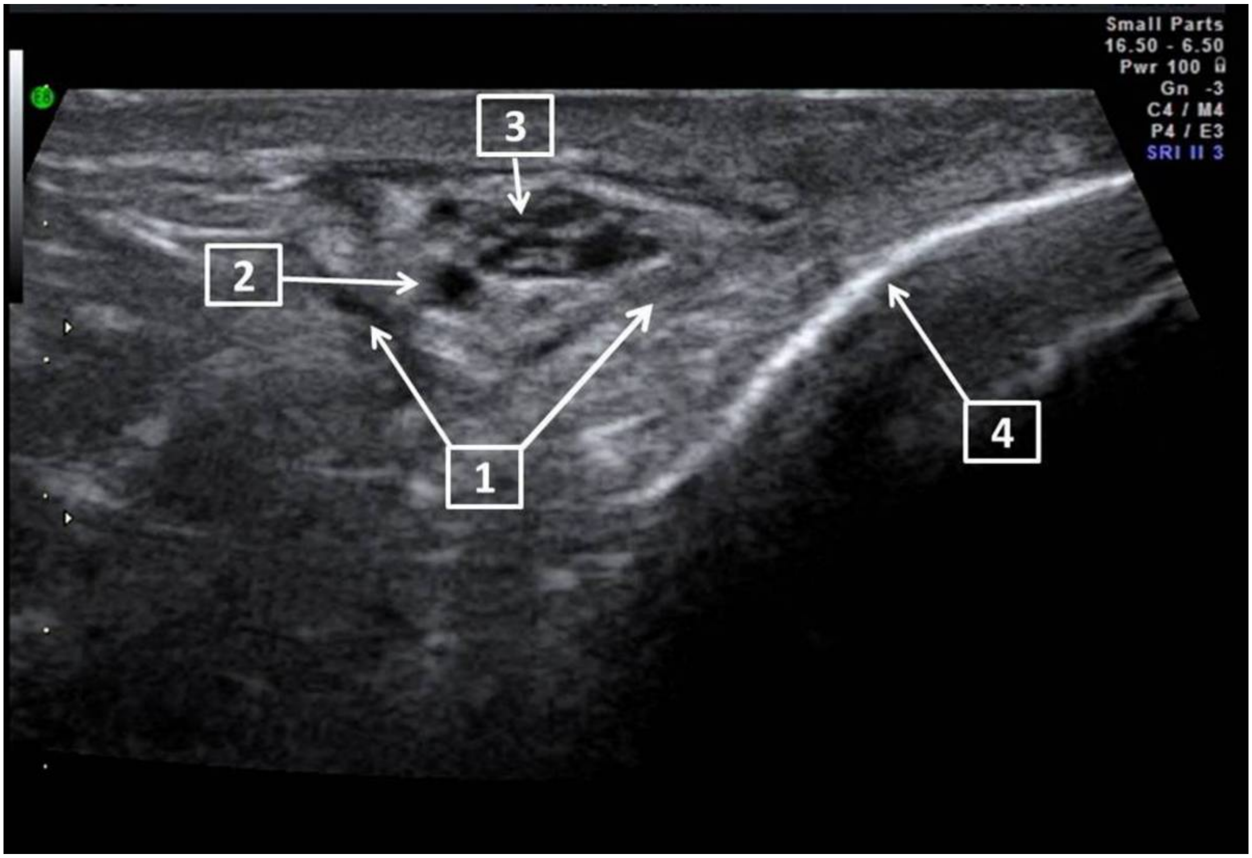

Fig. 2: Transverse scanning scrotal part of the left of the spermatic cord. 1 - spermatic cord, 2 - vas deferens, 3 - testicular artery, surrounded by testicular veins, 4 - os pubis

