DIAGNOSTIC AND THERAPEUTIC EFFICACY OF LAPAROSCOPY IN THE MANAGEMENT OF THE UNDESCENDED TESTIS

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Purpose: Twenty percent of undescended testes (UDT) are non-palpable. Imaging has shown suboptimal accuracy in locating non-palpable testis (NPT) with laparoscopy proving to be superior. We aim to evaluate the safety and efficacy of laparoscopy in diagnosis and management of NPT.

Materials and Methods: Included patients were >1-year old with NPT. No imaging was done, and laparoscopy was performed all patients. Patients were classified according to diagnostic laparoscopy into 6 types, Type-I: no testes, vas or spermatic vessels, Type-II: a blind- ended vas, Type-III: vas and vessels entering the inguinal canal, Type-IV: testis at internal inguinal ring (IIR), Type-V: testis <1 one inch from IIR, and Type-VI: testis >1 inch from IIR. Stretching maneuver (SM) was added for Type-V. Follow-up included examination and Doppler US 2-months from surgery.

Results: Twenty-five NPT (15 unilateral and 5 bilateral patients) were included. Mean age 1.8 years. Four testes were Type-IV, 14 Type-V, and 7 Type-VI. Three testes were removed due to atrophy. In 8 (32%) testes, Laparoscopic Orchiopexy (LO) was performed (3 Type-IV and 5 Type-V with positive SM). In 14 (56%) testes, Fowler Stephens laparoscopic orchiopexy (FSLO) was done (6 testes Type-V with negative SM and 8 Type-VI). On follow-up, no significant difference in size, site and vascularity was found between FSLO and LO.

Conclusion: Laparoscopy has 100% accuracy in locating NPT. LO and FSLO can be considered treatments of choice for Type-IV and Type-VI NPT, respectively. SM evaluates mobility to contralateral IIR and detects appropriate surgery for Type-V NPT.

Keywords: Laparoscopy; management; undescended; testis.

INTRODUCTION

The undescended testis (UDT) is a common childhood disorder. Twenty-one percent of premature infants have UDT. It also affects 3% of full term newborns as well as 0.8-1.5% of the infants by the end of the first year of life. In 20% of UDT, they are non-palpable with the testis being absent in 20-50% of these patients.1

In those patients with non-palpable testes (NPT) radiological investigations and laparoscopy will play a role in determining location and/or the presence of the NPT. The overall accuracy of radiologic testing, namely Ultrasound (US), Computed Tomography (CT) and Magnetic Resonance Imaging (MRI), is around 44%.2 US showed a poor ability in locating UDT with only 18% of inguinal testes visualized.3 CT scan appears to be more effective but at the expense of radiation while still lacking the accuracy needed in these cases. MRI was shown to be effective in 37% of cases. The suboptimal accuracy of these modalities and inevitability of surgical exploration lead to introduction of laparoscopy to locate the NPT in 1976 by Cortesi et al.4
The merits of laparoscopy, namely minimal morbidity, became obvious. Laparoscopy was extended to orchiopexy and orchiectomy for intra-abdominal testis, and the procedure gained wide acceptance. A comparative study between MRI and laparoscopy recommended laparoscopic evaluation as the preferable method in cases of NPT. Thus; laparoscopy appears to be ideal for both the diagnosis and treatment of NPT during the first or second year of life.

The aim of our work is to evaluate the safety and efficacy of laparoscopy in the diagnosis and management of NPT. We also aim to present a diagnostic laparoscopic classification of the testicular position in the abdomen in order to facilitate proper management.

MATERIALS AND METHODS

This was a prospective study conducted from May 2007 till September 2008 that included males >1-year old with NPT. All patients were diagnosed by history and physical examination. Retractile and gliding testes were excluded from the study. No US or CT-scan or any other radiographic imaging was done for the patients. All cases were examined under anesthesia (EUA) to confirm the diagnosis of NPT.

