

## Treatment of impalpable testis – one clinic’s experience

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### Abstract

**Introduction:** Undescended testes are recognised in 1% to 2% of boys during the first year of life, and about 20% of them are impalpable. Ultrasonography (US) may establish the localisation of the testis but the final diagnosis is usually determined laparoscopically.

**Aim:** To evaluate long-term results of laparoscopic treatment of boys with impalpable testes and sensitivity of preoperative ultrasound.

**Material and methods:** Between 2011 and 2015, we operated on 545 boys with undescended testes. Sixty-two of them with 65 impalpable testes were treated laparoscopically – the study group. Mean age was 3.5 years. The study group was divided into 5 groups according to type of treatment. The volume and position of the operated gonad were assessed manually and by ultrasound.

**Results:** In group 1 testicular agenesis was observed in 19 patients. In group 2 revision of the inguinal canal revealed testicular agenesis in 7 and atrophy in 4 patients. In group 3 conversion to classic orchiopexy was performed in 10 patients. In group 4 one-stage orchiopexy was performed in 9 patients on 12 testes. In group 5 a two-stage F-S procedure was performed in 13 patients. Ten testes in group 4 had a volume in the normal range (84%) and also 10 testes in group 5 (77%).

**Conclusions:** Laparoscopy in impalpable testes is the procedure of choice and allows definitive management, even when conversion to open procedure is necessary. Sensitivity of preoperative ultrasound is generally about 60% for true intra-abdominal testes, so diagnostic laparoscopy is necessary.

**Key words:** laparoscopy, ultrasound, boys, undescended testes.

### Introduction

The value of laparoscopy in the diagnosis and treatment of impalpable testis is beyond doubt, and is the procedure of choice in many paediatric surgical and urological centres [1–4]. In most cases, ultrasonography (US) is able to localise impalpable testes, their viability and volume, which can then be compared to the gonad located in the scrotum [5, 6]. A problem still

exists when the testis is invisible or the radiologist has a problem with visualisation, because this does not exclude its presence. The span of the surgery may be predicted before laparoscopy but only meticulous assessment of operating conditions enables the best surgical option to be chosen. The authors present their own experience in the management of impalpable testis in the current era of the laparoscopic approach.

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## Aim

The aim of the paper was to evaluate long-term results of laparoscopic treatment of boys with impalpable testes and sensitivity of preoperative ultrasound.

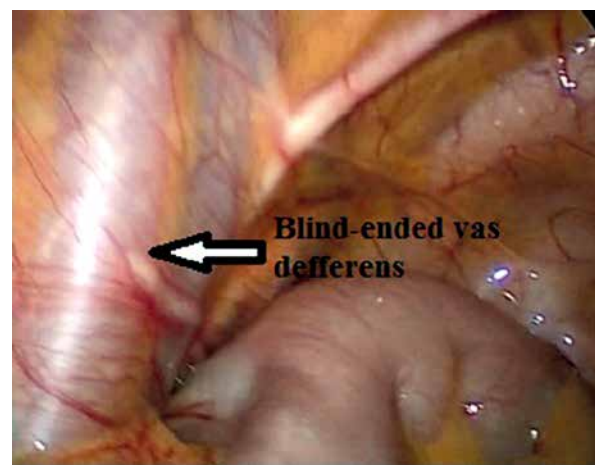
## Material and methods

Between 2011 and 2015, 545 boys with undescended testes were operated on in our centre. Sixty-two of them with 65 impalpable testes were treated laparoscopically, and those patients were the study group. Patients' ages ranged from 6 months to 14 years (mean age: 3.5). In all patients, US had been performed before surgery and had localised 27 testes from the 42 localised surgically (35 testes fixed in the scrotum and 7 testes removed). In 23 patients, testes were invisible on ultrasound and established during laparoscopy. All patients were carefully examined under general anaesthesia to confirm the absence of the testis in the inguinal canal. Patients

with palpable gonads under localized general anaesthesia were excluded from the study because surgery was performed in an open mode. The patient was placed in the supine position, and a pneumoperitoneum was created by the closed Veress needle technique through the umbilicus. A 30° 5 mm camera was inserted through the umbilical port and two 5 mm working ports were placed on both sides of the upper abdomen. The study group of patients was divided into 5 groups according to type of treatment. Disclosure of blind-ended testicular vessels or their absence finished the procedure – group 1 (agenesis of the testis). When the vas deferens and blood vessels penetrated the internal ring, open exploration of the inguinal canal was undertaken – group 2. In the case of atrophic testis, orchiectomy was the procedure of choice. If laparoscopy had revealed “peeping” testis, we performed conversion to classic orchiopexy – group 3. When laparoscopic orchiopexy was performed as a single-stage procedure, the testis was led through the inguinal canal – group 4. In a two-stage Fowler-Stephens (FS) orchiopexy, spermatic vessels were closed at least 3 cm cephalically to the testis during the first procedure – group 5. Orchiopexy was performed after a minimum 6-month period of hardening of the testis. The control US and manual assessment of the position and volume of the testis was performed 1 month and 1 year after definite surgery. Volume of the operated gonad was compared with volume of the contralateral testis and with own size standards of testes (Table I) [7]. During US investigation, colour Doppler assessment

