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THE ROLE OF VIDEOLAPAROSCOPY IN THE DIAGNOSTIC AND THERAPEUTIC APPROACH OF NONPALPABLE TESTIS

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ABSTRACT

Objective: Evaluate the results from the first 5 years of experience with laparoscopy for diagnosis and treatment of nonpalpable testes.

Materials and Methods: Medical records of 51 patients submitted to laparoscopic testicular exploration, during a 5-year period, were retrospectively analyzed. Patients' mean age was 65.7 months (median = 48) on the first procedure. The youngest patient was 10 months and the oldest was 14 years old on the first surgery. Twenty-four (47%) patients presented nonpalpable testes bilaterally, 7 (14%) only at the right side and 20 (39%) at the left, totaling 75 testicular units assessed. Patients who had their testes palpated after anesthetic induction were excluded from the study, and in all other cases, surgical management was based on the testicular position and viability. During the post-operative follow-up, surgical success was classified as palpable testis in scrotal sac, with adequate consistency and volume.

Results: Nine (12%) testes were not localized, but their vessels and deferent duct were atrophic. Two (3%) testes were intra-abdominal and atrophic, and 2 (3%) gonads, in the same patient, had a dysmorphic aspect. Nineteen (25%) testicular units were located close to the internal inguinal ring (peeping testes) and, in 22 (29%) units, the spermatic vessels and deferent duct penetrated the internal inguinal ring. Eight (10%) testes were located at a distance of less than 2 cm from the internal inguinal ring and 13 (17%) at a distance greater than 2 cm. The 2 intra-abdominal atrophic testes were removed. Inguinotomy was performed in a total of 41 (54%) cases, reaching a surgical success of 89%. Laparoscopic orchiopexy in one stage, without vascular ligation, was performed in 9 (12%) testes, which presented a distance of less than 2 cm from the internal inguinal ring, also with a surgical success index of 89%. Orchiopexy in 2 stages, with ligation of the spermatic vessels, was performed in 13 (17%) testicular units located at a distance greater than 2 cm from the internal inguinal ring, reaching 77% of good results.

Conclusion: Videolaparoscopy is a safe and effective method for diagnosis and treatment of nonpalpable testis.

Key words: testis; cryporchidism; diagnosis; therapeutics; laparoscopy
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INTRODUCTION

Cryptorchidism occurs in 0.8 to 1.2% of boys at 1 year old (1,2), and in 20% of them, the testis is nonpalpable (3), and it can be absent, intra-canalicular, or intra-abdominal.

The diagnosis and treatment of nonpalpable testes have been controversial, however, in the last 20 years, since the introduction of laparoscopy, they have undergone major changes. First, it became one of the choices diagnostic methods, since imaging scans such as ultrasonography, computerized tomog-

raphy, scintigraphy and magnetic resonance, do not offer a similar accuracy (4-7). In 1992, Jordan et al. (8) introduced the therapeutic application of laparoscopy in patients with nonpalpable testes and, since then, in addition to being a diagnostic method, it has been an option for treating this condition.

This work's objectives were: 1) To analyze the experience of the first 5 years following the introduction of videosurgery for diagnosis and treatment of nonpalpable testes in our service; 2) To access the surgical success of different orchiopexy techniques; 3) To assess the need of exploring the inguinal canal in cases where laparoscopy identifies spermatic vessels and deferent duct penetrating the internal inguinal ring.

MATERIALS AND METHODS

In the period from March 1996 to April 2001, 51 patients underwent diagnostic and therapeutic laparoscopy in our service. Patients' mean age was 65.7 months (median = 48) on the first procedure and 64.58 months (median = 50) on the second surgery. The youngest patient was 10 months and the oldest was 14 years old on the first surgery.

Twenty-four (47%) patients presented nonpalpable testes bilaterally, 7 (14%) only at the right side and 20 (39%) at left, totaling 75 testicular units assessed (Table-1).

