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Diagnostic Laparoscopy for the Management of Impalpable Testes

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Purpose: Controversy exists regarding the best approach to impalpable testes. We determined the usefulness of diagnostic laparoscopy for the management of impalpable testes.

Materials and Methods: Between 2000 and 2008, 86 patients with a mean age of 34 months underwent diagnostic laparoscopy. An inguinal canal exploration was performed in all cases, except in patients in whom the internal spermatic vessels terminated intraperitoneally with a blind end.

Results: The undescended testis was right-sided in 24 patients (27.9%), left-sided in 47 patients (54.7%), and bilateral in 15 patients (17.4%). Three patients (3.5%) had bilateral impalpable testes. The vas and vessels traversed the internal ring in 51 of 89 impalpable testes (57.3%); 20 (22.5%) were localized intraperitoneally, and 18 (20.2%) were diagnosed as vanishing testes. Open orchiopexies were performed on 24 testes (27.0%) and orchiectomies were performed on 43 nubbin testes (48.3%). After a mean follow-up period of 30 months, 12 of the 14 testes (85.7%) were viable following open conventional orchiopexy, compared with 6 of the 10 testes (60%) following a 1-stage Fowler-Stephens orchiopexy.

Conclusions: Diagnostic laparoscopy is a very helpful and minimally invasive technique in the diagnosis of impalpable testes, especially when preoperative ultrasonography is not sufficiently informative.

Key Words: *Laparoscopy; Testis*

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INTRODUCTION

An undescended testis is one of the most frequently occurring genitourinary anomalies in the field of pediatric urology [1-4]. The incidence of undescended testes has been reported to be 0.8% of infants at 1 year of age, 3.4% to 5.5% of full-term newborns, and 9.2% to 30.0% of premature infants [5-9]. Of all undescended testes, approximately 20% are reported to be clinically impalpable [10,11]. Whereas the management of boys with palpable undescended testes is straightforward, despite an abundance of international studies, there are no guidelines and there is considerable variability in the management of boys with impalpable testes.

Since the first report of diagnostic laparoscopy for impalpable testes in 1976, diagnostic laparoscopy has gained wide acceptance as a diagnostic procedure for identifying the exact anatomy of impalpable testes and the adnexae [12]. However, some investigators have recently reported that scrotal exploration is a potentially definitive approach for the diagnosis and management of impalpable testes [13]. Thus, we investigated the efficacy and results of diagnostic laparoscopy for the management of impalpable testes.

MATERIALS AND METHODS

Between April 2000 and December 2009, 86 patients (89 testes) with impalpable, undescended testes underwent diagnostic laparoscopy. Impalpable testes were diagnosed by physical examination and ultrasonography in the outpatient department, and the diagnosis was confirmed by careful physical examination under general anesthesia before surgery. Patients with testes that were palpable under general anesthesia were excluded from this study.

All patients with impalpable, undescended testes under-

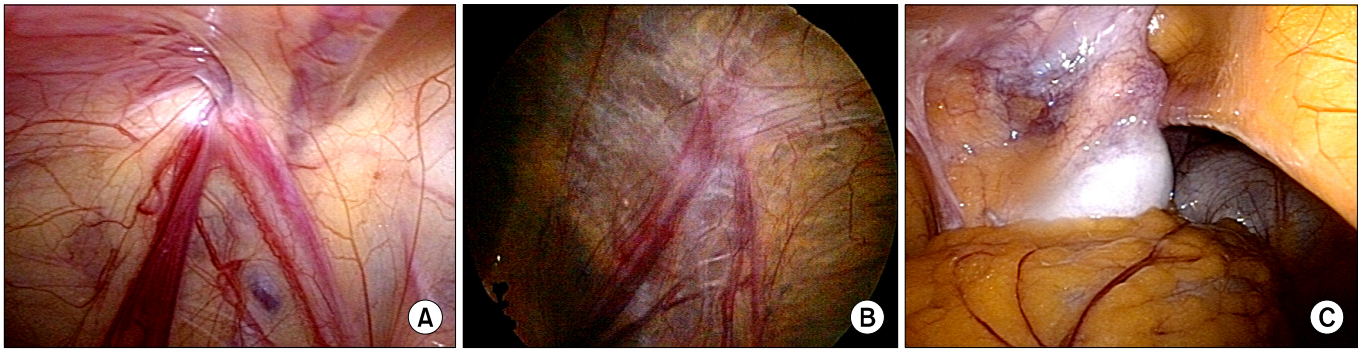

FIG. 1. (A) Laparoscopic findings of a normal vas deferens and spermatic vessels exiting the internal inguinal ring. The vas deferens and vessels clearly meet at the ring. (B) The vas deferens and vessels do not meet, suggesting that they are blind-ending, which is the characteristic finding of an intraperitoneal nonviable testis (including vanishing testis). (C) Intraperitoneal viable testis located above the internal inguinal ring.

