"To Evaluate the Success Rate and Future Outcomes of Laparoscopic Orchidopexy Compared With Open Orchidopexy in Modern Era"

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ABSTRACT

INTRODUCTION - Isolated cryptorchidism is one of the most common congenital anomalies found at birth and affects about 3% of full-term male new-borns. Once cryptorchidism is diagnosed, treatment choices may include watchful waiting, hormonal treatment, or surgery & initial therapy is often selected on the basis of age at presentation and the location of the cryptorchid testicle.

AIMS & OBJECTIVES - To evaluate the success rate of laparoscopic orchidopexy compared with that of open orchidopexy with comparison of post-operative morbidity & future outcomes.

MATERIAL & METHODS - A total of 40 patients were chosen after assessing inclusion/exclusion criteria. The patients were randomly divided into two groups.

Group A: 20 Patients undergoing open orchidopexy.
Group B: 20 Patients undergoing laparoscopic orchidopexy. Patients were assessed on the day before surgery, on the postoperative day 1, postoperative day 3, postoperative day 7, for postop pain, scrotal oedema, resumption of bowel sounds, retention of urine, wound infections, on respective days.

OBSERVATIONS & RESULTS - Total of 20 testicles were operated in group A by laparoscopic method and 21 testicle were operated in group B by open method.

CONCLUSION - Results of our study revealed that the laparoscopic orchidopexy is better than open orchidopexy in terms of:
- Postoperative pain
- Mean time to resume bowel sound
- Duration of hospital stay
- Scrotal edema
- Wound infection
- Testicular site
- Testicular atrophy

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I. Introduction

Isolated cryptorchidism is one of the most common congenital anomalies found at birth and affects about 3% of full-term male newborns. Unilateral cryptorchidism is more common than bilateral cryptorchidism, mostly on right side (70%).

Approximately 70% to 77% of cryptorchid testes will spontaneously descend, usually by 3 months of age. By 1 year of age, the incidence of cryptorchidism declines to about 1% and remains constant throughout adulthood.

Although the exact etiology is still unknown, it is postulated that genetic, hormonal (hypothalamic-pituitary-gonadal axis dysfunction, congenital hypogonadotropic hypogonadism, testicular dysgenesis), and anatomical (short vas deferens and spermatic vessels) factors are involved.

A birth weight <2.5 kg, being small for gestational age, prematurity, low maternal estrogen levels, and placental insufficiency with decreased human chorionic gonadotropins (hCG) secretion are suggested as risk factors for undescended testes.

In addition, exposure to environmental factors such as persistent exposure to organochlorine compounds, mono-esters of the phthalates, maternal smoking, and maternal diabetes mellitus are also reported to be risk factors for maldevelopment of the male reproductive organs. However, none of these factors has been shown to be solely responsible for the etiopathogenesis of undescended testes.
Clinical examination findings reveal that 80% of undescended testes are palpable and sit in the inguinal superficial pouch (30%), the inguinal canal (20%), the upper scrotum (45%) and rarely (5%) in the perineum or the thigh and that 20% of undescended testes are non-palpable and are located in the abdominal cavity. The diagnosis of undescended testes is clinical. Nearly 20% of undescended testes are impalpable. There are several reasons for impalpable testes, including intraabdominal, intracanalicular or ectopic location of the testes, testicular dysgenesis and absence of the testes.

The use of imaging techniques in the diagnosis of impalpable testes is controversial. Today, it is recommended that impalpable testes should be examined by laparoscopic surgery with or without radiological guidance.

Undescended Testes and the Rationale for Treatment

1. Risk for Infertility
Ten percent of infertile males have a history of undescended testes. The infertility risk is sixfold higher in patients with bilateral undescended testes compared to patients with unilateral undescended testis or with a healthy population.

2. Risk for Cancer
The risk for cancer is 35 to 48 times higher in patients with undescended testes compared to the overall population. The risk for malignant degeneration is 3-18% in these patients. A total of 10% of testis malignancies are associated with undescended testes.

3. Risk for Torsion
The risk for torsion is higher in adult patients with undescended testes compared to overall population. A germ-cell tumor was reported to occur in 64% of such cases. It was also suggested that the risk for torsion was associated with the duration of the undescended testes.

Once cryptorchidism is diagnosed, treatment choices may include watchful waiting, hormonal treatment, or surgery. In clinical practice, the choice of initial therapy is often selected on the basis of age at presentation and the location of the cryptorchid testicle. Watchful waiting may be used in boys <1 year of age with lower-lying testis in whom spontaneous descent is still a realistic possibility. Hormonal and surgical options are primarily selected on the basis of location and appearance of the undescended testicle. Hormonal treatment with luteinizing hormone releasing hormone (LHRH) analogs and/or human chorionic gonadotropin (hCG) could theoretically increase circulating androgens that may, in turn, promote testicular descent.

