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AGE-RELATED ULTRASOUND MORPHOMETRY OF HUMAN PROSTATE ORGANOMETRIC PARAMETERS AND ITS CHANGES IN CHRONIC ALCOHOLISM

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Abstract
The article presents the results of a study on age-related ultrasound morphometry of the biometric parameters of the human prostate and its changes during chronic alcohol exposure. Age-related changes in the prostate are uneven, which is due to the morphofunctional characteristics of the organ in different age periods. The greatest increase in prostate length was revealed in adolescence (34.0%), in adolescence the thickness increases by 38.5%, the width by 2.0 times, the volume of the gland by 3.4 times. The smallest increase in the volume-linear parameters of the gland was found in men of senile age. In men suffering from chronic alcoholism, there is an increase in the organometric parameters of the prostate gland.
Key words: prostate, postnatal ontogenesis, organometric parameters, prostate volume, chronic alcoholism.

INTRODUCTIO

Studies on the age-related restructuring of the internal organs of mammals do not lose their relevance and are of interest in terms of adjusting the age norm and taking it into account when evaluating pathological processes [12,18].

An analysis of literary sources in recent years [1,13,19,21] indicates that information on ultrasound morphometry of the human prostate is limited to individual observations of a certain age and, as a rule, is obtained simultaneously when examining them for the presence of a particular pathology, as a result, they are based on an insufficient number of observations for statistical reliability of the results, are sketchy and are given without taking into account age-related variability. At the same time, there is no data in the literature on the age-related ultrasound anatomy of the prostate of males throughout postnatal ontogenesis. There is no clear understanding of the patterns of formation of biometric parameters of an organ in chronic alcoholism, depending on age. Solving this problem will make it possible to formulate appropriate recommendations for doctors on the relationship of anatomical parameters of the prostate gland, depending on age and when exposed to chemical environmental factors.

MATERIALS AND METHODS

For ultrasound and examination of the human prostate gland, 654 male individuals were examined from the period of newborn to senile age. Including an ultrasound examination of the prostate of 154 mature (I-I periods) and elderly men suffering from chronic alcoholism. The scheme of age periodization of human ontogenesis, developed by the Institute of Physiology of Children and Adolescents, was used.

Newborn boys were examined in the maternity ward of the Bukhara Regional Perinatal Center. Boys under the age of 16 were examined at the Nasriddin-Shams multidisciplinary private

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clinic in Bukhara. Adult men over the age of 16 were examined at the Bukhara Multidisciplinary Regional Hospital and the Regional Narcological Dispensary.

Ultrasound examination measured the width, thickness, and length of the prostate gland. According to the results of ultrasound examination of the prostate, the volume of the gland was calculated according to the formula proposed by the team of authors (Michael Mitterberger et al., 2019). According to a number of authors, this calculation technique has the highest correlation with the actual volume of the prostate. According to it, $V = T \times W \times D \times \pi / 6$, where T is the thickness, W is the width, D is the length of the organ, π is 3.14 (constant).

Statistical data processing was performed using the Microsoft Office Excel 7.0 program, as well as using the Statistica 6.0 application software packages with the calculation of average (M) and relative (P) values, their average statistical errors (m), the t-Student reliability criterion, followed by the determination of the level of reliability of differences. The differences were considered statistically significant at $p \leq 0.05$.

RESULTS AND DISCUSSION

Ultrasound examination revealed that at the newborn age, the thickness of the prostate gland is 8.9± 0.32 mm (Table-1). Before old age, this parameter increases by 4.0 times. The highest growth rate of anterior posterior prostate size was revealed in adolescence (38.5%), which may be associated with the second pubertal leap in the body. The results of our research are consistent with the data of Kurbanov F.T. (2007), that biometric indicators of the prostate gland increase especially starting from the age of 11-15 years. Filippova E.A. holds a similar opinion. (2008), that at the age of 13-14 years, the prostate is actively increasing in size. In newborn boys, the smallest growth is determined in senility (2.0%) and infancy (5.6%), which coincides with the results of research by S.A. Esakov (2010), who believes that the prostate grows very slowly in newborns and children, especially during the first year of life.