TABLE 1. Laparoscopic findings according to laterality

Findings	Unilateral UDT (%)	Bilateral UDT (%)	p-value
Vessels into the internal ring	47 (66.2)	5 (27.8)	<0.001
Intraperitoneal nonviable testis	16 (22.5)	3 (16.7)	
Intraperitoneal viable testis	8 (11.3)	10 (55.6)	

UDT: undescended testis

TABLE 2. Results of inguinal exploration

Results	No. of testes (%)
Nil	5 (6.9)
Orchiectomy	43 (59.7)
Orchiopexy	
Standard orchiopexy	14 (19.4)
Fowler-Stephens orchiopexy	10 (13.9)

went diagnostic laparoscopy before making a decision regarding surgical management. The testes were classified into the following four types on the basis of the location and viability of the testes: intraperitoneal viable testes, intraperitoneal nonviable testes (including vanished testes), extraperitoneal viable testes, and extraperitoneal nonviable testes. In every case, except for intraperitoneal nonviable testes, an exploratory inguinal incision was performed.

Clinical and follow-up data from the eligible patients were retrieved from the patients' medical records and reviewed retrospectively. Comparison of laparoscopic findings and surgical outcomes were performed by Pearson's chi-square test. All p-values were 2-sided, and data were considered statistically significant at a $p<0.05$.

RESULTS

1. Baseline characteristics of the patients

Eighty-six patients were included in this study with a mean age of 34 months (range, 9-368 months) at the time of diagnostic laparoscopy. Seventy-one patients (82.5%) had a unilateral, impalpable undescended testes and 15 patients (17.5%) had bilateral undescended testes. Of the 71 patients who had a unilateral, impalpable undescended testis, 24 (27.9%) were right-sided and 47 (54.7%) were left-sided. Of the 15 patients who had bilateral undescended testes, 3 (3.5%) had bilateral, impalpable undescended testes, but 12 patients (13.9%) had a unilateral, impalpable undescended testis and a contralateral, palpable undescended testis. Thus, this study included a total of 89 impalpable testes. Coexisting anomalies included one case of ipsilateral renal agenesis and one case of Prader-Willi syndrome.

2. Laparoscopic findings

Of the 89 impalpable undescended testes, 52 patients (58.4%) had an internal spermatic vessel and vas deferens visualized entering the internal inguinal ring; 46 of the 52 testes (51.7%) were extraperitoneal nonviable testes, and the remaining 6 testes (6.7%) were extraperitoneal viable testes (Fig. 1). Nineteen testes (21.3%) were intraperitoneal nonviable testes and 18 testes (20.2%) were intraperitoneal viable testes.

There were some discrepancies in the distribution of laparoscopic findings between unilateral and bilateral undescended testes (Table 1). In the patients with unilateral undescended testes, as with the distribution of total testes, 47 patients (66.2%) had an internal spermatic vessel and vas deferens entering the internal inguinal ring, 16 testes (22.5%) were intraperitoneal nonviable testes, and 8 testes (11.3%) were intraperitoneal viable testes. In the patients with bilateral undescended testes, 10 testes (55.6%) were intraperitoneal viable testes, 3 testes (16.7%) were intraperitoneal nonviable testes, and cord structures entering the internal inguinal ring were observed in only 5 patients (27.8%, $p<0.001$).

3. Inguinal exploration

An inguinal exploration was performed on 72 testes (80.9%). In 5 patients, no testis was noted with the absence of cord structures (Table 2). Orchiectomies were performed in 43 hypotrophic or atrophic testes (59.7%), most of which were

TABLE 3. Success rate of orchiopexy according to the type of orchiopexy and anatomical position

Results	No. of surgeries	No. of viable testes (%)	p-value
Type of orchiopexy			0.051
Standard orchiopexy	14	12 (85.7)	
Fowler-Stephens orchiopexy	10	6 (60.0)	
Anatomical position			0.635
Inguinal canal	9	6 (66.7)	
Intra-abdominal position	15	12 (80.0)	

shown to enter the internal inguinal ring. Orchiopexies were performed on 24 testes (33.3%), including 10 cases (13.9%) of 1-stage Fowler-Stephens orchiopexies.

The duration of follow-up ranged from 6 to 98 months (mean, 30.6 months) for the 24 patients who underwent orchiopexies. The surgical outcomes of orchiopexies were assessed by testicular size and ultrasonographic findings [14]. Based on the method of the orchiopexy, 12 of 14 testes (85.7%) were viable following open conventional orchiopexy compared with 6 of 10 testes (60%) following 1-stage Fowler-Stephens orchiopexies, but there was no statistical significance (p=0.051) (Table 3). According to the testicular anatomical position, 6 of 9 testes (66.7%) in the inguinal canal were viable compared with 12 of 15 intraperitoneal viable testes (80%), but there was no significant difference in the success rate (p=0.635).

