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An assessment of different surgical approaches among different specialties for undescended testicle cases in the postpubertal era: A survey study

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The undescended testicle is the testis which completes its intra-abdominal development and remains on the normal migration path during its migration to the scrotum or remains in a location other than the normal descent path. It is well-established that spontaneous descent of the undescended testicle may continue during the first six months of life.[1,2] Histological examinations of undescended testicles showed that progressive loss of germ cells and Leydig cells occurred between six and 12 weeks of age and increased after the age of two.[3,4] Providing treatment without delay is important in terms of not only having a positive effect on spermatogenesis and hormone production in adulthood, but also reducing the risk of tumor development. It has been reported that the risk of developing malignant transformation in undescended testicles is 2.5 to 8 times higher than in intrascrotal-located testicles.[5]

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Abstract

Objectives: This study aims to evaluate different surgical approaches for postpubertal undescended testicle in the branches of pediatric surgery, urology, and pediatric urology and to identify the most optimal approach for the treatment of this special age group.

Materials and methods: Between March 2024 and April 2024, a 15-question survey was developed using Google Forms and sent via e-mail and text messages to pediatric surgery, urology, and pediatric urology specialists in Türkiye. A total of 119 surgeons who agreed to participate in the study were included.

Results: Of the 119 surgeons, 58 (48.7%) were pediatric surgeons, 40 (33.6%) were urologists, and 21 (17.6%) were pediatric urologists. In the study, 61.8% of the participants in the pediatric urology group had more than 10 years of specialized experience, compared to 60.4% and 57.5% of the respondents in the pediatric surgery and urology groups, respectively, who had 10 years or less (p=0.030). While pediatric surgeons and pediatric urologists strongly preferred diagnostic laparoscopy for the diagnosis of non-palpable testicles, 25% of urologists preferred magnetic resonance imaging (p=0.015). While approaching a patient presenting with a non-palpable unilateral undescended testicles, urologists and pediatric urologists preferred orchiectomy, if they found the testicles during laparoscopic exploration, while pediatric surgeons preferred orchidopexy with testicular biopsy (p=0.002).

Conclusion: Although there are similar approaches to postpubertal undescended testicle scenarios among the three specialties, there are certain differences in the diagnosis and treatment of non-palpable undescended testicles. It seems that urologists can make more aggressive decisions regarding the treatment of postpubertal non-palpable undescended testicle, whereas pediatric surgeons tend to make more aggressive decisions regarding the diagnosis of the condition. Pediatric urologists who are also pediatric surgeons or urologists are likely to follow the guidelines more closely for the management of postpubertal undescended testicle.

Keywords: Cryptorchidism, orchidopexy, orchiectomy, postpubertal, survey, undescended testicle.

In a meta-analysis, performing orchidopexy in the prepubertal period reduced the risk of cancer development by 5.8 times compared to the operation in the postpubertal period.[6] In another meta-analysis including a large number of patients, the risk of developing malignancy was reported as 2.2% in children who underwent orchidopexy before the age of 13 years, and this rate was reported as 5.4% in men who underwent orchidopexy at the age of 13 and later.[7] Consistent with these findings, the appropriate approach for patients presenting before puberty with undescended testicle is to perform orchidopexy.[6] However, there is no clear consensus regarding the treatment of undescended testicle in the postpubertal period.

In the present study, we aimed to evaluate different surgical approaches for postpubertal undescended testicle in the branches of pediatric surgery, urology, and pediatric urology, where undescended testicle surgery is performed, and to identify the most optimal approach for the treatment of this special age group.