The study showed that the width of the prostate gland increases 9.7 times from the period of newborn (4.8±0.22) to senile age (46.5±0.27). Its greatest growth is observed in adolescent boys, when it increases 2.0 times. The lowest rate of increase in the transverse size of the gland was found in old age (3.1%). We cannot agree with the research results of Filippova E.A. (2008), that after the age of 45 the prostate gland gradually decreases, stretching in a transverse direction.

It was found that the length of the prostate gland in boys at birth is 9.8 ± 0.32 mm, before senile age it increases 3.9 times. The highest rate of increase in the longitudinal size of the prostate is observed in adolescence (34.0%) and at the age of 4-7 years (21.4%), which correlates with the work of S.A. Esakov (2010), according to which a noticeable increase in prostate size is noted during the first childhood. Perhaps this is due to the first growth spurt occurring in the body. The smallest increase in the length of the gland is observed in men of senile age (2.7%).

It should be noted that before the second period of childhood, the length of the gland is greater than the width and thickness. Starting from adolescence, there is a predominance of transverse size over longitudinal and anteroposterior parameters, which is inconsistent with the data of Ivanchenko O.F. (1994), according to which this predominance is noted in children 6-9 years of age.

Table-1

Morphometric characteristics of ultrasound parameters of the prostate gland of males in the postnatal period

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parameters / age	thickness (mm)	width (mm)	length (mm)	volume (cubic cm)
newborns	5-11 8,9±0,32	3-7 4,8±0,22	6-12 9,8±0,32	0,05-0,42 0,24±0,02
infancy	6-12 9,4±0,25	3-8 5,1±0,21	7-13 10,4±0,25	0,07-0,66 0,29±0,02
early childhood	7-16 10,3±0,27	4-10 6,7±0,18*	8-16 11,4±0,21	0,12-1,1 0,45±0,03*
I – the period of childhood	9-18 12,5±0,19*	5-12 8,3±0,15*	9-20 13,8±0,23*	0,25-1,8 0,77±0,03*
II – the period of childhood	10-23 14,4±0,26*	7-19 11,1±0,24*	12-24 16,3±0,24*	0,44-4,8 1,44±0,09*
teenage years	15-26 19,9±0,3*	14-33 22,2±0,51*	14-28 20,6±0,34*	1,65-11,1 4,93±0,25*
adolescence	21-32 25,7±0,2*	26-39 33,9±0,23*	20-30 27,6±0,18*	5,7-20,6 11,6±0,27*
I – the period of adulthood	24-32 27,4±0,14*	29-41 35,8±0,22*	24-35 27,7±0,20	8,7-24,0 14,2±0,28*
II – the period of adulthood	26-36 31,2±0,18*	34-46 41,1±0,22*	26-35 31,0±0,16*	12,0-30,3 20,8±0,33*

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old age	30-40 34,5±0,22*	38-49 45,1±0,24*	30-41 37,2±0,24*	17,9-42,0 30,3±0,53*
senile age	32-40 35,2±0,36	44-50 46,5±0,27	34-41 38,2±0,32	25,0-42,9 32,7±0,81

Note: * - reliability of differences in relation to
by the previous age ($P \leq 0.05$).

The study showed that the volume of the prostate gland at birth is 0.24±0.02 cm³. Before senile age (32.7 ±0.81 cm³), it increases by 136.3 times. The greatest increase in volume is observed in adolescent boys, when it increases 3.4 times. Perhaps this is due to the puberty leap at this age. The lowest growth rate of this parameter was found in old age (7.9%).

It should be noted that until today there is no consensus about the sonographic values of the prostate gland. A number of authors cite these linear parameters, in which the organometric indicators differ (Table-2). All of them do not indicate the age of the subjects in their works.