DISCUSSION

The incidence of undescended testes is reported to be 0.8% to 1.5% in infants. Approximately 20% of undescended testes are impalpable. There are three main locations of impalpable testes: 40% of all impalpable, undescended testes are located intraperitoneally; 15% are vanished testes; and 45% have cord structures entering the internal inguinal ring [5,6]. For the assessment and diagnosis of impalpable, undescended testes, several diagnostic imaging tools, such as computed tomography or magnetic resonance imaging, cannot give us 100% reliable information about testes [12, 15,16].

To diagnose undescended testes, Siemer et al recommended diagnostic laparoscopy with a sensitivity and specificity of up to 90% [17]. Ang and Forrest reported that laparoscopy for impalpable, undescended testes is of proven valuable for both diagnosis and surgical management [18]. In their study, 25.3% of impalpable testes were identified intraperitoneally and 18.9% were absent; therefore, diagnostic laparoscopy was helpful in 44.2% of impalpable testes. Thus, performing a laparoscopy can prevent unnecessary surgical exploration. Our results are consistent with these findings. In our study, there were 19 cases of intraperitoneal nonviable testes (21.3%); only 3 of 19 cases underwent inguinal exploration and 2 of 3 cases did not undergo any type of surgery. There were 18 intraperitoneal viable testes (20.2%); thus, diagnostic laparoscopy was useful for a minimum of 42.5% of cases. Because most testes were identified intraperitoneally in the patients with bilateral undescended testes, we focus more and more on the usefulness of diagnostic laparoscopy in such situations.

Recently, Snodgrass et al reported that the initial scrotal incision for a unilateral impalpable testis may be definitive management when a nubbin is identified [13]. Snodgrass et al demonstrated that laparoscopy is a reliable diagnostic tool for detection of an intraperitoneal testis, but a dilemma arises when there is no testis, and the cord structures exit the inguinal ring [13]. Thus, most patients who undergo initial laparoscopy will undergo a second inguinal incision for an orchiectomy or orchiopexy. This study suggests that scrotal exploration is a definitive procedure as a diagnostic and therapeutic tool for extraperitoneal testes and nubbins in patients with unilateral impalpable testes, but laparoscopy is only for intraperitoneal testes [19]. However, in cases of high inguinal testes, neither a scrotal nor a laparoscopic approach is definitive, necessitating a groin dissection to confirm extraperitoneal nonviable testes. Also, we acknowledge that groin dissection without any prior knowledge of a testicular location would sometimes be a tedious and challenging task without any benefit to the patient. Thus, even in cases with extraperitoneal testes, diagnostic laparoscopy clearly shows the anatomy and provides accurate visual information, which surgeons can use to make a definitive decision.

In the current study, we found that there were some discrepancies in the distribution of laparoscopic findings between unilateral and bilateral undescended testes. In cases of bilateral undescended testes, 72.3% of testes were located intraperitoneally. A previous series by Chang et al reported a higher incidence of bilaterality (25%) in patients with intraperitoneal cryptorchid testes for reasons that are not entirely clear [2]. Considering the significant role of androgens in transinguinal descent of fetal testes, our findings support the notion that bilateral cryptorchidism is more under-masculinized than unilateral cryptorchidism. The fact that greater than one-half of the patients had intraperitoneal viable testes prompts us to make every effort to find a viable testis if the laparoscopic findings suggest intraperitoneal testes.

In the current study, the success rates were 85.7% for open conventional orchiopexies and 60% for 1-stage Fowler-Stephens orchiopexies. In our center, we chose to perform open conventional orchiopexies rather than the laparoscopic approach because we believe that the key to success is a careful dissection of the vas and vessels, which would be difficult to achieve laparoscopically in a very young patient. The Fowler-Stephens orchiopexies are recommended in patients high intraperitoneal testes, defined as a distance between the testis and the internal ring >3 cm [20]. Although we prefer a 1-stage Fowler-Stephens orchiopexy due to the risk of injury to the reproductive tract, as well as the testicular vessels during the second stage of the pro-

cedure [4], a meta-analysis showed that two-stage Fowler-Stephens orchiopexy appears to carry a higher success rate than the one-stage approach (85% vs. 80%; odds ratio: 2, in favor of the two-stage procedure) [21]. Given the outcomes in the current and a previous study, we suggest consideration of two-stage Fowler-Stephens orchiopexy rather than the one-stage procedure in similar situations [4].

CONCLUSIONS

According to the results of our study, diagnostic laparoscopic localization and assessment of an impalpable, undescended testis was useful in a minimum of 42.5% of cases, especially for patients with bilateral undescended testes. Even though there was no statistical significance, the different success rates following orchiopexy were associated with the type of orchiopexy.

Conflicts of Interest

The authors have nothing to disclose.

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