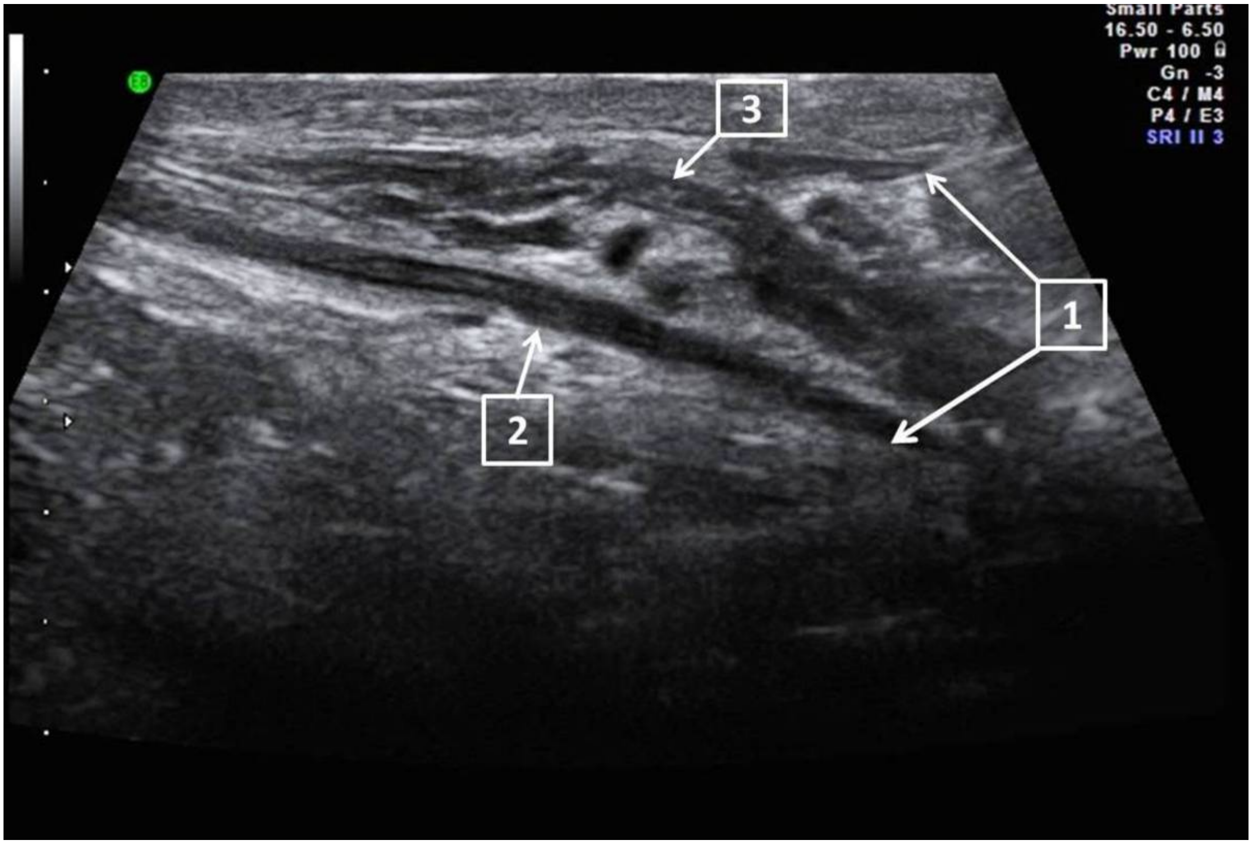

Fig. 3: Longitudinal scanning the scrotal area of the spermatic cord. 1 - spermatic cord; 2 - vas deferens, 3 - testicular artery, surrounded by testicular veins