Surgical options include various forms of orchidopexy or orchidectomy. Primary orchidopexy (surgical mobilization of the testicle with placement and fixation in the scrotum) is usually performed for palpable cryptorchid testicles that are of relatively normal size and appearance that are located in the inguinal canal.

This procedure can be performed as a single-stage operation, in which the vessels are ligated and the testicle is then placed into the proper position in the scrotum, or as a 2-stage procedure.

II. Aims And Objectives

AIM-
- To evaluate the success rate of laparoscopic orchidopexy compared with that of open orchidopexy.

OBJECTIVE-
- To evaluate post-operative morbidity of both method.
- To evaluate future outcome of both method in the terms of growth/atrophy.

III. Review Of Literature

The current method of testicular fixation within the subdartos pouch was first described by Schoemaker in 1932 but was popularized by John K. Lattimer, at Columbia University, in 1957. He also worked out a way to implement gentle traction via an elastic band anchored in the vicinity of the patient’s knee for 10 days.

With the inclusion of the subdartos pouch technique, the four key steps of standard orchidopexy were established just before the 1960s. The standard orchidopexy can be applied to almost all undescended testes with the exception of high undescended testes. The success rate ranges from 89% to 92%. Therefore, attention has turned to the treatment of high undescended testes which were not adequately treated by standard orchidopexy.

In 1979, Jones and Bagley suggested a high inguinal incision as the open surgical alternative for high canaliculic and infraabdominal testes. In case of a high undescended testis, the testicular artery and veins often limit the distal mobility of these testes. As mentioned earlier, attempts to divide the testicular artery were made well before the 20th century. However, a high atrophy rate precluded wide application. In 1959, Fowler and Stephens studied the vascular anatomy of the testis and devised a means to repair a high undescended testis and preserve its blood supply via collateral circulation. Children with a long, looping vas that extends down the
inguinal canal are the ideal candidates for this surgery, but less than one third of the children with intraabdominal testes were found to have this condition. Originally, Fowler and Stephens orchidopexy was known as a staged technique but it was further modified into a 2-staged operation with a better success rate (77% vs. 67%).

Bloom in 1991 described a procedure for staged pelviscop orchidopexy. The pure one-stage laparoscopic orchidopexy was first reported by Jordan and Winslow. Therapeutic laparoscopy has the advantage of

1) high magnification and improved visualization
2) capability of extensive vascular dissection up to the origin of gonadal vessels
3) minimal morbidity, and
4) the ability of creating a new internal ring medial to inferior epigastric vessels to achieve the straight vascular course to the scrotum.

Laparoscopic orchidopexy can be conducted as either one-stage orchidopexy with preservation of spermatic vessels or Fowler and Stephens orchidopexy. While current orchidopexy includes a variety of methods, all methods stem from the basic concepts of standard orchidopexy.

Docimo et al reported that the overall success rate of open surgical orchidopexy was 74% for abdominal testes. Moreover, the same author reported that success rate was 77% for open staged Fowler-Stephens and 81% for open primary transabdominal orchidopexy.

However, recently Abolyosar A et al presented better results with overall success rate was 85% and 90.5% for open and laparoscopic staged Fowler-Stephens orchidopexy, respectively. According to Jordon GH et al Between October 1991 and January 1993, 14 patients (16 testes) underwent minimally invasive surgery with 6 months of followup in all cases. No evidence of testicular loss or acute atrophy has occurred, with the entire procedure being accomplished by laparo-endoscopic techniques in all cases.

According to Dave et al presence of a long looping vas was associated with a higher atrophy rate following laparoscopic second stage Fowler-Stephens orchidopexy. Laparoscopic management of the long looping vas may be more challenging and, therefore/ in such cases open Fowler-Stephens orchidopexy may result in better success rates by preserving the integrity of the collateral vessels.

Merguerian PA et al laparoscopy is now used routinely for the diagnosis of nonpalpable testes whatever further management is completed with laparoscopy or open surgery. Proceeding with a laparoscopic orchidopexy procedure for viable abdominal testis, is considered safe and effective with significantly less morbidity.

The main benefit of laparoscopy is the ability to start treatment as soon as a diagnosis is made. It is not appropriate to leave a nonpalpable testis untreated, unless it is diagnosed as vanishing testis. Orchidopexy or orchiectomy should be carried out even when diagnostic imaging suggests intra-abdominal testis.

