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# The differences in testicular volumes in boys 8–36 months old with undescended, retractile and hydrocele testis — Usefulness of scrotal screening ultrasound

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ABSTRACT

*Purpose:* The aim of the study was quantitative and qualitative assessments of scrotal abnormalities diagnosed in boys 8 to 36 months old during ultrasound screening and estimation if these abnormalities influence testes volume.

*Materials and methods:* High frequency scrotal ultrasound was performed in 1448 patients aged 8–36 months as additional exam during screening ultrasound program for children including cervical and abdominal ultrasound. The mean age of examined boys was 17 months. For further analysis the children were divided in 5 age groups.

*Results:* The abnormalities in scrotal ultrasound were found in 20.1% of boys. Undescended, cryptorchid testes were found in 4.8% of patients, mobile testicle in 7.6% and hydrocele in 2.8%. The volume of undescended testes was statistically lower than volume of the descended testes in 3 youngest groups of boys ($p = 0.003$–$0.011$). The volume of mobile testicles did not increase with age, while in patients with hydrocele the testicular volume decreased with age.

*Conclusion:* Scrotal screening ultrasound performed in boys up to 3 years old may deliver information about the number and type of existing pathologies as well as their influence on the testicular volume. The volume of the pathological testes was lower than the volume of the normal ones. Improper growth of testes may potentially have important clinical implication for the function of testes in the future.



## 1. Introduction

Screening in medicine is a strategy used in a population to detect a disease in individuals without signs or symptoms of that disease. Unlike what generally happens in medicine, screening tests are performed on persons without any clinical sign of disease.

Scrotal ultrasound is one of the main diagnostic tools for detection and monitoring of testicular abnormalities in boys. A major indication is scrotal pain or abnormal clinical findings, which are widely reported in the literature. However, there are very few references concerning ultrasound population studies in asymptomatic patients, while subclinical problems can easily remain undiagnosed, particularly in small children.

An OVID database search shows that between years 1980 and 2010 over one hundred articles have been published that recommend ultrasound as valuable screening procedure in children, especially for evaluation of urinary tract and intestinal abnormalities, as well as for hip and heart diseases. There are no references concerning screening programs in pediatric hematology/oncology and only one referring to ultrasound screening of testicles in cases of subclinical varicocele in children [1].

Ultrasound Screening Program organized by Ronald McDonald House Charities including scrotal scans was performed in population of asymptomatic children aged 8–36 months. The primary aim of the project including cervical and abdominal ultrasound was early diagnostics of malignant diseases in children. Scrotal ultrasound in all boys was performed as additional scan in order to assess potential abnormalities. The participation in the study was voluntary. Parents of children at particular age were invited for the participation in the study by family doctors or p12ress announcements. The children were scanned in Mobile Pediatric US Unit, which traveled around the region encompassing the population of over 2 millions of inhabitants, so that the access to the scans could be given to a wide population of children. Two experienced pediatric radiologists performed examinations in parallel, altogether five radiologists took part in the project. All scans were performed according to standardized protocols.

The authors decided to perform the analysis of growth of the normal testes as well as the testes with pathologies and compare the results, suspecting that the development of testes may appear impaired if some abnormalities exist.

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## 2. Materials and methods

Scrotal screening ultrasound scans included into the study encompassed boys examined between February 2006 and December 2008. Overall 3101 children were examined, 1549 boys and 1552 girls. Totally 7532 ultrasound examinations were performed, including 1448 scrotal scans. In 101 boys there were difficulties in performing the procedure due to their anxiety and/or hyper mobility, so that the parents decided to resign from examination.

The mean age of examined boys was 17 months (8 to 36 months). SonoAce PICO ultrasound scanners with two probes: convex C 3–7 ED and linear L 5–9 EC, with power and color Doppler applications were used.

Before the exam parents of the children were asked to fill in the questionnaire about medical history concerning occurrence of scrotal pathologies.

The protocol of scrotal examinations included scrotum and inguinal regions. Each testis was analyzed separately. Length and thickness of the testis were measured in maximal longitudinal plane and width in axial plane (Fig. 1). Testicular volumes were calculated using the approximation for a prolapsed ellipsoid: $V = 0.523 \times \text{length} \times \text{thickness} \times \text{width}$ [2]. For further analysis the children were divided in five age groups: I (8–12 months), II (13–18 months), III (19–24 months), IV (25–30 months), and V (31–36 months). The volume of the testes and all abnormalities were assessed in relation to the age group. Results were expressed as mean ± standard deviation (SD). Comparison of mean results between groups with normal and abnormal testes in particular age groups was carried out by *t*-test analysis for independent samples. Results were considered significant at a p value of less than 0.05.