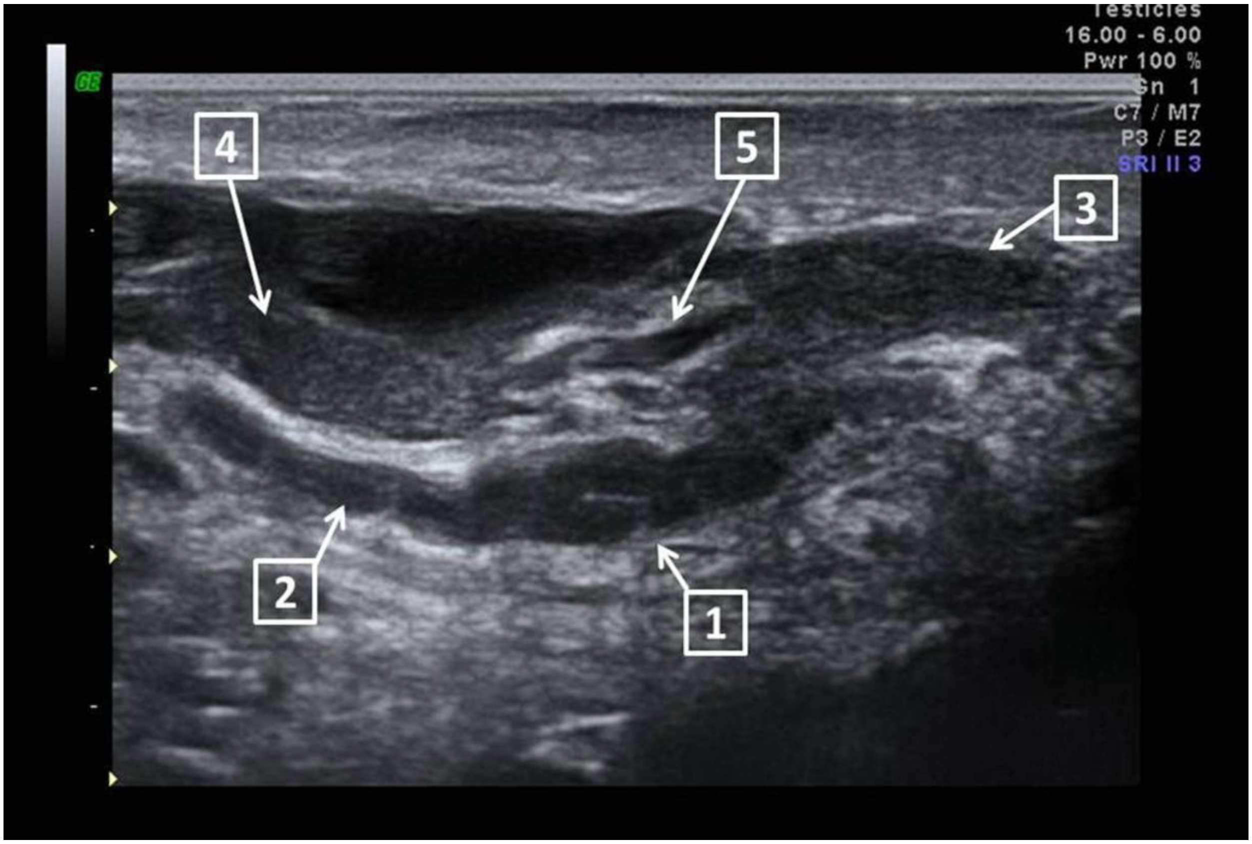

Fig. 4: Ultrasonography of the scrotum. The proximal region of the vas deferens. 1 - convoluted part of the vas deferens, 2 - direct part of the vas deferens, 3 - tail's epididymis, 4 - body's epididymis, 5 - testicular artery