MATERIALS AND METHODS

This survey study was conducted at Ankara Etlik City Hospital, Department of Pediatric Urology between March 2024 and April 2024. A questionnaire, prepared via Google Forms and consisting of 15 questions, was sent to pediatric surgery, urology, and pediatric urology specialist physicians across Türkiye via e-mail and text message. Physicians who agreed to participate in the questionnaire were asked questions regarding their field of specialization, duration of specialization, title, type of institution they worked in, and whether they were subspecialists in pediatric urology in the first five questions. In the questions between 6 and 8, physicians were asked about the number of undescended testicle surgeries they performed annually, the ideal age range for orchidopexy treatment, and the diagnostic approach to non-palpable testicles. In the questions between 9 and 14, an open-ended answer option was left, and questions were asked questioning the approaches of surgeons in different postpubertal undescended testicle scenarios. Question 15, which had a similar format, was oriented to maintain completely open-ended answers. Of a total of 123 surgeons reached, four did not agree to participate in the questionnaire. Finally, 119 surgeons were included in the study.

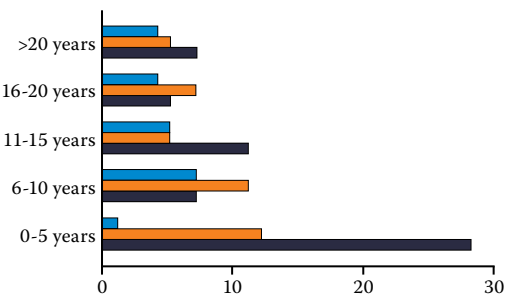
A written informed consent was obtained from each participant. The study protocol was approved by the Ankara Etlik City Hospital Scientific Research Evaluation and Ethics Committee (date: 20.03.2024, no: AEŞH-BADEK-2024-244). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 23.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were expressed in median (min-max) or number and frequency, where applicable. Comparisons between the groups were made using the chi-square and Fisher exact tests. A p value of <0.05 was considered statistically significant.

RESULTS

Of the 119 surgeons, 58 (48.7%) were pediatric surgeons, 40 (33.6%) were urologists, and 21 (17.6%) were pediatric urologists. In the study, 61.8% of the participants in the pediatric urology group had more than 10 years of specialized experience, compared to 60.4% and 57.5% of the respondents in the pediatric surgery and urology groups, respectively, who had 10 years or less (p=0.030) (Figure 1). There were no other statistically significant differences among the three groups in terms of specialty,



	0-5 years	6-10 years	11-15 years	16-20 years	>20 years
Pediatric urologists	1	7	5	4	4
Urologists	12	11	5	7	5
Pediatric surgeons	28	7	11	5	7

Figure 1. Comparison of pediatric surgeon, urologist, and pediatric urologist groups in terms of specialist periods.

title, and institutional characteristics of the participating surgeons (p>0.05).

A total of 31% of pediatric surgeons and 28.6% of pediatric urologists reported performing more than 50 undescended testicle surgeries per year, despite the fact that all surgeons in the urologists group reported performing 50 or less surgeries annually (p=0.004). Among the urologists, 25% preferred magnetic resonance imaging (MRI) as the first choice in the diagnostic approach to an undescended testicle which was non-palpable on

TABLE 1
Participating surgeons' annual undescended testicle surgery volume and clinical approaches to undescended testicle

	Pediatric surgeons (n=58)		Urologists (n=40)		Pediatric urologists (n=21)		Total (n=119)		
	n	%	n	%	n	%	n	%	*p*
Total number of undescended testis surgeries	40	69	40	100	15	71.4	85	79.8	**0.004***
0-50 / years	14	24.1	0	0	5	23.8	19	16	
50-100 / years	4	6.9	0	0	1	4.8	5	4.2	
>100 / years									
Ideal orchidopexy age									0.465
6-12 months	32	55.2	19	47.5	14	66.7	65	54.6	
6-18 months	15	29.2	17	47.5	4	19	36	30.3	
6-24 months	4	6.9	2	5	1	4.8	7	5.9	
12-24 months	7	12.1	2	5	2	9.5	11	9.2	
First choice in the diagnosis of NPT									**0.015***
MRI	4	6.9	10	25	0	0	14	11.8	
Inguinal exploration**	3	5.2	0	0	1	4.8	5	4.2	
Diagnostic laparoscopy	51	87.9	30	75	20	95.2	101	85	

NPT: Non-palpable testicle; MRI: Magnetic resonance imaging; * Statistically significant; ** If there is hypertrophy in the contralateral testicle.