**Table I.** Own size standards of testes [7]

Age	Range of testicular volume [ml]
1 month	0.24–0.48
2–12 months	0.29–0.76
2 years	0.34–0.77
3 years	0.46–0.83
4 years	0.58–1.0
5 years	0.48–0.86
6 years	0.54–1.02
7 years	0.48–0.89
8 years	0.59–1.04
9 years	0.54–1.16
10 years	0.76–1.98
11 years	0.53–3.35
12 years	0.3–6.28
13 years	2.46–8.29
14 years	2.31–7.66
15 years	6.18–11.21
16 years	6.88–16.7
17 years	8.89–16.77



**Photo 1.** Testicular agenesis, blind-ended vas deferens

**Table II.** Groups of patients

Group	No. of patients	Surgery	Diagnosis		
			Testicular agenesis	Testicular atrophy	Normal testis
1	19	Laparoscopy	19	0	0
2	11	Laparoscopy – conversion to revision of the inguinal canal	7	4	0
3	10	Laparoscopy – conversion to classic orchiopexy	0	0	10
4	9	One-stage laparoscopic orchiopexy (in 3 patients bilateral)	0	0	12
5	13	Two-stage laparoscopic orchiopexy	0	0	13
Together 62			26	4	35
			Together 65		

of viability of the testis was also performed. Long-term results of treatment were assessed in groups 4 and 5.

## Results

During laparoscopy, testicular agenesis was observed in 19 patients (Photo 1), so laparoscopy finished the diagnosis and treatment in that group 1 (Table II). Hypoplastic vessels and the vas deferens entering the internal inguinal ring were identified by laparoscopy in 11 patients (group 2) (Photo 2). Exploration of the inguinal canal revealed vanishing testis in 7 of them and 4 atrophic testes were removed.

In 10 boys, the testes had long vessels and easily entered the inguinal canal (“peeping” testis), so conversion to classic orchiopexy was performed (group 3) (Photo 3).

In 9 patients, one-stage orchiopexy was performed on 12 testes (in 3 patients bilaterally; group 4) (Photo 4). Patients with bilaterally undescended testes underwent orchiopexy on both sides during the same procedure.

The two-stage FS procedure was performed in 13 patients (group 5). During the first operation, clipping or diathermy was used to close testicular vessels before cutting (Photo 5). The second procedures were performed a minimum of 6 months after



**Photo 2.** Vanishing testis, hypoplastic vessels and the vas deferens



**Photo 3.** “Peeping” testis, conversion to classic orchiopexy



**Photo 4.** Testis with “long vessels” – one-stage laparoscopic orchiopexy



**Photo 5.** Testis with “short vessels” – first stage F-S (clip & cut)

the initial procedure (Photo 6). In all patients, the gonads were vivid and after elongation of the spermatic cord were situated in the dartos pouch in the scrotum.

US performed before the operation localised 27 of the 42 testes on which orchiopexy or orchidectomy was performed (sensitivity of US was 64%). In the group of patients where the gonads were really absent (23 testes) the sensitivity of US was 100%. Comparison of the results of the US follow-up study after 1 month and after 1 year revealed that in patients after one-stage orchiopexy, the volume of two testes was diminished after surgery (16%), and the volume of 10 testes was within the normal range for the age of the patients (84%). After a two-stage procedure, the volume of 3 testes was diminished



**Photo 6.** Testis with “short vessels” – second stage F-S after hardening

(23%), and the volume of 10 testes was within the normal range for the age of the patients (77%). In all cases, the volume of operated testes was smaller than the volume of the opposite testes, but was within the normal range. We did not observe any evident signs of atrophy in the operated testes. None of the investigated patients required orchietomy during the observation period. The location of the testes in all cases was in the scrotum, although this was in the upper part in most of the patients.

## Discussion

Undescended testis is one of the most common conditions referred to paediatric surgeons. About 1% to 1.5% of boys have recognised undescended testes requiring surgical intervention [2, 4, 8]. Most of them are localised in the groin, and standard surgical orchiopexy through the inguinal canal, or, as proposed by Bianchi, through the scrotum resolves the problem [9]. In 20% of patients with cryptorchidism, the testis is impalpable, and that group of patients is presently treated usually using laparoscopic techniques [2, 8, 10–12]. Therapy for undescended testis is recommended between 6 months and 1 year of life [1, 13, 14]. However, that is only possible when boys are under the control of a paediatric surgeon; in other circumstances, the age at surgery is usually much higher. In the present series, the mean age of operated boys was 3.5 years. The time of surgery in patients with impalpable testes in our opinion is the same as with undescended inguinal testes; this is in accordance with other opinions, but standards have

not yet been established [10, 11, 15, 16]. Laparoscopy may be safely performed even in small children; therefore, the age of the child is not a contraindication to surgery.

In the one-stage procedure we achieved good results after 1 year of observation in 84% and in the two-stage FS procedure in 77%. These results are comparable with other publications. Abbas *et al.* presenting a series of 100 patients reported a total success rate of 63.3% [17]. Ruiz Pruneda *et al.* presenting the results of a group of 42 patients treated with the Fowler-Stephens technique achieved a 64% success rate and recommend this procedure in intra-abdominal testes with short spermatic vessels [18].