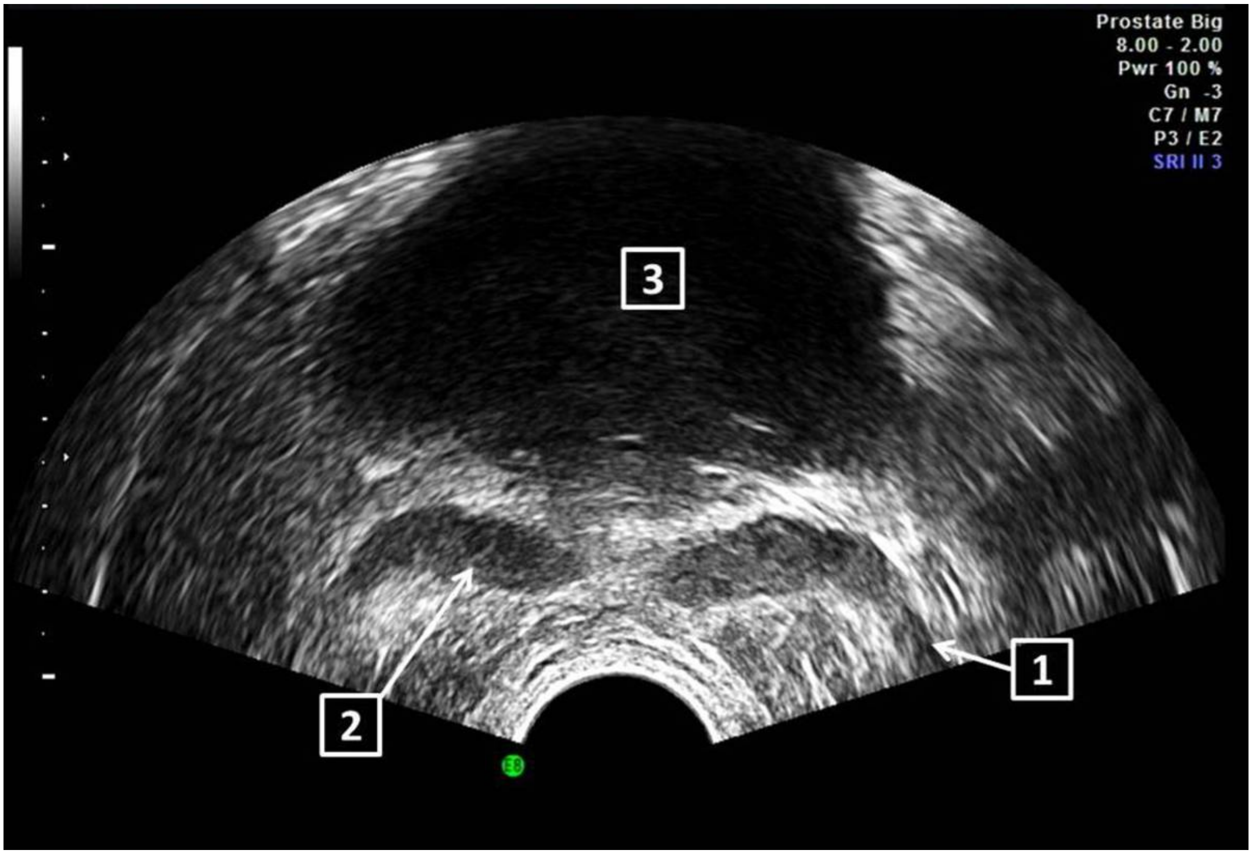

Fig. 5: Transrectal ultrasonography. Distal section of the vas deferens. 1 - vas deferens, 2 - ampoule of the vas deferens, 3 - bladder