Twenty-two (43%) patients presented comorbidities (Table-1). Thirty-nine (76%) patients were White and the others were Mulatto or Black, and there was none patient of Asian origin. Twenty-five (48%) patients underwent pelvic and inguinal ultrasonography, and in only 10 (40%) the result coincided with the surgical finding. Stimulation with β-HCG was performed in 5 (9,6%) patients with bilateral nonpalpable testes, without change of testicular position at the post-treatment assessment.

All patients were submitted to inhalatory and intravenous general anesthesia, followed by testicular palpation. Those patients who had their testes palpated at this moment were excluded from the study and were submitted to inguinotomy. The surgical technique that was employed included gastric stenting, vesical drainage and Trendelenburg's position; infraumbilical incision and the confection of a pneumoperitoneum with Veress needle, insufflating carbon dioxide at pressures of 8 to 10 mmHg. Then a 10 mm trocar was introduced through the incision, enabling the investigation of the peritoneal cavity with an optic (30°) of 10 mm. First, potential injuries to hollow viscera and other organs were assessed; next, the following was evaluated: region of internal inguinal ring, spermatic vessels and deferent duct, testicular size and position, in addition to comparison with the contralateral unit.

In cases of absent testicular structure, with spermatic vessels and deferent in blind sac, the laparoscopic procedure was terminated. When the testis was next to the internal inguinal ring (peeping testes), the inguinotomy was preferred, because, in our experience, such testicular position allows for the classic orchiopexy with good results. If elements of the spermatic cord penetrating the internal inguinal ring were identified, the exploration was proceeded by inguinal route and, when a viable testis was identified, orchiopexy was performed.

Table 1 – *Laterality and associated pathologies.*

Nonpalpable Testis	Frequency	Associated Pathologies
Bilateral	24 (47%)	18 (75%) : 6 DR; 5 MPH; 4 PB; 2 MGD; 1 HP
Right	7 (14%)	2 (29%) : 1 DR; 1 HP
Left	20 (39%)	2 (10%) : 1 DS; 1 KT
Total	51 (100%)	22 (43%)

DR = neuro-psychomotor development retardation; MPH = male pseudo-hermaphroditism; PB = prune-belly syndrome; MGD = mixed gonadal dysgenesis; HP = hypospadias; DS = Down's syndrome; KT = Klippel-Trenounay syndrome.

In all other situations, 2 auxiliary trocars, one of 10 mm and other of 5 mm, were located in both hemiclavicular lines at the level of the umbilicus scar, under direct visualization. Patients with bilateral cryptorchidism were treated in a single time.

When the testis was located at less than 2 centimeters from the internal inguinal ring, the laparoscopic orchiopexy in one stage was performed, which consisted in the distal section of the gubernaculum, if present; dissection of the peritoneum laterally to the spermatic vessels, mobilizing the vessels and the deferent for an extension of 8 to 10 cm of their retroperitoneal position. The vessels were preserved by blunt dissection, avoiding electrocoagulation. Upon completing the dissection, the testis was free of adhesions to the posterior abdominal wall, with the spermatic vessels and the deferent duct. At this moment, a laparoscopic clamp (Grasping or Maryland) was introduced, from a new internal inguinal ring created medially to the obliterated ipsilateral umbilical artery, up to the scrotal sac. A small incision and a sub-dartos pouch were created in the scrotum, through which a 5 mm trocar, followed by a Grasping clamp, were introduced into the peritoneal cavity. The testis was then driven to his position within the sub-dartos pouch in the scrotum, pulled by the gubernaculum, aiming not to injury its vascular supply. The desufflation of the pneumoperitoneum provided an additional extension to the testicular position.

In cases of testes that were more than 2 centimeters away from the internal inguinal ring, the laparoscopic orchiopexy in 2 times was performed, which consisted initially in ligation of the spermatic vessels with metallic clips and their section. The laparoscopic orchiopexy was performed in a second time, usually with a 6-month interval from the first surgery. Closure of the internal inguinal ring was not performed in any case of laparoscopic orchiopexy.