TABLE 2
In questions 9, 10, and 14, participants' clinical approach data for different postpubertal undescended testicle scenarios

	Pediatric surgeons (n=58)		Urologists (n=40)		Pediatric urologists (n=21)		Total (n=119)		
	n	%	n	%	n	%	n	%	*p*
Preoperative consultation for postpubertal UUT									0.794
No consultation	50	86.2	32	80	20	95.2	102	85.7	
Pediatric endocrinology	3	5.2	4	10	0	0	7	5.9	
Pediatric oncology	1	1.7	0	0	0	0	1	0.8	
Pediatric endocrinology and oncology	3	5.2	3	7.5	1	4.8	7	5.9	
Other response	1	1.7	1	2.5	0	0	2	1.7	
Preoperative consultation for postpubertal BUT									0.177
No consultation	9	15.5	10	25	4	19	23	19.3	
Pediatric endocrinology	38	65.5	20	50	16	76.2	74	62.2	
Pediatric oncology	2	3.4	0	0	0	0	2	1.7	
Pediatric endocrinology and oncology	7	12.1	10	25	1	4.8	18	15.1	
Other response	2	3.4	0	0	0	0	2	1.7	
Orchidopexy was performed and the biopsy pathology was ITGCN	47	81	31	77.5	17	81	95	79.8	0.596
Orchiectomy	9	15.5	9	22.5	4	19	22	18.5	
Tumor markers follow-up at close intervals	2	3.4	0	0	0	0	2	1.7	
Other response									

UUT: Unilateral undescended testicle; BUT: Bilateral undescended testicle; ITGCN: Intratubular germ cell neoplasia

physical examination and/or could not be detected on ultrasound. Among the pediatric urologists, none of the participants selected MRI; however, in the pediatric surgery group, this rate was 6.9% (p=0.015). There was no statistically significant difference among the three groups in terms of the ideal timing of orchidopexy (p=0.465) (Table 1).

The clinical approach of the participants to different postpubertal undescended testicle scenarios in Questions 9, 10, and 14 is shown in Table 2, and in Questions 11 to 13, it is shown in Table 3. The majority of participants in all three groups reported that preoperative consultation was not necessary for the patient presenting with unilateral undescended testicle (UUT) in the postpubertal period. For the patients presenting with bilateral undescended testicle (BUT) in the postpubertal period, the majority of participants in all three groups reported that preoperative pediatric endocrinology consultation was necessary. In the approach to the patients who presented with an inguinal UUT, the majority of surgeons in all three groups considered it

TABLE 3
In the questions between 11 and 13, participants' clinical approach data for different postpubertal undescended testicle scenarios

	Pediatric surgeons (n=58)		Urologists (n=40)		Pediatric urologists (n=21)		Total (n=119)		
	n	%	n	%	n	%	n	%	*p*
Approach to a postpubertal patient with inguinal UUT*									0.263
Tumor markers follow-up without surgery	3	5.2	3	7.5	0	0	6	5	
Orchidopexy without testicular biopsy and tumor markers follow-up	27	46.6	17	42.5	7	33.3	51	42.9	
Testicular biopsy without orchidopexy and tumor markers follow-up	0	0	0	0	0	0	0	0	
Orchidopexy with testicular biopsy and tumor markers follow-up	11	19	10	25	6	28.6	27	22.7	
Orchidopexy with testicular biopsy and no tumor markers follow-up	9	15.5	2	5	2	9.5	13	10.9	
Inguinal orchiectomy	3	5.2	7	17.5	5	23.8	15	12.6	
Other response	5	8.6	1	2.5	1	4.8	7	5.9	
Approach to a postpubertal patient with intra-abdominal UUT*									**0.002****
Radiological imaging and tumor markers follow-up without surgery	1	1.7	2	5	0	0	3	2.5	
LE, orchidopexy without testicular biopsy, and tumor markers follow-up	14	24.1	11	27.5	5	23.8	30	25.2	
LE, testicular biopsy without orchidopexy, and tumor markers follow-up	1	1.7	1	2.5	0	0	2	1.7	
LE, testicular biopsy, and orchidopexy if the testis is present	29	50	3	7.5	6	28.6	38	31.9	
LE and orchiectomy if the testis is present	11	19	23	57.5	9	42.9	43	36.1	
Other response	2	3.4	0	0	1	4.8	3	2.5	
Approach to a postpubertal patient with inguinal BUT*									0.640
Tumor markers follow-up without surgery	1	1.7	0	0	0	0	1	0.8	
Bilateral orchidopexy without testicular biopsy and tumor markers follow-up	24	41.4	24	24	8	38.1	56	47.1	
Testicular biopsy without orchidopexy and tumor markers follow-up	1	1.7	1	1	0	0	2	1.7	
Bilateral orchidopexy with bilateral testicular biopsy	25	43.1	14	14	11	52.4	50	42	
Bilateral inguinal orchiectomy	3	5.2	1	1	1	4.8	5	4.2	
Other response	4	6.9	0	0	1	4.8	5	4.2	

