

SUMMARY IN ENGLISH

Introduction: To date, no standards for prostate size in children have been established. Prostate volume during development has been analyzed in medical literature in small groups of patients. Transabdominal ultrasound and magnetic resonance imaging are used in the diagnosis to visualize the prostate gland in children. The development of the external genitalia and the prostate gland depends on androgens produced by the testicles of the fetus. We wanted to find out whether abnormal development of external genitalia is accompanied by abnormal development of the prostate.

Aims: To establish norms for prostate volume in boys aged 1 to 17 years using transabdominal ultrasound. To compare prostate size in boys with varying degrees of hypospadias, with particular attention to the presence of Müllerian structures (Ms), in relation to age-specific reference values.

Study design: Between 2021 and 2024, transabdominal prostate ultrasound was performed on 522 Caucasian boys, aged 1-17 years (mean age 9.73 years). All the boys examined were patients of the Urology Clinic. Normative data were based on results of 345 boys with normal lower urinary tract, urethral and penile structures. Patients with abnormal external genitalia, Prune Belly Syndrome, Myelomeningocele, chromosomal disorders, or prostate abnormalities found in ultrasound were excluded from the study. Patient eligibility was determined based on medical records and physical examinations. During ultrasound height, anterior-posterior dimension and width of prostate were assessed. Prostate volume was calculated using the ellipsoid formula $V = H \times L(AP) \times W \times 0.523$. Measurements were correlated with age, weight, and height. Results were analyzed using descriptive statistics, statistical significance. After estimating preliminary results, taking into account the development periods, patients were divided into age groups: 1- 4 years (n = 70), 5-10 years (n = 124), 11- 12 years (n = 43), 13- 15 years (n = 65), and 16- 17 years (n = 43).

After establishing the norms, 126 patients with hypospadias (mean age 9.67 years) were selected from the entire study group (n=522). They were divided into groups depending on the severity of the defect: mild hypospadias MH (n = 53), severe hypospadias SH (n = 48), hypospadias with persistent Müllerian structures HMs (n = 25). The results were compared with the current norms developed during the first study.

Results: In the first study, norms were established and presented in a table and nomogram. The table and nomogram show prostate volume according to age. The mean prostate volume was respectively: 1-4 years 0.66 ml; 5-10 years 1.04 ml; 11-12 years 2.62 ml; 13-15 years 8.41 ml and 16-17 years 11.50 ml. Based on the results; prostate size does not change significantly until the age of 8. A transitional phase can be observed between the ages of 8 and 11. A significant increase in volume occurs after the age of 11. A statistically significant relationship was found between prostate size, age, height, and body weight.

The second study found differences in prostate volume in patients with hypospadias with the presence of Müllerian structures compared to the norm. In boys aged 1–4 years, the mean prostate volume MPV was 0.63 ml with MH and 0.57 ml with SH, compared to the normal value of 0.66 ml. There were no patients with HMs in this group. In the 5–10 age group, MPV in patients with MH was 1.22 ml, in patients with SH – 0.86 ml, and in patients with HMs –

0.49 ml, compared to the norm of 1.04 ml. In the 11–12 age group, MPV in patients with MH was 1.92 ml, in patients with SH it was 1.26 ml, and in patients with HMs it was 0.70 ml, compared to the normal value of 2.62 ml. At the age of 13–15 years, MPV was 7.72 ml in patients with MH, 8.52 ml in patients with SH and 2.28 ml in patients with HMs, compared to the age norm of 8.41 ml. At the age of 16–17, MPV was 10.53 ml in patients with MH, 10.59 ml in patients with SH and 5.63 ml in patients with HMs, compared to the norm of 11.50 ml. The results of ANOVA variance analysis comparing the control group with the three groups of patients with hypospadias and Dunnet's test comparing the group of patients with HMs with the control group showed that the two age groups of patients with hypospadias and Müllerian elements have a statistically significantly smaller prostate (5-10; 13-15; p-value 0.012; 0.024, respectively). In the 16-17 age group, a trend towards statistical significance was found (p-value – 0.054). In the 11-12 age group, the p-value was 0.182.

Discussion: The established norms can serve as a reference point for prostate analysis in patients with urogenital defects.

Conclusion: Transabdominal ultrasound, being a non-invasive, painless, and easily accessible examination, allows for the assessment of prostate size even in boys aged 1 year. A statistically significant relationship between prostate size, body weight and height was found. Age-specific norms for prostate size in boys were established. In boys with hypospadias without Müllerian elements, prostate volume did not differ significantly from the norm. In patients with hypospadias coexisting with Müllerian elements, prostate volume was significantly smaller in two age groups and showed a tendency towards statistical significance in another of the four groups studied. Such a relationship has not been described previously.