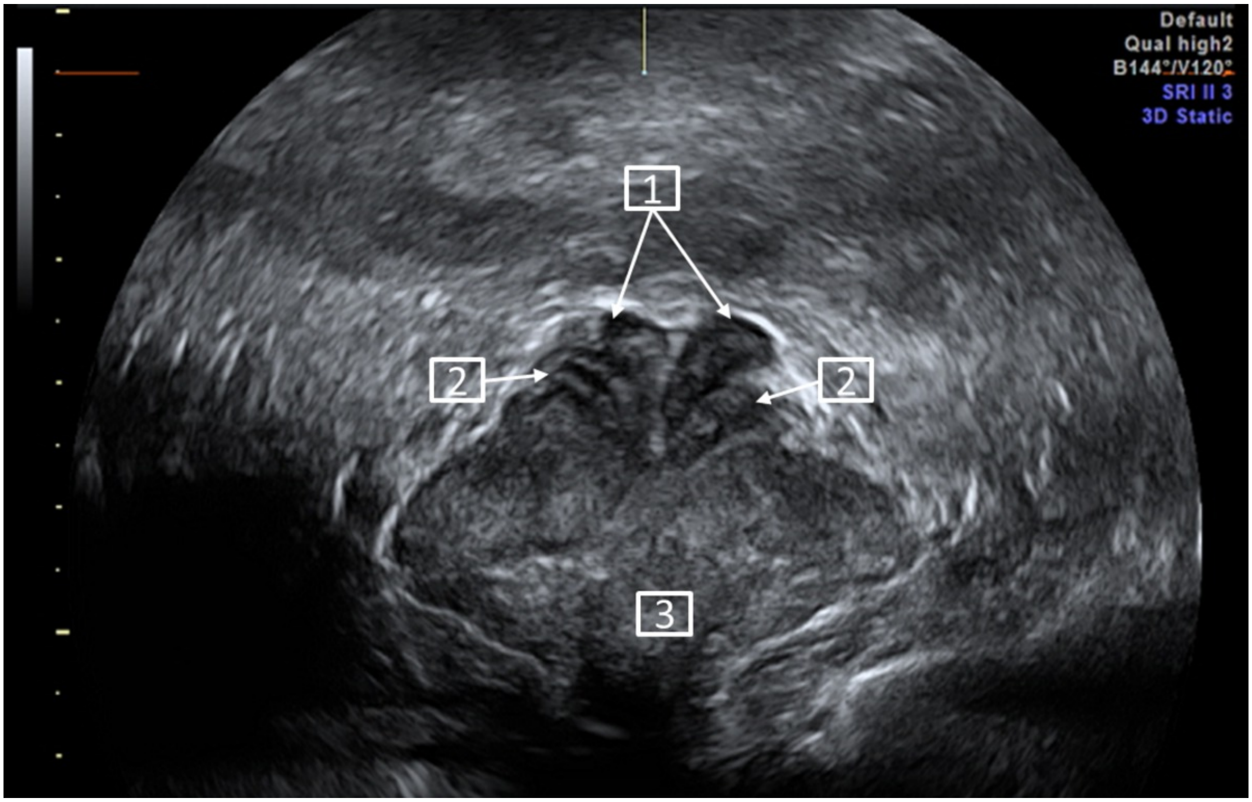

Fig. 6: 3D transrectal ultrasonography. Coronal plane. Distal section of the vas deferens. 1 - ampoules of the vas deferens, 2 - seminal vesicles, 3 - prostate

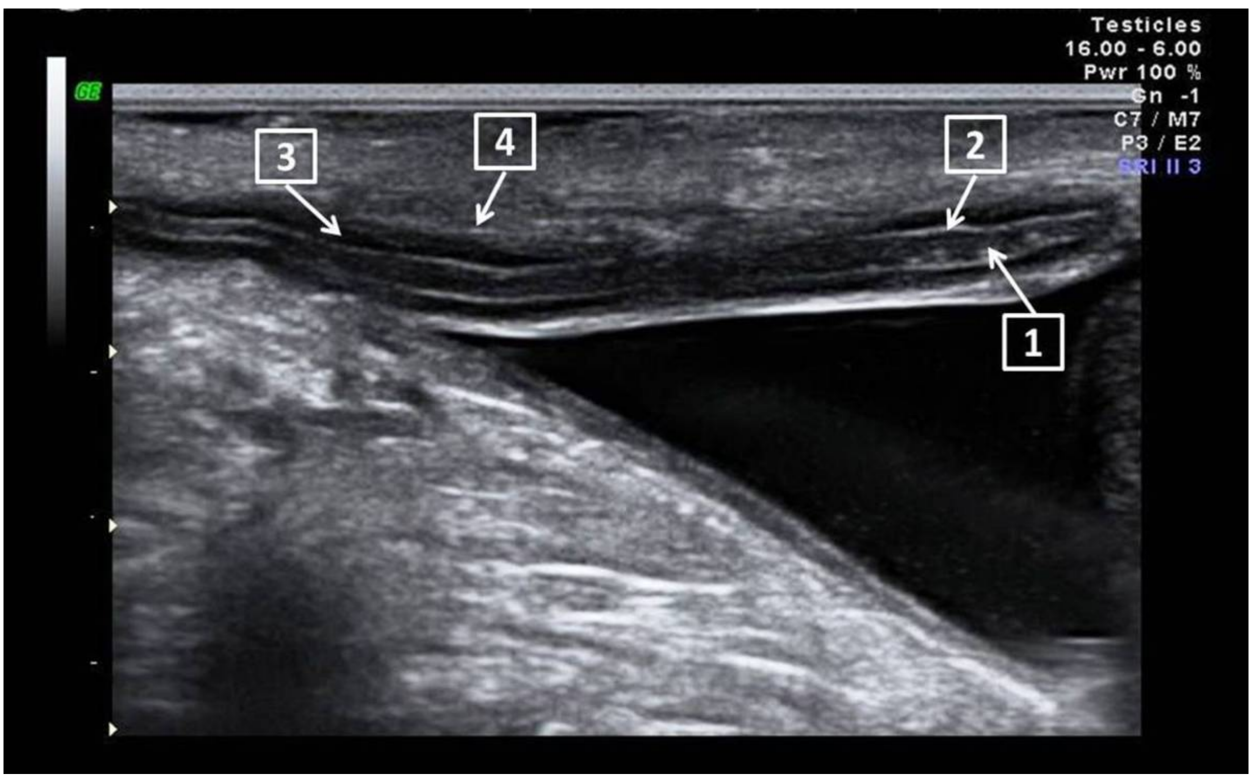

Fig. 7: Ultrasonography of the scrotum. Longitudinal scanning vas deferens. The internal structure of the vas deferens. 1 - lumen of the vas deferens with seminal fluid, 2 - the mucous membrane, 3 - the muscular layer, 4 - adventitia