UUT: Unilateral undescended testicle; BUT: Bilateral undescended testicle; LE: Laparoscopic exploration; * The contralateral testicle is intrascrotal and normal; ** Statistically significant

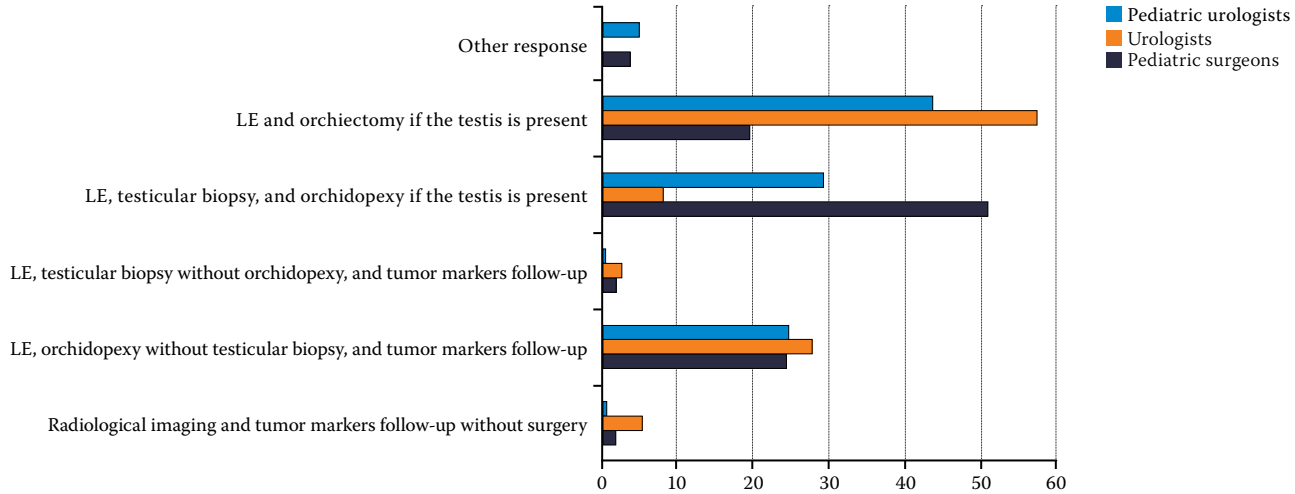


Figure 2. Differences in approach to postpubertal intra-abdominal unilateral undescended testicle scenarios among pediatric surgery, urology and pediatric urology groups.
LE: Laparoscopic exploration.

