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Original Article (Pages: 5145-5152)

Beneficial Impression of San-ligation over High-ligation during Orchidopexy; a Cross-Sectional of 2659 Patients

Amrollah Salimi[1], Sara Shahmoradi[2], Shervin Rashidi Nia[2], *Seyyed Shahin Eftekhari[2]

[1]Department of Pediatric Surgery of Hazrat Masoume Hospital, Qom University of Medical Sciences, Qom, Iran.
[2]Student Research Committee, Qom University of Medical Sciences, Qom, Iran.

Abstract

Background
The ligation of the patent processus vaginalis (PPV) is the challenging issue during the orchidopexy in the patients who suffering undescended testis (UDT). In the present study we aimed to comparing the advantages of the orchidopexy with high-ligation method and the san-ligation method as a modified orchidopexy in our more than 6 years` experiences.

Materials and Methods
The medical records of 2,659 boys with UDT who undergone orchidopexy in xx hospital, Qom-Iran, between February 2010 and October 2016 were analyzed. The exclusion criteria were consisting of critical cases, presence of concomitant obvious clinical hernia, re-operation due to re-ascending, abdominal UDT, and coincidence with other anomalies. Two surgical method were performed based upon the medical records: 1- orchidopexy with PPV high-ligation, and 2- orchidopexy with PPV san-ligation.

Results
A total of 2,659 medical records with 3,208 UDTs were reviewed. Of them, 2,210 (79.4%) patients had unilateral UDT. Of the total UDTs, 1,956 (61%) UDTs were located in the inguinal canal. The mean age of the patients was 21.3 ±2.7 months. Of the total UDTs, 2,187 (68.2%) and 1,021 (31.8%) were undergone orchidopexy with high-ligation and san-ligation PPV, respectively. The operative time significantly decreases in the san-ligation PPV group (11.2 minutes vs. 18.4 minutes; P =0.03). A total of 207 (6.45%) complications were occurred in the 187(7%) patients. The commonest complication was spermatic cord/testicular edema which was no significant difference in both surgical groups (P=0.769).

Conclusion
The modified orchidopexy with san-ligation of PPV does not significantly increase the risk of post-operative complications. However, this method significantly reduces the operative time.

Key Words: Children, Ligation, Orchidopexy, Processus vaginalis, Undescended testicles.

*Please cite this article as: Salimi A, Shahmoradi S, Rashidi Nia Sh, Eftekhari SS. Beneficial Impression of San-ligation over High-ligation during Orchidopexy; a Cross-Sectional of 2659 Patients. Int J Pediatr 2017; 5(6): 5145-52. DOI: **10.22038/ijp.2017.23372.1961**

Corresponding Author:

Seyed Shahin Eftekhari, MD, School of Medicine, Qom University of Medical Sciences, Qom, Iran. Adress: 32, Shahid Ahadi Alley, Andisheh St., Shahid Beheshti St., Tehran, Iran.

E.mail: sheftekhari14122000@gmail.com

Received date: Mar.14, 2017; Accepted date: Apr.22, 2017

1- INTRODUCTION

According to the litterateurs, one of the most common congenital male reproductive anomaly and endocrine abnormality in the male pediatrics population is undescended testis (UDT) (1, 2). Embryologically, UDT defined as a congenital misstep in gubernacular development or migration which subsequently prevented the normal descending of testicle into the normal scrotal position (2, 3). The incidence of UDT is estimated 2-5% in the normal male population, however the incidence of 30% is approximately reported in the premature boys (3, 4). Propitiously, the incidence of UDT has decreased to 0.8% up to the age of one year because of spontaneous descent of the testicle (3). However, the risk of some related diseases including infertility, torsion, testicular malignancies, trauma, inguinal hernia/hydrocele and also psychiatric disorders are higher in the boys who suffering UDT (1, 5, 6).

The most acceptable and successful therapeutic approach for improvement of UDT is inguinal orchiopexy (2, 3). The inguinal orchiopexy is the fourth common pediatrics surgery which was performed following appendectomy, circumcision, and inguinal hernia repair, respectively (7). In the inguinal orchiopexy, we have an adequate tension-free mobilization of the spermatic cord, the adhered fibers of spermatic cord can be better divided, a patent processus vaginalis (PPV) can be dissected easily, and also repositioning into the scrotum (3). Therefore, early orchiopexy can be performed for reducing the risk of the complications which may occurred due to UDT, however, it can be prevented destructive effect on spermatogenesis (2, 8).