Laparoscopic surgery has a second advantage; namely, permitting minimum invasive surgery. Although laparotomy requires a relatively large surgical wound and ablation, laparoscopic surgery can be done with a few trocars and a small incision for guiding the testis. Furthermore, laparoscopic surgery seems to be better in terms of postoperative pain and clinical findings.

Lintula et al although marginally longer in duration, primary Laparoscopic Orchidopexy appears to be a feasible, safe technique for the management of the low intra-abdominal testes, whereas the staged Fowler-Stephens Laparoscopic Orchidopexy may be more safe than primary Laparoscopic Orchidopexy in cases with high intra-abdominal testes.

According to Lowe et al Anatomic localization of nonpalpable testes facilitated accurate planning of operative repair, thereby potentially improving the ultimate result. Additionally, the technique rendered exploration unnecessary in patients with the intra-abdominal vanishing testis syndrome. No complications were noted as a result of laparoscopy in these patients.

According to Chang et al additional high overall success rate in placing the testis into the scrotum through laparoscopic procedures is considerably better than reported in other series to date. Laparoscopic Orchidopexy is an effective method for managing intra-abdominal testes in children. Patients who had undergone previous surgery had a higher risk of developing testicular atrophy. The additional dissection around the vas almost inevitably leads to testicular atrophy.

Dhanani et a high degree of success can be obtained for children with intra-abdominal testes. Mobility of the testis on exploration is a good indicator that the testis can be managed with primary Orchidopexy without division of the vessels. If primary Orchidopexy cannot be performed, excellent results are achieved with a staged Fowler-Stephens Orchidopexy.

To establish its high safety, improvements in laparoscopy operation skills and development of new surgical instruments are thought to be important. With the recent appearance of newly developed 2 or 3 mm trocars, endoscopes and forceps, less invasive laparoscopic surgery is becoming feasible. Laparoscopy for nonpalpable
testis is considered to be the most effective method for diagnosing the existence or absence of the testis and its location.

IV. Material And Methods

MATERIAL
This study was conducted on patients attended Outpatient Department of Surgery at S. N. Medical College, Agra, during the period from March 2014 to April 2015.

ELIGIBILITY CRITERIA

INCLUSION CRITERIA
Patients clinically diagnosed with non-palpable testes undergone laparoscopic and open orchidopexy were included in the study.

EXCLUSION CRITERIA
- Re-do surgery for failed orchidopexy.
- Orchidopexy for retractile testes.
- Orchidopexy for ascending testes.
- Orchidopexy beyond childhood.
- Trapped testes resulting from prior inguinal surgery.

METHODS
A total of 40 patients were chosen after assessing inclusion/exclusion criteria. The patients were randomly divided in two groups.

**Group A**: 20 Patients undergoing open orchidopexy.

**Group B**: 20 Patients undergoing laparoscopic orchidopexy.

The diagnosis of non-palpable testes was confirmed by examination under general anaesthesia in both the groups. In patients, testes palpable under general anaesthesia were excluded from study.

In the laparoscopic group (Group B) the laparoscopic findings were as follows:
1. Vanished testes, blind ended spermatic vessels.
2. Vessels and vas entering the ring.
3. High abdominal testes, found on iliac vessels.
4. Low abdominal testes, found between iliac vessels and internal ring.
5. Peeping testes, that emerges from internal ring.

Those in the first two categories were excluded from this study.

For all high abdominal testes, laparoscopic first stage Fowler-Stephens (clipping of spermatic vessels) was performed initially. A second stage Fowler-Stephens orchidopexy was performed 3 month later. For low abdominal and peeping testes primary laparoscopic orchidopexy was performed. For bilateral cases one side was managed at a time and second side was treated 3 month later after the first in both groups.

Both groups were compared in respect of

**Early Parameters**-
- Duration of operation
- Postoperative pain
- Scrotal oedema
- Resumption of bowel sound
- Duration of hospital stay

**Late Parameters**-
- Testicular site
- Testicular atrophy

Patients assessments and outcome measurements
All the patients were assessed on the day before surgery, on the postoperative day 1, postoperative day 3, postoperative day 7, for postop pain, scrotal oedema, resumption of bowel sounds, retention of urine, wound infections, on respective days.

Visual analogue pain scale was used for pain assessment and other parameters were assessed clinically.

Statistical Analysis:
The statistical analysis of data was done using fisher's exact test and paired t test.
V. Observations And Results

A total of 40 patients were enrolled in the study, which were clinically diagnosed as non-palpable undescended testes. Two groups of 20 patients in each group was made randomly.

**Group A:** Comprised 20 patients in whom laparoscopic orchidopexy was done either by primary laparoscopic or by Fowler Stephan staged laparoscopic orchidopexy.