RESULTS

Laparoscopic Findings

Videolaparoscopy defined the intraabdominal anatomy in all cases. Nine (12%) testes were not localized, however their vessels and vas deferens were atrophic. Two (3%) testes were intraabdominal and atrophic and 2 (3%) gonads, in the same patient, had a dysmorphic aspect. Nineteen (25%) testicular units were located next to the internal inguinal ring (peeping testes) and, in 22 (29%) cases, the spermatic vessels and the deferent duct penetrated the internal inguinal ring. Eight (10%) testes were located at a distance of less than 2 cm from the internal inguinal ring, and 13 (17%) at a distance greater than 2 cm.

Surgical Management

The 2 intraabdominal atrophic testes were removed, by laparoscopic approach in one case, and by inguinal approach on the second one.

The 2 gonads with dysmorphic aspect were biopsied by laparoscopy. The histological analysis showed viable testicular tissue in one of them, with laparoscopic orchiopexy without vascular ligation being performed.

Inguinotomy was performed in a total of 41 (54%) cases: in 19 testicular units located next to the internal inguinal ring and in those 22 where the spermatic vessels and the vas deferens penetrated the internal inguinal ring. Among those, 13 units presented anorchia or testicular atrophy on inguinotomy, with the excision of testicular remnants being performed. In the remainder 28 units, open orchiopexy was completed.

Laparoscopic orchiopexy without vascular ligation, in one stage, was performed in 9 (12%) testes: 8 that presented a distance of less than 2 cm from the internal inguinal ring, in addition to the unit with dysmorphic aspect that had been submitted to biopsy.

Orchiopexy with ligation of spermatic vessels in 2 stages was performed in 13 (17%) testicular units located at a distance superior to 2 cm from the internal inguinal ring. The interval between the first and the second procedure was 6 months.

Surgical Result

After a mean follow-up of 11.2 months, the findings of physical examination of the 50 testicular units driven to the scrotum were analyzed in order to evaluate the surgical success, that is, topical testes in the scrotum, with adequate volume and consistency (Table-2).

Of the 28 testicular units that were driven to the scrotum by open orchiopexy, 25 (89%) were palpable in the scrotum with adequate consistency and volume; one (4%) in low inguinal canal and 2 (7%) evolved with atrophy.

Of the 22 testes driven to the scrotum by videolaparoscopy, 9 were driven to the scrotum without vascular ligation, in one stage, with 89% of success and only one (11%) testicular atrophy. 13 were operated by Fowler-Stephens technique with ligation of vessels, in 2 stages, reaching 77% of good results, with 3 (23%) palpable testes in the inguinal canal. Relative to the non-closing of the internal inguinal ring in cases of laparoscopic orchiopexy, no inguinal herniation was identified in the follow-up.

Pathological Study

It was performed in 17 testes: in the 2 intra-abdominal atrophic testes, it revealed cells in the prepubertal developmental stage; in the 2 dysmorphic gonads that were submitted to biopsy, it demonstrated a dysgenic gonad and a rudimentary testis. However, in the 13 units where the spermatic vessels and the vas deferens penetrated the internal inguinal ring, during the inguinal exploration, testicular atrophy or anorchia were identified, demonstrating lack of testicular tissue in 11 cases, scaring tissue in 1 and cells in the prepubertal developmental stage in another.

Second Surgery

Inguinotomy and orchiopexy were performed due to testicular atrophy, detected in the post-operative follow-up, in 3 units: 2 of them were initially located in the internal inguinal ring, and had undergone orchiopexy by inguinal approach on the first surgery, whereas the third unit had been driven to the scrotum by laparoscopy in one step.

DISCUSSION

The main reasons for investigating nonpalpable testes and their position in the scrotum when present, are to preserve fertility, to make the testicular examination easier anticipating the diagnosis of an eventual malignant transformation, in addition to esthetic and psychological factors.

The traditional method for investigating a nonpalpable testis consists in an exploration by inguinotomy, or by lower abdominal approach. Videosurgery was used for this purpose, for the first time, in 1976, by Cortesi et al. (9) and, since then, it has been improved and used, as well, for therapeutic purposes.