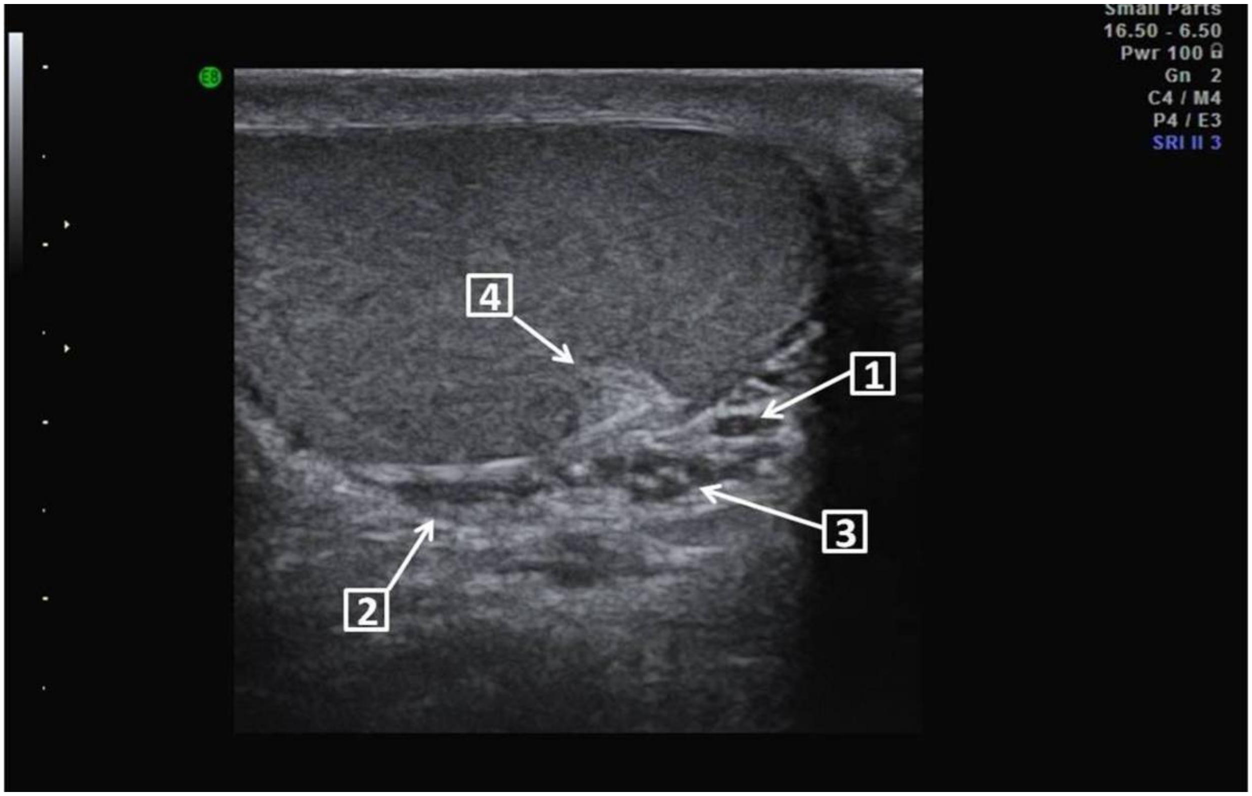

Fig. 8: Ultrasonography of the scrotum . Transverse scanning. Normoposition right testicle. Level of the middle third of the testicle. 1 - vas deferens, 2 - body's epididymis, 3 - testicular artery, surrounded by veins, 4 - mediastinum's testicle