**Group B:** Comprised 20 patients in whom primary open orchidopexy was done.

### Table 1: Distribution of cases according to age

<table>
<thead>
<tr>
<th>Age group</th>
<th>Group A</th>
<th>Group B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>&lt; 2 yrs</td>
<td>5</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>2-4 yrs</td>
<td>8</td>
<td>40</td>
<td>12</td>
</tr>
<tr>
<td>4-6 yrs</td>
<td>7</td>
<td>35</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100</td>
<td>20</td>
</tr>
</tbody>
</table>

p-value=0.4927

The groups are not significantly different.

Fisher's exact test is used

### Table 2: Distribution of cases according to laterality

<table>
<thead>
<tr>
<th>Side of undescended testes</th>
<th>Group A</th>
<th>Group B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Right</td>
<td>12</td>
<td>60.00</td>
<td>10</td>
</tr>
<tr>
<td>Left</td>
<td>6</td>
<td>30.00</td>
<td>9</td>
</tr>
<tr>
<td>Bilateral</td>
<td>2</td>
<td>10.00</td>
<td>1</td>
</tr>
<tr>
<td>Total no. of patients</td>
<td>20</td>
<td>100.00</td>
<td>20</td>
</tr>
<tr>
<td>No. of testicle operated</td>
<td>22</td>
<td>100.00</td>
<td>21</td>
</tr>
</tbody>
</table>

p-value=0.5509

The groups are not significantly different.

Fisher's exact test is used

![Graph showing distribution of cases](image)

**Table 3: Intra operative findings / location of testes in group A**

<table>
<thead>
<tr>
<th>Location of testes</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peeping testes</td>
<td>12</td>
<td>54.55</td>
</tr>
<tr>
<td>Low abdominal testes</td>
<td>6</td>
<td>27.27</td>
</tr>
<tr>
<td>High abdominal testes</td>
<td>2</td>
<td>9.09</td>
</tr>
<tr>
<td>Vanishing testes</td>
<td>1</td>
<td>4.55</td>
</tr>
<tr>
<td>Vas. And vessel entering the ring</td>
<td>1</td>
<td>4.55</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>100.00</td>
</tr>
</tbody>
</table>
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So a total of 20 testicles were operated in group A by laparoscopic method and 21 testicle were operated in group B by open method.

Table-4: Distribution of case according to type of procedure done

<table>
<thead>
<tr>
<th>Type of procedure</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Primary open orchidopexy</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>Primary lap orchidopexy</td>
<td>11</td>
<td>55.00</td>
</tr>
<tr>
<td>One stage Fowler step. method</td>
<td>6</td>
<td>30.00</td>
</tr>
<tr>
<td>Two stage F.S. methods</td>
<td>2</td>
<td>10.00</td>
</tr>
<tr>
<td>Orchidectomy</td>
<td>1</td>
<td>4.76</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table-5: Comparison of Operation Time in Group A and B

<table>
<thead>
<tr>
<th>Groups</th>
<th>Operation Time (min.)</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>A</td>
<td>90-120</td>
<td>116.2</td>
<td>12.42</td>
</tr>
<tr>
<td>B</td>
<td>60-90</td>
<td>74.6</td>
<td>14.8</td>
</tr>
</tbody>
</table>
To Evaluate the Success Rate and Future Outcomes of Laparoscopic Orchidopexy Compared With ...

The two groups are significantly different with respect to Operation Time. In group A average operative time was 90-120 minutes while in group B it was 60-90 minutes.

Table-6: Comparison of Hospital Stay in Group A and B

<table>
<thead>
<tr>
<th>Groups</th>
<th>Hospital stay (hrs.)</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>24.75</td>
<td>2.60</td>
<td>-48.4212</td>
</tr>
<tr>
<td>B</td>
<td>72.25</td>
<td>3.50</td>
<td></td>
</tr>
</tbody>
</table>

In group A mean duration of hospital stay was 24.75 hrs while in group it was 72.25 hrs.