appropriate to perform orchidopexy without a testicular biopsy and then follow-up with tumor markers. In the approach to the patient presenting with inguinal BUT, 43.1% of pediatric surgeons and 52.4% of pediatric urologists preferred bilateral orchidopexy with bilateral testicular biopsy, while 60% of urologists preferred bilateral orchidopexy without testicular biopsy. In this scenario, no statistically significant difference was detected among the groups (p=0.640). While approaching a patient presenting with a non-palpable UUT, 57.5% of urologists and 42.9% of pediatric urologists preferred to perform an orchiectomy, if they found the testicle during laparoscopic exploration, while 50% of pediatric surgeons preferred to perform an orchidopexy with testicular biopsy if they found the testis during laparoscopic exploration. The three groups' approaches to non-palpable UUT significantly differed (p=0.002) (Figure 2). In case of intratubular germ cell neoplasia (ITGCN) as a result of histopathological examination in the patients who underwent orchidopexy with testicular biopsy, the majority of the participants in all three groups preferred to perform orchiectomy (p=0.596).

In Question 15, the participants were asked in an open-ended manner why they would not perform orchiectomy in patients with postpubertal undescended testicle. Of 119 participants, 61 were selected to respond to this question. The following subheadings classified the top three responses to this open-ended question: hormonal support and fertility contribution (21.2%); absence of definite malignancy despite an increased tumor risk (19.7%); and ease of follow-up with physical examination, imaging, and tumor markers in testicles lowered into the scrotum (16.4%).

DISCUSSION

In the presented study, we evaluated different surgical approaches for postpubertal undescended testicle in the branches of pediatric surgery, urology, and pediatric urology. The only statistically significant difference between the characteristic features of the groups was that the specialist period was higher in the pediatric urology group, unlike the other two groups. In Türkiye, becoming a pediatric urology specialist first requires becoming a pediatric surgery or urology specialist, which we believe could be the cause of this difference. Although six to 12 months was considered the most optimal orchidopexy age by 54.6% of all participants, six to 18 months was considered appropriate by 30.3%. That is, 85% of surgeons thought orchidopexy should be finished before 18 months. According to a study, patients with inguinal UUT at the age of one and under had considerably higher mean tubular infertility indices

and germ cell counts than patients in other age groups.[4] The aforementioned study suggested that to preserve fertility potential, inguinal orchidopexy should be done within the first year of life and no later than age two.[4] Similarly, the European Association of Urology (EAU) pediatric urology guideline recommends that orchidopexy should ideally be performed at months six to 12 and completed at 18 months at the latest.[8]

Of all the surgeons in the inguinal UUT postpubertal period scenario, 42.9% considered that orchidopexy without testicular biopsy was suitable, while 22.7% thought that orchidopexy with testicular biopsy was appropriate. When the case in the scenario was presented as inguinal BUT, two different approaches were dominant. While 47.1% of all participants preferred to perform bilateral inguinal orchidopexy without a testicular biopsy, 42% preferred to perform bilateral inguinal orchidopexy with a testicular biopsy. Based on these results, all participants were confused about whether to take a biopsy or not. It was found that around 2.5% of 81 patients who presented with unilateral or BUT after the age of 14 had testicular cancer, and 93% of the patients had azoospermia.[9] Orchiectomy was done on 22 testicles and orchidopexy on seven testicles of the patients who presented with undescended testicles in the postpubertal period. One out of 22 testicles (4.5%) which underwent orchiectomy had a germ cell tumor (pure seminoma).[10] According to the findings, in a five- to 10-year follow-up, no testicular cancer was found in any patient who had orchidopexy, and no contralateral testicular cancer was found in any patient who had orchiectomy.[10] It was reported that spermatozoa were only detected in one testicular sperm extraction out of 25 postpubertal undescended testicles.[11] Consistent with these studies, the EAU pediatric urology guideline suggests orchiectomy for patients presenting with undescended testicle and a normal and intrascrotal contralateral testicle in the postpubertal period.[8] In the current study, orchiectomy was avoided in both inguinal UUT and BUT scenarios (12.6% and 4.2%, respectively). In contrast, in the intra-abdominal UUT scenario, one in three of the participants preferred to perform an orchiectomy. In response to Question 15, the participants gave the following explanations for not having an orchiectomy: *(i)* While the risk of malignancy is increased, it is not certain; *(ii)* it is more appropriate to follow with a normal testicular biopsy report; *(iii)* it raises the risk of infertility; healthy testicular tissue provides hormonal support; *(iv)* it is easier to physically examine the testicle placed in the scrotum to check for tumors; *(v)* and an orchiectomy may have adverse psychosocial effects on the patient and his family.