Considering the occasional difficulties for driving an abdominal testis to the scrotum, several techniques were described. Orchiopexy by inguinal approach is feasible in cases of testes next to the internal inguinal ring. The procedure by inguinal approach in 2 stages, not used in this series, has the disadvantage of technical difficulty in the second stage, which can lead to testicular injury, or damage of the spermatic cord (10). Autotransplantation, that is not performed in our service as well, requires microvascular surgery techniques and a prolonged hospitalization time (11,12). The ligation of spermatic vessels, as postulated by Fowler & Stephens, has a testicular atrophy index around 30% (13,14); that can be lowered to about 10%, when the procedure is per-

Table 2 – *Surgical result according to the technique employed, excluding testes initially atrophic or absent.*

Technique	Atrophic Testis	Palpable in Inguinal Canal	Palpable in Scrotum	Total
Orchiopexy by inguinal approach	2 (7%)	1 (4%)	25 (89%)	28 (56%)
Orchiopexy by laparoscopic approach (one stage)	1 (11%)	0	8 (89%)	9 (18%)
Orchiopexy by laparoscopic approach (Fowler-Stephens - 2 stages)	0	3 (23%)	10 (77%)	13 (26%)
Total	3 (6%)	4 (8%)	43 (86%)	50 (100%)

formed in 2 stages, allowing the development of collateral circulation (15).

The mean age of patients in our sample was high (mean = 65.7 and median = 48 months), reflecting a probable delay in the diagnosis or in the referral of boys with nonpalpable testes to the tertiary care service. Once the follow-up in our service was initiated, there was no investment in imaging studies or hormone therapy, due to their limited results according to the literature. In this series, 48% of patients underwent ultrasonographic investigation, mostly before referral, and in only 40% of the cases, the findings coincided with the surgical anatomy.

Analyzing the results on a laterality basis, we observed that among the 24 patients (48 testicular units) who presented nonpalpable testes bilaterally, 18 (75%) presented associated pathologies, 10 (21%) absent or atrophic testicular units and 13 (27%) units in "high" position (> 2 cm from the internal inguinal ring). Among the 7 patients who presented nonpalpable testes only at the right side, 2 (28%) presented associated pathologies, only 1 (14%) missing unit and none unit in high position. We observed 20 nonpalpable units only at the left side, with 2 (10%) presenting associated pathologies, 14 (70%) absence or atrophy and none high unit. The highest incidence of associated pathologies in patients with nonpalpable testes bilaterally is probably because patients bearing neuropathies, male pseudo-hermaphroditism, prune-belly syndrome and mixed gonadal dysgenesis, often evolve with cryptorchidism. The analysis based on laterality also suggests that the "high" position of intra-abdominal testes is more frequent in bilateral defects and that anorchia or testicular atrophy are more commonly observed in cases where the defect occurs only at the left side.

One of the purposes of this study was to assess the surgical result of the 3 different techniques that are used in our service. Orchiopexy by inguinal approach and laparoscopic orchiopexy without ligation of vessels presented a surgical success (adequate testicular volume and position) of 89%, whereas laparoscopic orchiopexy in 2 stages (Fowler-Stephens), obtained 77% of good results; values that are consonant to the literature (13-16).

Inguinal exploration, in cases where laparoscopy had identified spermatic vessels and deferent duct penetrating the internal inguinal ring, proved to be necessary, because in 9 cases (41%) viable testes were found and driven successfully to the scrotum. In this sample, such exploration was performed by inguinal approach in all cases, due to the team's larger experience with this approach. However, by retrospectively assessing and based on data from the literature (17-19), we do not see a reason why such exploration is not made by laparoscopic approach, since it has showed to be safe and effective. Such management could avoid the use of 2 approaches (laparoscopy and inguinotomy) for obtaining the same objective.

Schleef et al. (19) suggest the inguinal laparoscopic exploration in cases where one can observe hypoplastic elements of the spermatic cord penetrating the internal inguinal ring. Such study, based also in findings from other works (20-22), suggests the hypothesis that in cases where hypoplastic elements of the spermatic cord penetrate a closed internal inguinal ring, there is never a normal testis in the inguinal canal. In our sample, it was possible to identify 2 cases on the definition above, and in none of them a viable testis was found in the inguinal canal. Our sample of inguinal laparoscopic exploration is still small, with a larger number of studies being required to confirm such hypothesis.