The sensitivity of radiological diagnosis of impalpable testis of 64% in our series was too low to exclude the presence of testes in the abdomen. The US is able to localise testes in the abdomen, but when they are not visualised, this does not exclude their presence [1, 5, 6]. The sensitivity of US diagnosis is still too low, and all these patients required surgical exploration. Nijs *et al.* estimated US sensitivity as 48% and advocated surgical exploration in all cases of impalpable testis [6]. The same conclusions were presented by Shoukry *et al.*, who determined sensitivity as 85% [19]. In many cases, connected with inguinal hernia, the diagnosis of abdominal testis may be overestimated by US because the testis may be pushed up into the abdomen during investigation. That group of cases was not treated as impalpable testis; usually under general anaesthesia, testes were palpable and surgery was performed in open mode through the inguinal canal; however, in

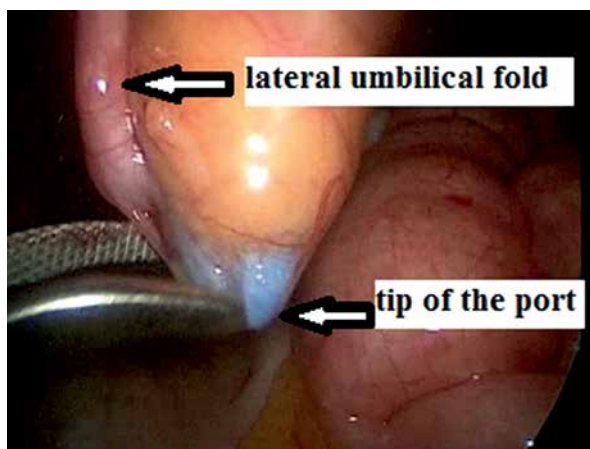
our group, the “peeping testis” was recognised only during laparoscopy in 10 patients.

One of the most important questions during surgery is whether the inguinal canal should be explored in open mode when the vas deferens enters the internal inguinal ring [2, 8]. Usually, exploration reveals a blind-ended vas deferens, although 4 of the 11 patients in our group showed remnants of atrophic gonads histologically that, in our opinion, should be removed. Our practice is open exploration, which definitely resolves the problem and provides definitive management; this is very important for parents who are usually afraid of malignant transformation.

In the group of patients with true abdominal testes, the important question is what kind of operation should be performed: one- or two-stage orchiopexy [3, 20, 21]. In our tactics, we start with elongation of the testicular vessels. If vessels are long enough to perform a one-stage operation, the spermatic cord is also freed. The testis is led through the inguinal canal under laparoscopic control. When testicular vessels are short, they are clipped and cut about 3 cm above the testis. The second procedure is performed a minimum of 6 months after the first operation. In our group of patients, we did not observe atrophy of the testes after cutting of the testicular vessels, so the first step of the Flower-Stephens procedure was saved for testes in our study.

In both one-stage and in two-stage Flower-Stephens procedures, we used additional 5 mm or 10 mm trocars which were inserted through the scrotum. In the one-stage procedure, we led the testis through the inguinal canal, but in the two-stage procedure, the internal orifice of the scroto-peritoneal port was situated between the bladder and the lateral umbilical fold – “neo-ring” (Photo 7). That location, which misses the internal ring medially, gives a shorter route by about 2 cm. When we selected that route, we always used a 10 mm trocar, which enabled tension-free location of the testis and good visualisation of the spermatic cord, preventing accidental twisting. Choosing that route, it is very important to visualise the lateral border of the bladder; in many cases, additional preparation between the fold and the bladder is necessary [22, 23].

Our time of observation was a minimum of 1 year. Most authors observed marked signs of atrophy of the testis during the first 6 months after surgery; therefore, in our opinion, the time of observation is sufficient, although the investigated group is still



**Photo 7.** “Neo-ring” – additional port situated between the bladder and the lateral umbilical fold

under control [2, 3, 10]. There are only a few investigations assessing impalpable testes after puberty. Esposito et al. assessed patients a minimum of 10 years after laparoscopic F-S procedures and demonstrated that more than 83% of patients had satisfactory results, although the operated testes were always smaller compared to the normal testes, but were well vascularised [10].

The next important question is how to protect patients with only one testis (patients with an absent testis or atrophy requiring orchiectomy). Elder recommends contralateral scrotal orchiopexy to prevent future testicular torsion [1]. In all patients, we propose a three-point fixation of the normal testis during the initial procedure or during implantation of the prosthesis. In our opinion, the risk of fixation is very low and prevents the only testis from accidental torsion.

## Conclusions

Laparoscopy in impalpable testes is the procedure of choice and allows definitive management, even when conversion to open procedure is necessary. More than 80% of testes found in the abdomen were saved in our material. Sensitivity of preoperative ultrasound is generally about 60% for true intra-abdominal testes, so diagnostic laparoscopy is necessary.

## Conflict of interest

The authors declare no conflict of interest.

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