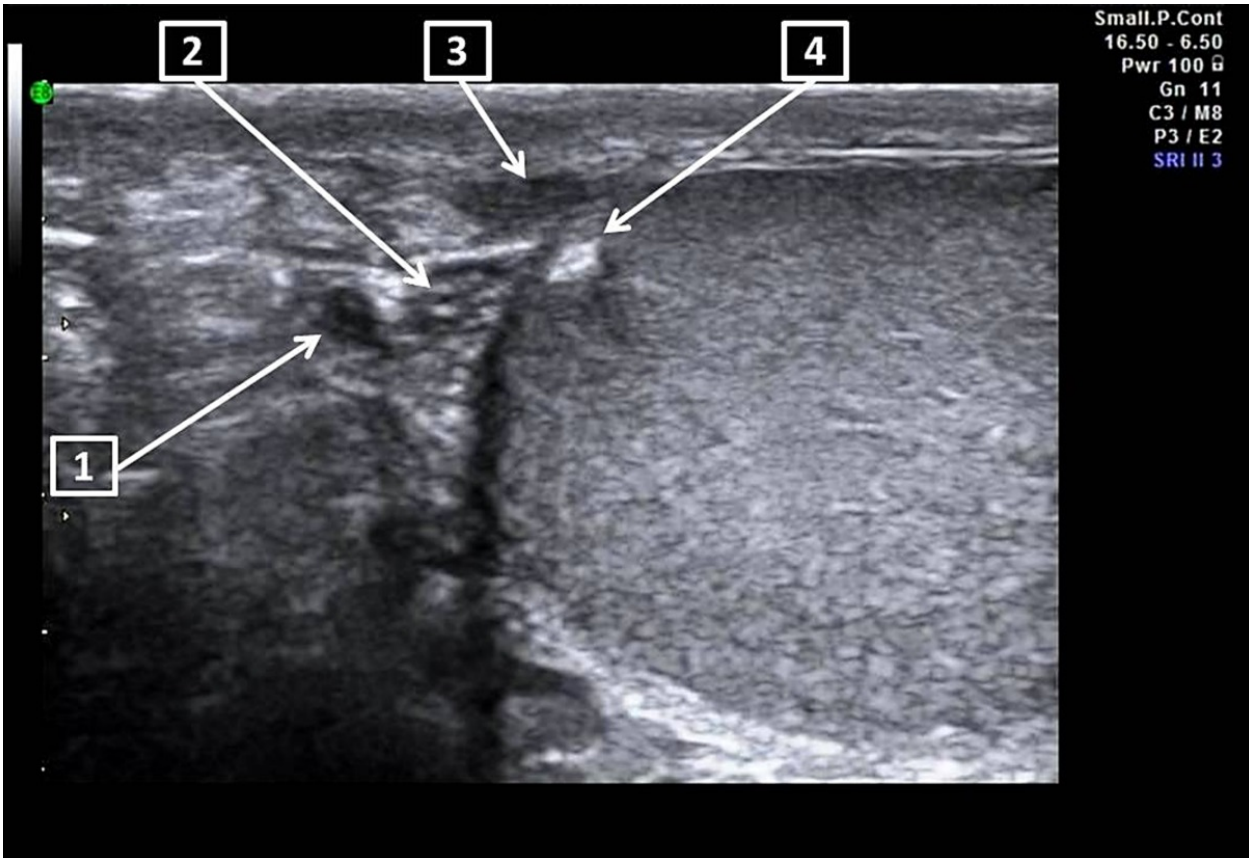

Fig. 9: Ultrasonography of the scrotum . Transverse scanning. Inversion of the right testicle. Level of the middle third of the testicle. 1- vas deferens, 2 - testicular artery; 3 - body's epididymis, 4 - mediastinum's testicle