The clinicians always looking for the foremost and at least safest therapeutic surgical techniques for the patients (9). Within the last decades, various modifications on the inguinal orchiopexy in order to reducing the complication and duration of the operation were represented by some authors (9, 10). They suggested that san-ligation of the PPV can reduces the complication due to operation time (9). In the present study, we aimed to review the more than six years` experience and compared the outcomes of two challenging surgical techniques of modified orchiopexy: san-ligation orchiopexy versus high-ligation orchiopexy.

2- MATERIALS AND METHODS

2.1. Study Design

The medical records of 2,659 boys with UDT who undergone orchiopexy between February 2010 and October 2016 in the referral department of pediatric surgery of Hazrat-e-Masumeh pediatrics hospital, Qom, Iran were reviewed. The inclusion criteria were consisting of the patients with UDT, the patients who aged between 6 months to 10 years, and the first time of orchiopexy. The exclusion criteria were including critical cases, presence of concomitant obvious clinical hernia, re-operation due to re-ascending, abdominal UDT, and coincidence with other anomalies.

2.2. Surgical Methods

According to the medical records, two surgical methods (high-ligation and san-ligation of the PPV) were considered by the discretion of the pediatric surgeon. Inguinal approach was performed in both techniques, traditionally. In high-ligation method, after transection and ligation of the gubernacular attachment, the testicle is repositioning in the scrotum and anchored sub-dartos pouch. However, in alternative challenging surgical method (san-ligation method), patent processus vaginalis is gently peeled off the spermatic cords up to the highest possible, and subsequently it would have transected at the level of internal ring without ligation (11). In the both methods, the wound is closed by

sutures. All surgeries were performed by the senior pediatrics surgeon (A.S).

2.3. Data Collection

Pre-specified data-collecting forms were completed by the medical staff to collecting the data including age of initial repair, side of UDT, type of surgical approach, time of operation (recorded from the beginning of the skin incision to the end of its closure), intra- and post-operative complications consist of post-operative hydrocele, hernia, testicular atrophy, testicular re-ascent, minor hematoma, infections, and spermatic cord/testicular edema.

2.4. Ethical consideration

The study research proposal was approved by research council of Qom University of Medical Sciences. This University's Ethics Committee also supervised and corroborated the study in terms of ethical considerations, and since both compared techniques previously described in detail, so there is no ethical obstacle for conducting this study (10-12). To comply with the principle of anonymity, the samples' identities were kept confidential.

2.5. Statistical Analysis

A sample size of 1,108 subjects was calculated for type one error of 0.05, and power of 0.8. The statistical software of SPSS version 24.0 for windows (SPSS Inc., Chicago, IL) was used for data analysis. Results were presented as mean ± standard deviation (SD) and were summarized using absolute frequencies and percentages for categorical variables.

Categorical variables were compared using Chi-square test or Fisher's exact test. For the normally distributed data, Student t-test and for the non-normally distributed data, Mann–Whitney Rank Sum test were used. P-value of 0.05 or less were considered to be statistically significant.

3- RESULTS

The medical records of 3,019 patients were reviewed. Of them, 360 medical records which met the exclusion criteria were excluded from the study. However, a total of 2,659 medical records were analyzed. Of them, 2,110 (79.4%) patients had unilateral UDTs and remaining 549 (20.6%) of patients were suffered bilateral UDTs. Of the total of unilateral UDT, 1,017 (48.2%) and 1,093 (51.8%) had left-sided and right-sided UDTs, respectively. According to the medical records, the initial position of the undescended testicles was analyzed. Of the total 3,208 UDTs, 1,956 (61%), 956 (29.8%), and 296 (9.2%) of the undescended testicles were located at inguinal canal, external ring, and internal ring, respectively (**Table.1**).

The mean age of the patients was calculated 21.3±2.7 months with the range of 6 months to 9.6 years. Of the total patients, 1,279 (48.1%) were categorized under one-year-old and also 1,927 (72.5%) patients were categorized under two-year-old (**Figure.1**). According to the medical records, 2,187 (68.2%) cases of UDT were undergone orchidopexy with high-ligation of PPV and remaining 1,021 (31.8%) of the UDT cases were undergone orchidopexy with san-ligation of PPV.