If the histopathological evaluation of patients who underwent testicular biopsy and orchidopexy was reported as ITGCN, the significant majority of all participants (80%) preferred to perform orchiectomy in our study. The rate of ITGCN varied from 2 to 4% in histological examinations of patients who had orchiectomy for a postpubertal undescended testicle.[12,13] Within five years, 50% of ITGCN cases in the postpubertal period show progression to invasive germ cell tumors.[14] Taken together, if the pathological examination is reported as ITGCN, then it seems appropriate to proceed with orchiectomy as the last resort.

One of the main findings of this study is that the diagnostic approach to non-palpable testicles significantly differed from the other approaches. Pediatric surgeons and pediatric urologists strongly preferred diagnostic laparoscopy (DL) for the diagnosis of non-palpable testicle (87.9% and 95.2%, respectively). On the other hand, one in every four urologist participants preferred MRI as the first diagnostic tool in the diagnosis of non-palpable undescended testicle. In a prospective study comparing DL and MRI for the identification of non-palpable testicle in children, MRI showed a sensitivity of 80 to 95% and a specificity of 60 to 75%, whereas DL showed a sensitivity of 90 to 100% and a specificity of 80 to 100%.[15] Although non-invasive nature of MRI is appealing, it has certain drawbacks , such as the need for extra diagnostic procedures in the event of false negatives and the need to do the procedure under anesthesia for children. Diagnostic laparoscopy can be considered the most appropriate method for the diagnosis of non-palpable testicle, as it provides simultaneous definitive treatment in addition to its high sensitivity and specificity rates.[16,17]

The way non-palpable intra-abdominal testicles were treated significantly differed among the surgical groups, which was another noteworthy

finding. When DL revealed an intra-abdominal testicle, most urologists and pediatric urologists chose orchiectomy; however, most pediatric surgeons chose orchidopexy, which involves a testicular biopsy. It was reported that 3.7 times more ITGCN was found in the testicle positioned intra-abdominally than in the testicle located inguinally in a study where orchidopexy was done on postpubertal testicle combined with a testicular biopsy (25% and 6.8%, respectively).[18] According to another study, the risk of cancer was five times higher for undescended testicles located intra-abdominally than for those located extra-abdominally.[19] The testicle inside the abdomen is more prone to torsion or testicular cancer, despite its essentially insignificant role in fertility.[20] Orchiectomy appears to be the most reasonable method for intra-abdominal postpubertal testicle treatment when there is a contralateral normal testicle present. The assertion that the testicular biopsy performed is the primary risk factor for the development of a testicular tumor also needs to be addressed. It has also been suggested that open biopsy trauma may be a cause of malignancy.[21]

The main limitations to this study are the use of a non-validated questionnaire and the inability to reach all pediatric urologists, pediatric surgeons, and urologists in Türkiye. It is noteworthy that the majority of participants in the current study, which reviewed the techniques used by different disciplines in cases with postpubertal undescended testicle, usually approached inguinal-situated testicle with an organ-sparing surgery, either with or without biopsy. However, most urologists and pediatric urologists prefer orchiectomy when the testicle is located intra-abdominally, while most pediatric surgeons insist on orchidopexy. Another difference of opinion that should be emphasized is that urologists prefer non-invasive MRI at a higher rate compared to other groups in the diagnosis of non-palpable testicle.

In conclusion, our study results indicate that urologists can make more aggressive decisions regarding the treatment of postpubertal non-palpable undescended testicle, whereas pediatric surgeons tend to make more aggressive decisions regarding the diagnosis of the condition. Pediatric urologists who are also pediatric surgeons or urologists are likely to follow the guidelines more closely for the management of postpubertal undescended testicle.

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