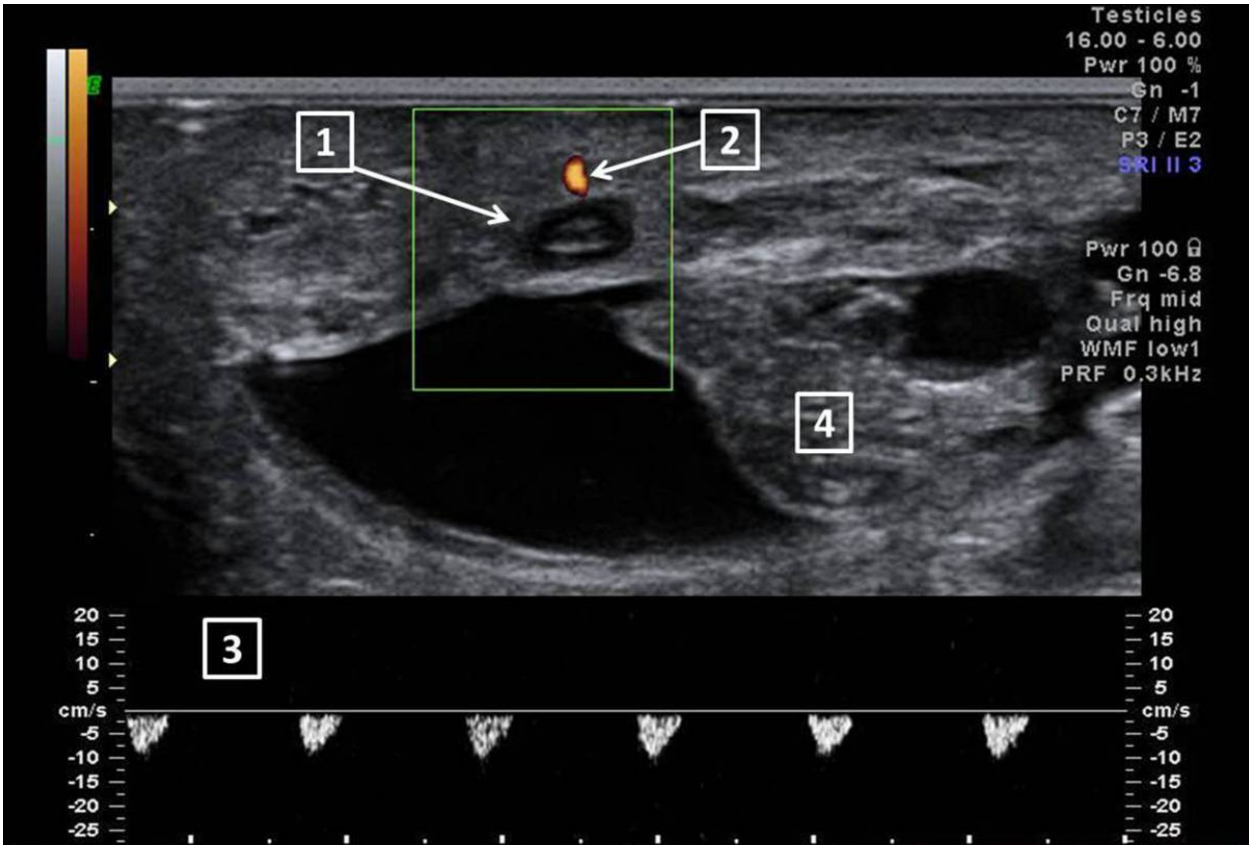

Fig. 10: Dopplerography of the vas deferens. Transverse scanning the vas deferens at the level of heads of the epididymis. 1 - vas deferens, 2 - deferential artery, 3 - blood spectrum of the deferential artery, 4 - head's epididymis

Conclusion

Adequate estimation of the sizes and internal structure of the VD by ultrasound is possible in scrotum, ingunal and terminal regions VD. Adequate estimation of the internal structure of the VD by ultrasound is only possible in scrotum and terminal regions VD Dimensions, internal three-layer framework and perfusion of the VD are constant and reliable for practical work. Any statistically significant differences in the structure and blood supply VD depending on the age, BMI, the duration of sexual abstinence, the testicles and prostate gland in the present study have been not identified. These peculiarities of echoanatomy and vascularization VD can be useful in studying various diseases of the inguinal canal and of the scrotum in adult patients.

Practical recomendations: There are 3 stages ultrasound VD, which caused the most problems: determination of location of VD, identification VD, visualization deferential artery (DA). To overcome these difficulties were developed echographic criteria.

1. To correctly locate the VD in relation to testes and spermatic cord is necessary to clarify the position testes in the scrotum. A reliable anatomical landmark is used mediastinum testes. Antelateral direction cone mediastinum on cross sections indicates normoposition, and retromedial direction cone of mediastinal on the longitudinal inversion testes. When normoposition testes the VD is located along the rear edge of the testes and in front of the mediastinum testes, and in spermatic cord the VD takes the corner retromedial position. In the case of longitudinal inversion testes the VD also located along the rear edge testes, but the back from the mediastinum testes, and in spermatic cord the VD takes the corner antelateral position.

2. For the correct identification of VD in spermatic cord is used incompressibility, avasculare, layered structure, the same outer diameter of the VD over.

3. For identification DA apply visualization DA in the form, repeating the course of the VD, and check-in high-resistance blood flow.

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