

The usefulness of testicular atrophy index in the assessment of undescended testicle – preliminary report

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Abstract

Purpose: Cryptorchidism affects 2-8% of male newborns. There is a controversy regarding timing of surgery as well as indications for orchiopexy in boys with retractile testicle.

The aim of this study was to evaluate the clinical usefulness of testicular atrophy index (TAI) as a criterion of qualifying patients with undescended testes for surgery as well as of monitoring the results of treatment.

Material and methods: In 1999-2000, 105 cryptorchid boys, aged 1 to 15 years (mean 4.8) underwent unilateral orchiopexy. Dimensions and volume of testes were measured by means of scrotal US and TAI was calculated before and 1 year after surgery.

Results: Pre- and postoperative scrotal US measurements were analyzed in 35 boys divided into five age dependent groups. The preoperative TAI values ranged from 27.1% to 52.8%. The biggest loss in volume of affected testis was found in boys aged 4 to 10 years (35.4% to 52.8%). The TAI values measured one year after orchiopexy were lower than preoperative ones. Significant difference in TAI values, ranging from 18.16% to 36.43% were observed in boys between 2 and 10 years ($p < 0.001$). In the youngest (0-2yrs) and the oldest boys (>10yrs) the difference was not statistically significant.

Conclusions: The testicular atrophy index (TAI) proved to be a valuable and objective tool for qualifying patients with undescended testes for surgery as well as for monitoring the results of treatment. Its value of 20% and more should be considered an indication for surgery in boys with retractile testes.

Key words: undescended testicle, scrotal ultrasonography, testicular atrophy index, orchiopexy

Introduction

Cryptorchidism is a serious developmental disorder and still remains one of the most frequent anomalies of genitourinary tract in boys. It affects 2-8% of male newborns, but its incidence falls to 0.5-1% during the first year of age due to the spontaneous descent of the number of testicles. Cryptorchidism may lead to impaired fertility and germ-cells neoplasia, therefore early hormonal (after the first year of life) and surgical treatment (after the second year of life) is recommended [1,2]. Besides clinical examination, the ultrasound imaging (US) is the basis of the accurate diagnosis and the assessment of the treatment results [3-5]. Considerable advances that have occurred in this kind of imaging over recent years as improved transducer technology allow the objective and precise monitoring of testicular parameters [5-7].

The aim of this study was to determine clinical usefulness of the index of testicular volume decrease (testicular atrophy index – TAI) in the management of the patients with undescended testicle treated in authors' department [3,4].

Material and methods

In 1999-2000, 105 cryptorchid boys, aged 1 to 15 years (mean 4.8) underwent unilateral orchiopexy in the Department of Pediatric Surgery & Oncology in Lodz. To all these patients hormonal therapy prior to surgery (chorionic gonadotrophin, Biogonadyl) was administered without satisfactory results. The following parameters were analysed in all patients: age, side of anomaly, dimensions, volume and position of the testicle before and 1 years after surgery (orchiopexy).

Ultrasound studies were performed by experienced sonographers using Toshiba unit with linear array 7.5 and 10 MHz transducers. The largest measurements in each dimension were

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Table 1. Results of scrotal US before orchiopexy (N=35).

Age range	No of patients	Mean volume of affected testis (ml)	Mean volume of contralateral testis (ml)	TAI (%)
0-2	5	0.44	0.63	27.10
2-4	10	0.56	1.09	35.40
4-6	8	0.57	1.20	44.20
6-10	6	0.66	1.17	52.80
>10	6	0.76	1.25	28.90

recorded and used to calculate testicular volume (TV) using the empirical formula of Lambert: $TV (ml) = 0.71 \times (\text{width} \times \text{length} \times \text{height}) / 1.000$ [8]. The testicular atrophy index (TAI) of the affected testicle was calculated as: $TAI = (\text{contralateral testis volume} - \text{affected testis volume}) / \text{contralateral testis volume} \times 100$ and expressed as a percent [3].

Mean differences between pre- and postoperative TAI measurements were evaluated by paired Student's t-test.

Results

Out of 105 patients, 58 (55.2%) presented with right and 47 (44.8%) with left undescended testicle. Pre- and postoperative scrotal US measurements of 35 boys were analyzed. Patients were divided into five age dependent groups as follows: 0-2, 2-4, 4-6, 6-10, over 10 years. Number of patients in each group, mean volume of affected and contralateral testis as well as TAI before operation are shown in *Tab. 1*. The TAI ranged from 27.1% to 52.8%. The biggest loss in volume of affected testis was found in boys aged 4 to 10 years.