In the present study the mean operation time which was recorded from the beginning of the skin incision to the end of its closure were 11.2±2.1 and 18.4±3.7 minutes in the group with PPV san-ligation and PPV high-ligation groups, respectively (P=0.03). Based upon the data extracted from the medical records, the mean follow-up time was calculated 10.2±2.1 months with the range of 6-15 months, and 81.9% attendance. During the follow-up time, 207 (6.45%) complications were occurred in 187 (7%) patients (**Table.2**). Of the patients with complications, 103 (55.1%) patients were undergone orchidopexy with PPV high-ligation and remaining 84 (44.9%) patients were

undergone orchidopexy with PPV san-ligation (P =0.657). The spermatic cord and testicular edema were the most common complication which occurred in 123 (3.8%) cases (64 cases with PPV high-ligation vs. 59 cases with PPV san-ligation; P =0.769). Seventy-six (2.4%) cases of skin and subcutaneous complications including mild hematoma and infection were occurred in 56 patients (39 cases with PPV high-ligation vs. 37 patients with PPV san-ligation; P=0.697). A post-operative hydrocele was occurred in five (0.2%) cases (3 vs. 2 in the PPV high-ligation vs. san-ligation, respectively; P =0.732). During the follow-up-time 3 (0.09%) cases of testicular re-ascent were occurred in the PPV high-ligation group (P=0.09). During our reviews, there was no case of post-operative inguinal hernia reported (**Figure.2**).

Table-1: General characteristic of the patients with high-ligation and san-ligation orchidopexy

Variables	Total (%)	Orchidopexy with PPV high-ligation (%)	Orchidopexy with PPV san-ligation (%)
Patients	2659	1786 (67.2)	873 (32.8)
Mean age ±SD	21.3±2.7	20.9±3.8	22.1±0.5
Unilateral	2110 (79.4)	1471 (82.4)	639 (73.2)
Left-sided UDT	1017 (48.2)	740 (41.4)	227(31.7)
Right-sided UDT	1093 (51.8)	731 (41)	362 (43.6)
Bilateral UDT	549 (20.6)	315 (17.6)	234 (26.8)
UDTs	3208	2187 (68.2)	1021 (31.8)
UDT at internal ring	296 (9.2)	145 (6.6)	151 (14.8)
UDT at external ring	956 (29.8)	604 (27.6)	352 (31.5)
UDT at inguinal canal	1956 (61)	1438 (65.8)	518 (50.7)
PPV: Patent Processus Vaginalis; SD: Standard Deviation; UDT: Undescended Testis.			