Those who oppose to laparoscopy for diagnosis and treatment of nonpalpable testes claim that the procedure is longer, brings a risk of long-term adhesions, in addition to subjecting the patients with testis, or testicular remnants, in inguinal canal, to a needless procedure in 48 to 64% of cases (23-25). In 54% of the children in this sample, the exploration of the inguinal pathway was performed by inguinotomy after the laparoscopic identification of spermatic vessels penetrating the internal inguinal ring. Nevertheless, data from the literature (19-22) show that even in these cases it is possible to perform orchiopexy by laparoscopic exploration of the inguinal pathway. This approach would have the advantage of avoiding the performance of an inguinotomy in patients whose procedure had already been initiated by laparoscopic route.

Evaluating the literature data about false-negative inguinal explorations (26), in addition to the risk of in-situ carcinoma in cryptorchid testes (27-28), we should engage in the definitive laparoscopic diagnosis. It is worth to remember that some laparoscopic procedures were canceled, with an inguinotomy performed, due to palpation of the testis after anesthetic induction. This results from the fact that the muscle relaxation and the immobilization of the child contribute to testicular palpation. Despite of this, in 9 cases, testes located in the inguinal canal were not palpated. Laparoscopy allowed their correct localization and their treatment by inguinal approach.

CONCLUSION

Laparoscopy showed to be a safe and effective method for assessment and treatment of nonpalpable testes. It enabled that intraabdominal anatomy was accurately defined in all cases, providing higher safety in dissection of delicate structures, under direct visualization. If also offered a fast recovery to the patient, with excellent esthetic results. Non-closure of the internal inguinal ring did not result in inguinal hernia.

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EDITORIAL COMMENT

Laparoscopy is already a recognized method for assessment and treatment of nonpalpable testes, and the experience presented by the authors confirms such data.

The therapeutic sequence for the several laparoscopic findings is well defined in this work, giving importance to the reference of distance from the testis to the internal inguinal ring. Therefore, if the distance is less than 2 cm, the orchiopexy can be performed immediately, since the dissection allows to obtain a sufficient length of the spermatic vessels to comfortably fix the testis to the scrotum (most of the times, that occurs when it can be taken to the internal orifice of the contralateral inguinal canal). On the other hand, when the initial distance is greater than 2 cm, probably a sufficient length will not be obtained, even with exhaustive dissection, thus it is more prudent to make the vascular ligation only, and to perform the orchiopexy in a new procedure after 6 months.

Contrarily to the authors, I consider that the identification of the testis next to the internal inguinal ring is a formal indication for laparoscopic orchiopexy, inclusively when it is located within the hernial sac ("peeping testis"). However, it is fundamental that the deferent, which can insinuate further beyond the testis, through the internal orifice of the inguinal canal, forming a loop in the hernial sac wall, is carefully dissected, avoiding its injury. For that, it is necessary to pull the hernial sac into the abdominal cavity, in order to make its visualization easier. Due to the low testicular position, the length of spermatic vessels and deferent rarely constitutes a limiting factor to the success of primary laparoscopic orchiopexy.

In the discussion, the authors suggest the possibility of laparoscopic dissection of the inguinal canal to treat canalicular testes, when vessels and deferent are identified penetrating the obliterated internal inguinal orifice. In my opinion, this is a haz-

ardous proposal, since in some cases the testis is viable, but is located below the external orifice of the inguinal canal, that is, in the inguinal subcutaneous tissue, consequently in a site of difficult access by laparoscopic approach. Moreover, there is a significant risk of trauma to the testis, deferent and spermatic vessels with this laborious dissection, making the orchiopexy unfeasible. Such strategy would be warranted only if all canalicular testes should be removed, due to being atrophic, what is not confirmed by the authors' own sample. Additionally, in case of atrophic or vestigial canalicular testes, the inguinotomy allows that, following the orchiectomy, testicular prostheses are inserted at the same time.

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