Laparoscopy was performed for all cases with NPT with diagnostic (site and size of testis) and therapeutic intent. Patients were classified according to diagnostic laparoscopic findings into 5 types (Table 1).

Table (1): Laparoscopic Classification True UDT

<table>
<thead>
<tr>
<th>Type</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>No testis, vas or spermatic vessels indentified.</td>
</tr>
<tr>
<td>Type II</td>
<td>Blind-ended vas.</td>
</tr>
<tr>
<td>Type III</td>
<td>Vas and vessels entering the inguinal canal</td>
</tr>
<tr>
<td>Type IV</td>
<td>Testis at IIR *</td>
</tr>
<tr>
<td>Type V</td>
<td>Testis within 2.5cm from IIR</td>
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</tbody>
</table>
Type VI
Testis high in abdominal cavity (>2.5 from IIR)

*IIR: Internal inguinal ring

The treatment decisions were based on laparoscopic findings. For Types I and II, no further intervention was done. For Type III exploration of inguinal canal was done with orchietomy or orchiopexy done for atrophic and viable testes, respectively. One-stage LO was performed for Type IV patients. Lastly, for Types V and VI patients, a laparoscopic ‘stretching maneuver’ (SM) was done to assess the testicular mobility. The testis was grasped and stretched to the contralateral IIR. One-stage LO was performed for testes with positive stretching, while 2-stage laparoscopic Fowler-Stephens orchiopexy (LFSO) was performed with 6 months' duration between the 2 stages.

Follow up 2 months after orchiopexy was done for all cases to assess size, viability and position of descended testes. This was done with clinical examination and Doppler US.

RESULTS

All Patients were ≤ 1-year with mean age of 1.8 years (range 1-4). Fifteen patients with unilateral and 5 patients with bilateral NPT (total patient N=20), that is, 25 true NPT were included in the study. On laparoscopy, 16% (4/25) of testes were Type-IV and 1-stage LO was performed. Of those 4, one became atrophic on follow-up, for which orchietectomy was performed.

Fifty-two percent (13/25) of testes were Type-V, while 28% (7/25) of testes were Type-VI. Of the Type-V, 1/13 (8%) was atrophic and removed, 6/13 (46%) had a negative SM (due to short vessels) while 6/13 (46%) had a positive SM. Two-stage LFSO and 1-stage LO were performed in negative and positive SM, respectively. In 1/25 (4%), laparoscopy revealed a hemi-uterus with a fallopian tube and fimbria but no ovary on one side, and the other side showed a testis, biopsy revealed a pre-pubertal testis. The case was later diagnosed as mixed gonadal dysgenesis. (Table 2).

Table (2): Results and performed procedures

Patients and Testes

Patients
20 with true UDT

15 with unilateral true UDT

5 with bilateral true UDT

Median age

(range)
1.8 (1-4)

Total Testes
25

Type IV
- 4/25 (16%)
  - 3/4 requiring one-stage LO
  - ¼ requiring orchiectomy

Type V
- 13/25 (52%)
  - orchiectomy in 1/13
  - 6/13 with ?ve SM requiring 2-stage LFSO
  - 6/13 with +ve SM requiring 1-stage LO

Type VI
- 7/25 (28%)
  - FSLO was performed for all

Ambiguous

Genitalia
- 1/25 (4%)
  - Removal revealing mixed gonadal dysgenesis
At 2 months, 9/22 (40%) of testes were found in upper scrotum of which 5/9 (56%) were treated by 1-stage LO and 4/9 testes (44%) treated by 2-stage LFSO. In 11/22 (50%), testes were in mid-scrotum, of which 8/11 (73%) were treated by 2-stage LFSO and 3/11 (27%) were treated 1-stage LO. In 2/22 (9%), testes were retracted in the inguinal canal. Both testes were treated with 2-stage FSLO.