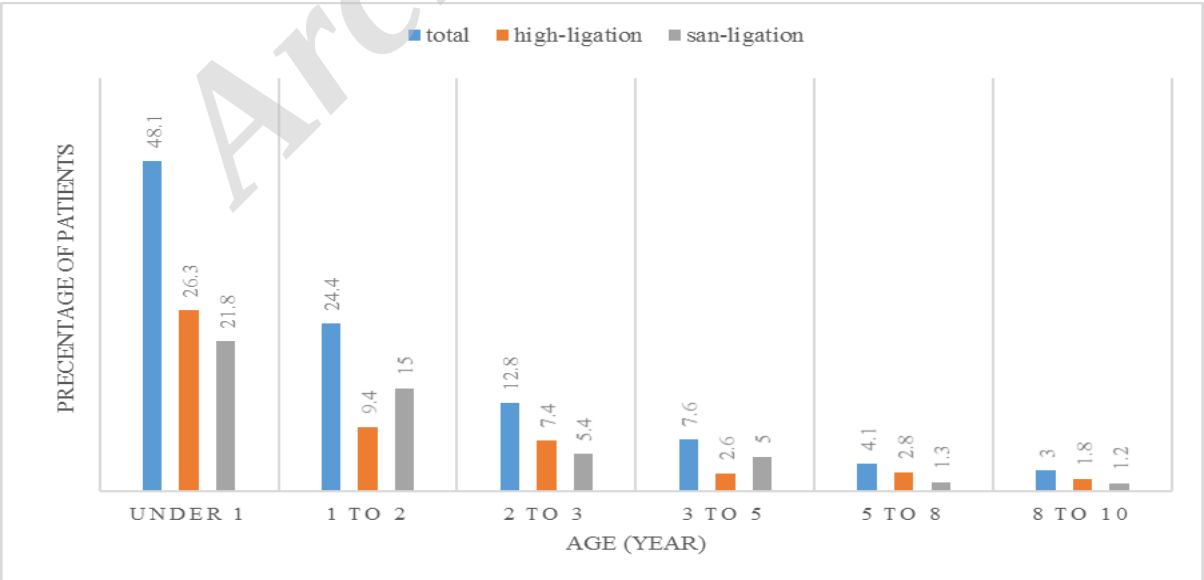

Fig.1: The Comparison of the high-ligation and san-ligation patent processus vaginalis by the age categorization.

Table-2: The comparison of operative time and post-operative complication in both groups

Variables	Orchidopexy with PPV high-ligation (n=1786)	Orchidopexy with PPV san-ligation (n=873)	Total (n=2659)	P-value*
Operative time (mean ± SD)	18.4±3.7	11.2±2.1	16.03±3.2	0.003
Complications	109(6.1%)	98 (11.2%)	207 (7.8%)	0.657
Hydrocele	3 (0.2%)	2 (0.2%)	5 (0.2%)	0.732
Hernia	0	0	0	-
Atrophy	0	0	0	-
Re-ascent	3 (0.2%)	0	3(0.1%)	0.09
Skin complication	39 (2.2%)	37 (4.2%)	76 (2.9%)	0.697
Minor hematoma	30 (1.7%)	33 (3.8)	63 (2.4%)	0.987
Infection	9 (0.5%)	4 (0.4%)	13 (0.5%)	0.738
Edema (spermatic cord and testis)	64 (3.7%)	59(6.8)	123 (4.6%)	0.769

PPV: Patent Processus Vaginalis; * P-value of 0.05 or less were considered to be statistically significant; SD: Standard Deviation.

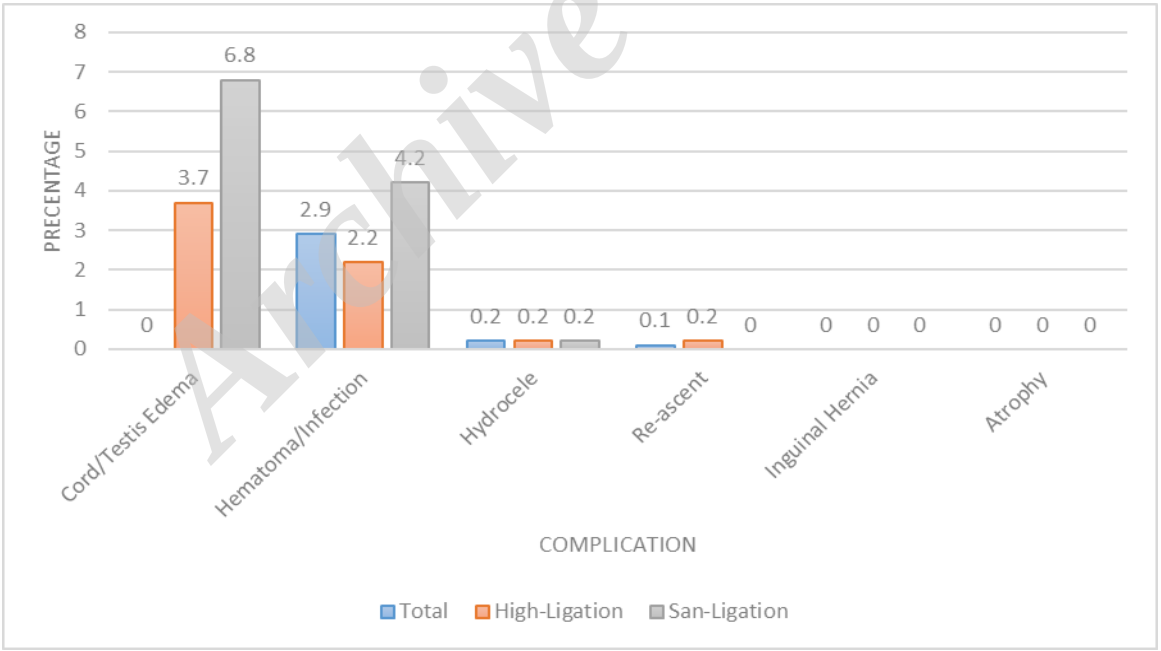

Fig.2: The comparison of the high-ligation and san-ligation patent processus vaginalis by the complications.