Table-2

Linear parameters of the human prostate according to a number of authors

Authors	Dimensions (cm)		
	Thickness	Width	Height
Watanabe H. et al., 1974	2,76±0,4 (2,1-3,4)	4,8±0,4 (3,9-5,3)	2,8±0,5 (2,0-4,0)
Demidov V.N. et al., 1989	1,8-2,5	2,7-4,2	2,5-4,0
Penu A.Yu., 1990	1,5-2,5	2,4-4,0	2,3-3,8
Ignashin N.S., Vinogradov V.R., 1990	1,6-2,3	2,7-4,3	2,4-4,3
Lavrova S. A., Tkachenko P. M., 1999	1,8-2,4	2,7-4,5	2,4-4,1
Hofer M., 2002	< 3	< 5	< 3
Kapustin S.V., Pimanov S.I., 2005	1,7-2,3	2,2-5,0	2,5-4,2
Filippova E.A., 2008	1,7-2,5	3,5-5	3,2-4,5
Nazarenko G.I., Khitrova A.N., 2017	2,5	3,5	4,0

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Until recently, there have been disagreements in the literature on the volume parameter of the prostate gland. Thus, Watanabe H. et al. (1974) believes that the normal volume of the prostate on average should be 21.0± 5.6 cm³. Ignashin N.S., Vinogradov V.R. (1990) provide data that the volume should be 24 cm³. Cooner W.H. et al. (1994) state that the volume of the gland should not exceed 20 cm³. Lavrova S. A., Tkachenko P. M. (1999) consider that the volume should be 20 cm³, Hofer M. (2002) 25 cm³, Kapustin S.V., Pimanov S.I. (2005) about 25 cm³. Zubarev A.V., Gazhonova V.E. (2002) in their research, they cite data that the volume of the prostate can reach 20-30 cm³. Sholokhov V.N. et al. (2006) it is believed that the volume of the gland, depending on the age of men, can range from 20 cm³ to 40 cm³. Recent data from Trufanov G.E., Ryazanov V.V. (2016) indicate that the upper limit of the prostate volume of men can reach up to 40 cm³, an indicator greater than this value is regarded as an increase in it.

In men suffering from chronic alcoholism, the thickness of the prostate gland increases by 29.8% from the first period of adulthood to old age (Table-3). Compared with the control group, the anteroposterior prostate size increases by 13.8% at the first stage of middle age, by 3.8% at the second stage, and by 17.4% in old age.

Table-3

Morphometric characteristics of ultrasound parameters of the prostate gland of men suffering from chronic alcoholism

parameters / age	thickness (mm)	width (mm)	length (mm)	volume (cubic cm)
I – the period of adulthood	25-36 31,2±0,34*	33-43 38,0±0,31*	31-43 37,0±0,37*	13,8-34,8 22,9±0,65*
II – the period of adulthood	26-38 32,4±0,37	36-48 41,5±0,37	34-45 39,9±0,34*	16,6-42,9 28,1±0,79*
old age	33-46 40,5±0,39*	44-56 49,6±0,36*	41-59 47,3±0,54*	31,1-79,5 49,7±1,45*

Note: * - the reliability of the differences in relation to the control (P≤ 0,05).

The width of the gland in chronic alcoholics increases by 30.5% from the first period of adulthood to old age. Compared with the control of similar ages, the transverse size of the prostate increases by 6.1% at the first stage of middle age, by 1.0% at the second stage, and by 10.0% in old age.

The length of the prostate in men suffering from chronic alcoholism increases by 27.8% from the first period of adulthood to old age. Compared with the control group, the longitudinal size of the gland increases by 33.6% at the first stage of middle age, by 28.6% at the second stage, and by 27.2% in old age.

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The volume of the prostate gland in chronic alcoholics increases 2.2 times from the first period of adulthood to old age. Compared with the control of similar ages, this parameter increases by 61.3% at the first stage of middle age, by 35.1% at the second stage, and by 64.0% in old age.

Conclusion

During postnatal human development, the ultrasound parameters of the prostate gland increase with age. The greatest increase in prostate length was revealed in adolescence (34.0%), in adolescence the thickness increases by 38.5%, the width by 2.0 times, the volume of the gland by 3.4 times. The smallest increase in the volume-linear parameters of the gland was found in men of senile age. Until the second period of childhood, the longitudinal size of the organ is larger than the transverse and anteroposterior, starting from adolescence, the width of the prostate prevails over the length and thickness of the gland.

In men suffering from chronic alcoholism, there is an increase in the volume-linear parameters of the prostate gland. Compared with the control, the maximum increase in longitudinal size was observed in the second period of adulthood (28.7%), transverse size (10.0%), anteroposterior size (17.4) and organ volume (64.0%) in elderly men.

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