Thus, in 14 testes treated with 2-stage LFSO, 2 were retracted to the inguinal region, 4 testes in the upper scrotum, and 8 were in the mid-scrotum (14%, 57% and 29%, respectively). In the 8 testes treated with 1-stage LO, 5 testes were in the upper scrotum and 3 testes in the mid-scrotum (62.5% and 37.5%, respectively). On comparing these 2 groups, concerning the site of the testis, there was no statistical difference after either types of orchiopexy (P=0.23). (Table 3).

Table (3): Site and size of surgically descended testes

<table>
<thead>
<tr>
<th>Site and Size of testis</th>
<th>LSFSO</th>
<th>LO</th>
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<tbody>
<tr>
<td>Site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Upper scrotum</td>
<td>4 (28.57%)</td>
<td>8 (57.14%)</td>
</tr>
<tr>
<td>- Mid-scrotum</td>
<td>2 (14.29%)</td>
<td>3 (25.00%)</td>
</tr>
<tr>
<td>- Retraction</td>
<td>5 (35.71%)</td>
<td>3 (29.03%)</td>
</tr>
</tbody>
</table>

Thus, in 14 testes treated with 2-stage LFSO, 2 were retracted to the inguinal region, 4 testes in the upper scrotum, and 8 were in the mid-scrotum (14%, 57% and 29%, respectively). In the 8 testes treated with 1-stage LO, 5 testes were in the upper scrotum and 3 testes in the mid-scrotum (62.5% and 37.5%, respectively). On comparing these 2 groups, concerning the site of the testis, there was no statistical difference after either types of orchiopexy (P=0.23). (Table 3).
Concerning the size, 3/25 testes were atrophic on initial diagnosis (including 1 MGD). In 2/25 testes (0.08%) (1 treated by 1-stage LO, and 1 treated by 2-stage FSLO), size was smaller on follow-up (<2 cm x 2 cm in greatest dimension). The remaining 20 testes (80%) (including 2 testes retracted in IC) were of normal size when compared to contralateral testis (>2 cm x 2 cm in greatest dimension). In total, 14 testes were treated with 2-stages LFSO, and 8 testes were treated with 1-stage LO. In the 1-stage LO group, only 1/14 testes (7%) diminished in size while 13/14 (93%) testes were normal in size on follow-up (mean 4.25 cm ± 4.25). In the 1-stage LO group (n=8) only 1/8 testis (12.5%) was diminished in size on follow up. The difference between the two groups was not statistically significant (p=0.83) (Table 3). Additionally, all testes in both treatment groups (LFSO and LO) showed a normal vascularity on follow-up by Doppler US. This showed that LFSO and LO had similar results regarding site, size and vascularity of the descended testis with no statistically significant difference.

DISCUSSION

Multiple radiological and imaging modalities are available for the evaluation and management of NPT. Laparoscopy was found to be an effective and safe technique for precisely locating NPT as well as for surgical planning. It also offers considerable advantages of evaluation of the size and morphology of the intra-abdominal testes. Additionally, with laparoscopy, high retroperitoneal and atraumatic dissection of the spermatic vessels can be done for high intra-abdominal testes without disturbing the peritoneum between the vas deferens and the distal spermatic cord.8
Our series is a prospective study done on 20 patients with 25 NPT, with a mean age of 1.8 years old. Laparoscopy was done for all patients in our series with no imaging done before the laparoscopic procedure. Intra-abdominal testes were classified into 6 types according to their position from IIR (Table 1).

In their prospective study, El-Anany et al. reported on 117 NPT in 95 patients with a mean age of 5 years. All patients underwent laparoscopy for evaluation and management of NPT. One-stage LO was performed for 44/117 testes (37.6%) while LFSO was performed for 47/117 testes (40.2). The mean follow-up was 3 years. All testes in 1-stage LO group were of good size and viability by testicular scintigraphy. Four (8.7%) were at the neck of the scrotum, and 42 were at the bottom of the scrotum (91.3%). In the LFSO group, 2/47 (4.3%) testes showed atrophy while 45/47 (95.7%) were of good size and viability, but all were in the bottom of the scrotum 6 months after completion of the staged procedure.