Table-7: Comparison of Post-Operative complications in Group A and B

<table>
<thead>
<tr>
<th></th>
<th>Group A (n=19)</th>
<th>Group B (n=20)</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resumption of bowel sound (hrs)</td>
<td>9.50±1.50</td>
<td>13.25±2.25</td>
<td>6.090</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Pain</td>
<td>0.20±0.05</td>
<td>0.40±0.10</td>
<td>7.834</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Oedema</td>
<td>2 (10.53)</td>
<td>3 (15.00)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retention of urine</td>
<td>3 (15.79)</td>
<td>4 (20.00)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wound infection</td>
<td>1 (5.26)</td>
<td>2 (10.53)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prolonged ileus (more than 24 hrs)</td>
<td>2 (10.53)</td>
<td>3 (15.00)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Figures in parentheses indicate percentage)

Table 8: Follow up comparison in Both groups

<table>
<thead>
<tr>
<th>Testicular site</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>High inguinal</td>
<td>2(10.53)</td>
<td>4(21.05)</td>
</tr>
<tr>
<td>Bottom of scrotum</td>
<td>17(89.47)</td>
<td>15(78.95)</td>
</tr>
<tr>
<td>Total</td>
<td>19(100.00)</td>
<td>19(100.00)</td>
</tr>
</tbody>
</table>

(Figures in parentheses indicate percentage)

Table 9: Follow up comparison in Both groups

<table>
<thead>
<tr>
<th>Testicular atrophy</th>
<th>Group A (n=19)</th>
<th>Group B (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(5.26)</td>
<td>2(10.52)</td>
<td></td>
</tr>
</tbody>
</table>

(Figures in parentheses indicate percentage)

VI. Discussion

Non palpable undescended testis has been identified as one of the common and classic indication for paediatric laparoscopy. The main advantage of laparoscopy are accurate localization of the testis and total avoidance of open exploration in some patient. The main criticism against inguinal exploration for a non palpable testis is that it may fail to locate an intra-abdominal testis.
In our study, inguinal exploration clearly identified the status of all 21 testis for which it was employed. Many of the clinically non palpable testis were either canalicular or low abdominal and was readily managed by standard inguinal approach.

In a report by Lakhoo et al, the author found viable testis in 59% of boys with previous negative inguinal exploration. Kirsch et al reported a large experience with 447 non palpable testis, all of which were treated through standard inguinal incision. They concluded that the inguinal approach with transperitonealmobilisation of vas and vessel is highly successful for intra-abdominal undescended testis. William et al reported that in 37 of 39 non palpable testis, groin exploration was sufficient for deciding and executing treatment. Adams and alloway et al reported good results with inguinal exploration followed by preperitoneal approach for 110 non palpable testis. They concluded that the advantage of laparoscopy could be achieved by this open surgery with a favourable cost-benefit ratio.

In an randomised control trial, Ferro et al concluded that laparoscopy only increased the operating time and cost without any significant advantage over open surgery.

Several authors reported excellent result with laparoscopic orchidopexy for non palpable testis. Chang et al reported an overall success rate of 96% with laparoscopy orchidopexy for non palpable undescended testis. Similarly good results have been reported for staged laparoscopic Fowler-Stephens orchidopexy.

According to Lintula et al, although marginally longer in duration, primary Laparoscopic Orchidopexy appears to be a feasible, safe technique for the management of the low intra-abdominal testes.

Similar was the result of Merguerian PA et al that laparoscopy is now used routinely for the diagnosis of nonpalpable testes whatever further management is completed with laparoscopy or open surgery. Proceeding with a laparoscopic orchidopexy procedure for viable abdominal testis, is considered safe and effective with significantly less morbidity.

Docimo et al reported that the overall success rate of open surgical orchidopexy was 74% for abdominal testes. Moreover, the same author reported that success rate was 77% for open staged Fowler-Stephens and 81% for open primary transabdominalorchidopexy.

Only a few earlier repts compared laparoscopic versus open inguinal approach in non palpable undescended testis.

In our study, we also compared the two approaches and found that except in duration of operation and cost effectiveness laparoscopic orchidopexy is better than open orchidopexy in terms of postoperative complications and in long term efficacy in terms of testicular site and atrophy.

Both the groups were compared in terms of immediate postop complications and long term efficacy in terms of testterial site and atrophy.

Similar were the results of Abolyosar A et al with overall success rate was 85% and 90.5% for open and laparoscopic staged Fowler-Stephens orchidopexy, respectively.

So the results of our study are little better than other studies done previously.

VII. Conclusion

The aim of the study was to evaluate the success rate of laparoscopic orchidopexy compared with that of open orchidopexy. A total of 40 patients were enrolled in the study and two groups were made with each group having 20 patients. In one group patients were operated by open inguinal approach and in second group patients operated through laparoscopic approach. Results of our study revealed that the laparoscopic orchidopexy better than open orchidopexy in terms of:

- Mean time to resume bowel sound (less in laparoscopic group)
- Duration of hospital stay (shorter in laparoscopic group)
- Scrotal edema (less in laparoscopic group)
- Wound infection (low in laparoscopic group)
- Testicular site (better in laparoscopic group)
- Testicular atrophy (less in laparoscopic group)

Bibliography

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