Results of corresponding parameters measured one year after orchiopexy are presented in *Tab. 2*. TAI was significantly lower comparing with its preoperative values. Remarkable difference in TAI values, ranging from 18.16% to 36.43% were observed in boys between 2 and 10 years (three middle groups in each table) ($p < 0.001$). In the youngest (0-2yrs) and the oldest boys (>10yrs) the difference was not statistically significant (*Tab. 3*).

Discussion

Accurate assessment of the position of undescended testicle and its volume compared with contralateral, healthy testicle gives the surgeon a basic knowledge in cryptorchid boys [1,2]. Testicular volume measurements are of particular importance in assessing the clinical significance of cryptorchidism [7,9,10]. The scrotal ultrasound offers the greatest accuracy of all clinical methods used to determine testicular volume [5,7,11]. Because fertility is undefined at this age impaired growth of affected in relation to healthy testicle seems to be the only objective indication for surgery. However, Lee et al. [12] found that in men with a history of unilateral cryptorchidism small testicular size at orchiopexy was not associated with decreased paternity (89.8%), abnormal hormone levels, a lower sperm count or decreased testicular volume in adulthood.

Table 2. Results of scrotal US after orchiopexy (N=35).

Age range	No of patients	Mean volume of affected testis (ml)	Mean volume of contralateral testis (ml)	TAI (%)
0-2	5	0.88	1.10	20.00
2-4	10	0.86	1.00	17.24
4-6	8	0.96	1.28	21.04
6-10	6	0.96	1.15	16.37
>10	6	0.81	0.85	22.40

Table 3. Comparison of testicular atrophy index (TAI) before and after orchiopexy (N=35).

Age range (yrs)	No of patients	TAI before surgery (%)	TAI after surgery (%)	Difference	Student t-test
0-2	5	27.10	20.00	7.10	NS
2-4	10	35.40	17.24	18.16	$p < 0.001$
4-6	8	44.20	21.04	23.16	$p < 0.001$
6-10	6	52.80	16.37	36.43	$p < 0.001$
>10	6	28.90	22.40	6.50	NS

There is still controversy regarding indications for orchiopexy in the group of boys with retractile or so called "wandering testicle" [1,2]. Although the testicle found in the inguinal canal can be easily pulled manually to the scrotum, it is pushed back to the canal as soon as the grip is released. We think there is a place for watchful waiting in these patients. We recommend scrotal US to be repeated every 12 months since the initial presentation. If there is significant progressive decrease in affected testicle volume during the observation period, one should offer surgical treatment.

We believe, basing on the results of the earlier studies of one of us (J.N.), that 20% and higher testicular atrophy index (TAI) should be considered an indication for surgery both in patients with undescended testicle and varicocele [4]. Sayfan et al. [13] suggested that a 20% to 25% volume differential is clinically significant. In our patients TAI ranged from 27.1% to 52.8% at initial diagnosis.

Scrotal US, including colour Doppler, enables an exact morphological analysis of the late results after surgical correction of undescended testes. In Riebel et al. [10] material, 53% of previously maldescended testes showed abnormalities with regard to position, volume, structure and perfusion without any correlation with the patient's age at surgery or the time interval between surgery and US (2-11yrs).

Testicular atrophy is observed in approx. 5-10% of testes in long-term outcome after orchidopexy, but it is impossible to say, if it resulted from injury of blood vessel during operation or pre-existent primary damage (testicular dysplasia) [1,2].

Our data show that repair of undescended testicle results in the growth of affected testes in the treated group. The postoperative TAI values decreased from 18.16% to 36.43% depending on patient's age. The smallest difference in TAI measurements (no growth of affected testes) was observed in the youngest (0-2yrs) and the oldest boys (>10yrs). This find-

ing indicates that the best results of surgical treatment of undescended testes should be expected in boys aged 2 to 10 years.

Conclusions

Ultrasound assessment is important in detecting testicular volume (TV) differential in cryptorchid boys. It should be used routinely to determine growth impairment secondary to undescending of testes. The testicular atrophy index (TAI) proved to be a valuable and objective tool for qualifying patients with undescended testes for surgery as well as for monitoring the results of treatment. Its value of 20% and more should be considered an indication for surgery in boys with retractile testes.

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