One-stage LO was found to have higher success rates when compared to open techniques. In their retrospective multi-institutional analysis, Baker et al. reported an overall success rate of 92.8% for laparoscopically managed NPT (97.2% for primary LO, 74.1% for single-stage LFSO and 87.9 for two-stage LFSO). Overall atrophy rate was 6.1% (22% in single-stage LFSO group, 10% in two-stage LO group and 2% in primary LO group). An overall success rate of 93% was reported by Lindgren et al. for primary LO or LFSO.

A large single-group experience showed similar success rates for all laparoscopic techniques of orchiopexy: with an 85% overall success rate for one- or two- stage LFSO and atrophy in 4%. Yucel and colleagues in 2007 reported a series of 46 testes located within 1 inch from the IIR, with a success rate of 84.4% for LO.

In our study, no testes were of the Type I, II or III, with 24/25 (96%) found to be Type IV. All type VI testes (N=7) were treated by 2-stage LFSO with a 6-months interval between the 2 stages. On follow-up 2/7 were retracted in the inguinal canal with normal size and vascularity requiring open orchiopexy. The remaining 5 testes were in the scrotum 2 months after completion of the 2 stages with only 1 testis showing atrophy (1.6 cm x 1.0 cm) and diminished vascularity. Thus 2-stage LFSO can be considered the treatment of choice for high intra-abdominal testes with short spermatic vessels.

All testes located at IIR (Type IV) (N=4) were treated by 1-stage LO except for one testis that was removed due to atrophy. At 2 months all testes were in scrotum with normal size and vascularity. Thus, 1-stage LO can be considered as the treatment of choice for testes located at IIR.

For Type V (located within 1 inch from IIR) there were reports of 2-stage LFSO being performed if the testis was > 2 cm from the IIR, with no assessment of the effect of testicular mobility. In another series, Banieghbal and Davies 7 reported that for testes located within 2.5 cm from the IIR, testicular mobility (using cord length and mobility) can be used as a predictive guide for the surgical management, with a successful outcome following orchiopexy. The contralateral IIR was used as a reference point to assess cord length and potential mobility of testes. This was called the "stretching maneuver? (SM), and was validated by anthropometric measures were the distance between the IIR was on average 0.5 cm > the distance from the mid-scrotum to the ipsilateral IIR. These findings were constant across the different age. In our series, 13 testes were type-V of which 1 was atrophic from start requiring orchiectomy. In 6/12 testes there was negative SM and 2-stage LFSO was done with all testes (100%) showing normal position, size and vascularity. The remaining 6 testes had positive SM and 5/6 testes were treated by 1-stage LO and 1/6 required 2-stage LFSO due to short vessels after dissection. All 6 testes treated by 1-stage LO were of normal scrotal position on follow-up. Additionally all testes showed normal vascularity except 1 testis that showed atrophy. This may suggest the accuracy and dependability of SM in determining the appropriate line of management for Type V NPT.

Generally, both 2-stage LFSO and 1-stage LO had successful results regarding site, size and vascularity of the testes. For 2-stage LFSO, 14.29% were retracted in the inguinal canal and re-operated upon by open orchiopexy, while 85.71% were in the scrotum. Atrophy occurred in 7.14% with an overall success rate of 92.86%. For 1-stage LO, all testes were in the scrotum (100%) with an overall success rate of 87.5% and 12.5% diminishing in size and vascularity. No significant difference was found between both lines of management regarding position, size or vascularity.
CONCLUSION

Finally, we conclude that laparoscopy is a versatile tool that can be safely used in locating NPT as well as assessing testicular mobility using the SM. This helps in detecting an appropriate surgery particularly for Type-V NPT using either 1- or 2-stage laparoscopic procedures. Laparoscopy achieves an acceptable mean overall success rate of 86.6% for both 1- and 2-stage procedures.

REFERENCES