4- DISCUSSION

The present study is the first study which reviewing and comparing the short- and long-term complication of high-ligation and san-ligation orchidopexy in our urban (Qom- Iran). First description of the basic principles of the orchidopexy was disgusted by Bevan in 1988 (12). These principles were including adequate mobilization of the testis and vessels, ligation of the hernia sac, and also appropriate fixation of the testis in the scrotum (12). As some believed that the occurrence of UDTs were associated with the patent processus vaginalis in the hernia sac, therefore, they recommended to high-ligation of the PPV (13).

In the past decades, the new modifications of the orchidopexy base on the PPV ligation were reported (11). Some investigators believed that metamorphosis of the mesodermal cells leads to re-peritonealization, they explained that the PPV ligation is not necessary (12). They proposed that there was no anymore advantages in the PPV high-ligation group rather than san-ligation group. As reported in the previous studies, the post-operative inguinal hernia as a complication of the laparoscopic orchidopexy and herniotomy with PPV san-ligation was not occurred (12-18). Some authors reported that testicular atrophy can be occurred due to PPV high-ligation (11).

As we represented, in our more than 6 years` experiences, there was no case of testicular atrophy and post-operative inguinal hernia occurred during our follow-up- time with the mean of 10.2 months (Figure.2). In our experience, only five cases of post-operative hydrocele were occurred which was not significantly differences in both surgical group. In one study which comparing the post-operative complications of herniotomy with san-ligation and high-ligation of the hernia sac, authors represented that the most common complications due to these surgical methods were spermatic cord/testicular edema and skin/subcutaneous complications (9). However, in their study, there was no significant difference in the complications rate between both surgical groups (9). In the present study, as reported above, the most common complications which occurred due to the operation methods were spermatic cord/testicular edema and skin/subcutaneous complication, respectively (Table.2, Figure.2.).

However, in our study there was no significant differences in the occurrence rate of these complication between both surgical groups. Another opinion which was explained by some authors, is that the orchidopexy with san-ligation not only reduces the minor complications due to operation, but also reduces the risk of anesthetic and post-anesthetic complications because of significantly decreases in operation time (10, 12).

Various operation times were reported by many investigators. In one study the mean operative time was reported 40 minutes, however, in another study the mean operative time was reported 16.45 minutes (12-40 minutes) and 30 minutes (20- 60 minutes) for the unilateral and bilateral UDT, respectively (11, 12). As obvious in our results, the mean operative time was significantly reduced (about 7 minutes lower) in the PPV san-ligation orchidopexy (11.2 vs. 18.4; P =0.03).

As we previously reported, inguinal hernia repair or hydroceletomy without high-ligation of the hernia sac and also PPV may reduce the risk of re-ascent (18), however, in the present study there was no testicular re-ascent was occurred in the PPV san-ligation group. Based upon the present study, authors believed that PPV san-ligation orchidopexy not only does not increases the short-and long-term complication, but also reduces the risk of the anesthetic and post-anesthetic complication because of the reduction in

the operative time. As some authors believed, attempting to isolation and ligation of the PPV is frequently lead to tearing the hernia sac in the patients with the thin hernia sac wall, therefore, this intraoperative complication lead to increases the operative time for re-exploration and repair (16,17,19).

However, based upon our more than 6 years` experiences, only incomplete transection of the PPV may be suffice. The strength of our study is to compare two different approaches for orchidopexy which is certainly challenging in the practice. However, common to all retrospective studies, our study is restricted due to potential recording biases. Therefore, conducting further prospective investigations as clinical trials with sufficient sample size is highly recommended

5- CONCLUSION

In the present study we concluded that orchidopexy with san-ligation PPV does not significantly difference in the short- and long-term complications rate. However, this challenging modification of the orchidopexy can reduces the operative time and subsequently lead to reducing the anesthetic and post-anesthetic complications.

6- CONFLICT OF INTEREST

The authors have no financial disclosures or conflicts of interest.

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