## 3. Results

The abnormalities in scrotal ultrasound (Table 1) were found in 291 boys (20.1%), among which the presence of multiple pathologies was seen in 21 patients (1.5%). Information from the parents shows that 72% of all examined children and only 53% of patients with pathologies previously underwent scrotal clinical examination.

**Table 1**
Frequency of all abnormalities found during scrotal examinations.

| Abnormality | Frequency | Percent |
|---|---|---|
| Undescended testis | 69 | 4.8 |
| Mobile testis | 110 | 7.6 |
| Monoorchis | 8 | 0.6 |
| Hydrocele | 41 | 2.8 |
| Increased scrotal fluid amount | 31 | 2.1 |
| Funicocele | 20 | 1.4 |
| Inguinal hernia | 14 | 0.9 |
| Epididymal cyst | 14 | 0.9 |
| Microlithiasis | 3 | 0.2 |
| Thickening of the tunica vaginalis | 2 | 0.1 |

The undescended (cryptorchid) testes were found in US in 69 patients (4.8%), unilateral in 33 cases and bilateral in 36 cases (total number of undescended testes (n) in statistical analysis was 105). In 2 patients with undescended testis there was also coexisting inguinal hernia. In 4 patients the opposite testis was mobile.

In 8 out of 1448 patients (0.6%) total absence of the testis in scrotum or inguinal canal was found in US.

Most frequent abnormality included mobile testes, which were found in 110 children (7.6%). The testicles were mobile unilaterally in 54 cases, bilaterally in 56 cases (n = 166). Six patients had multiple abnormalities; in 4 cases undescending of the opposite testis was seen, in one patient also microlithiasis of the mobile testis was observed and in one increased amount of fluid between layers of tunica vaginalis.

The mean volume of scrotal testes without any pathology was 0.51 ml ± 0.14 (min 0.10 ml–max 1.42 ml). According to the age groups, the mean testes volume ranged from 0.49 ml ± 0.14 (group I) to 0.57 ml ± 0.16 (group V) (Table 2).

The mean volume of undescended testes was lower than volume of the descended testes in all age groups. It was 0.38 ml in the group I and increased to the 0.48 ml in group IV (Table 2). Group V was not included because of too small number of cases of undescended testes (only 2 cases). Mean volumes of descended and cryptorchid testes were significantly different in children from 8 to 24 months old (for group I p = 0.003; group II p = 0.001; group III p = 0.011).

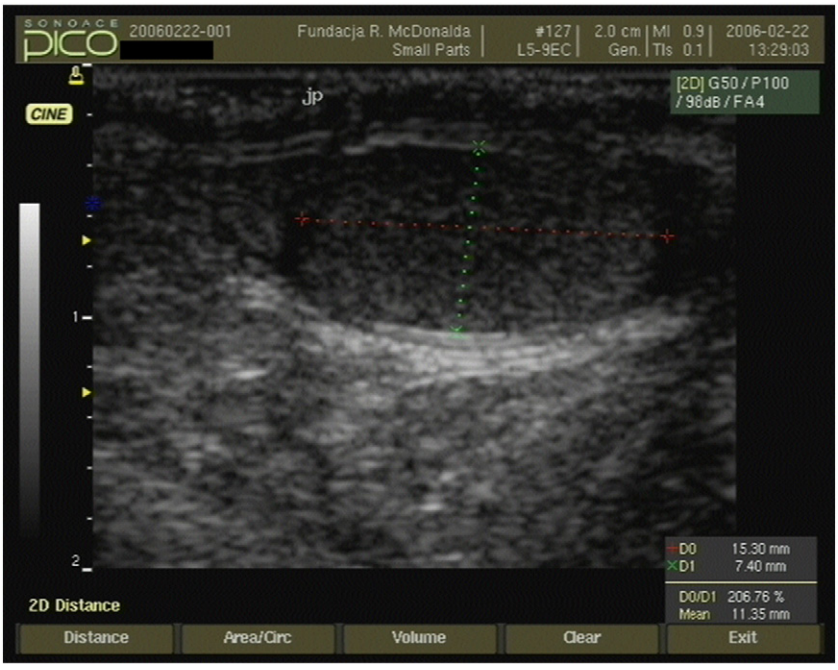


**Fig. 1.** Normal testis, longitudinal view with standard measurements.