Journal of Pediatric Urology (2015) 11, 275.e1–275.e4

Non-absorbable sutures are associated with lower recurrence rates in laparoscopic percutaneous inguinal hernia ligation

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Keywords
Laparoscopy; Hernia; Inguinal; Hydrocele

Received 18 December 2014
Accepted 18 April 2015
Available online 14 June 2015

Summary

Introduction
Laparoscopic hernia repair with percutaneous ligation of the patent processes vaginalis is a minimally invasive alternative to open inguinal herniorrhaphy in children. With the camera port concealed at the umbilicus, this technique offers an excellent cosmetic result. It is also faster than the traditional laparoscopic repair with no differences in complication rates or hospital stay. The goal of this study was to describe a series of consecutive patients, emphasizing the impact of suture materials (absorbable vs. non-absorbable) on hernia recurrences.

Methods
A retrospective review was performed of consecutive transperitoneal laparoscopic subcutaneous ligations of a symptomatic hernia and/or communicating hydrocele by 4 surgeons. Patients $\geq$ Tanner 2 or with prior hernia repair were excluded. The success of the procedure and number of sutures used was compared between cases performed with absorbable vs. non-absorbable suture. Risk factors for surgical failure (age, weight, number of sutures used, suture type) were assessed with logistic regression.

Results
94 patients underwent laparoscopic percutaneous hernia ligation at a mean age of 4.9 years. Outcomes in 85 (90%) patients with 97 hernia repairs at a mean of 8 months after surgery revealed 26% polyglactin vs 4% polyester recurrences ($p = 0.004$) which occurred at mean of 3.6 months after surgery, Table 1. Repairs performed with non-absorbable suture required only 1 suture more often than those performed with absorbable suture (76% vs 60%, $p = 0.163$). Logistic regression revealed suture type was an independent predictor for failure ($p = 0.017$). Weight ($p = 0.249$), age ($p = 0.055$), and number of sutures ($p = 0.469$) were not significantly associated with recurrent hernia.

Discussion
Our review of consecutive hernia repairs using the single port percutaneous ligation revealed a significantly higher recurrent hernia rate with absorbable (26%) versus non-absorbable (4%) suture. This finding remained significant in a logistic regression model irregardless of number of sutures placed, age, and weight. Though the authors acknowledge the drawback of the potential for learning curve to confound our data, we still feel these findings are clinically important as this analysis of outcomes has changed our surgical practice as now all providers involved perform this procedure with exclusively non-absorbable suture. We thus suggest that surgeons who perform this technique, especially those newly adopting it, use non-absorbable suture for optimal patient outcomes.

Conclusions
Recurrent hernia after laparoscopic percutaneous hernia ligation was significantly lower in repairs performed with non-absorbable suture. Based on this data, we recommend the use of non-absorbable suture during laparoscopic ligation of inguinal hernias in children.

http://dx.doi.org/10.1016/j.jpurol.2015.04.029

Introduction

In the pediatric population, laparoscopic inguinal hernia repair is a minimally invasive alternative to open inguinal herniorrhaphy. Previously published meta-analyses have reported similar outcomes with a laparoscopic approach to that with a standard open repair, with $\leq$4% having recurrent hernias [1]. Although a laparoscopic approach has been associated with a longer operative time when compared to an open repair, the advantages of an endoscopic technique include the ability to easily evaluate the contralateral internal ring and a reduced risk of metachronous hernia [1].

In addition to laparoscopic hernia repair, with division or ligation of the sac using three laparoscopic instruments, a minimally invasive hernia repair can also be accomplished with percutaneous suture ligation without additional laparoscopic ports, other than a 3 mm or 5 mm camera, via the subcutaneous endoscopically assisted ligation (SEAL) technique [2]. This approach involves high ligation of the patent processus at the internal ring without a groin incision or dissection of the vas and spermatic vessels [2]. With the camera port concealed at the umbilicus, this technique offers an excellent cosmetic result with virtually invisible incisions.

Initial reports indicate low rates of recurrent hernia (0.5–4%) after SEAL hernia ligation [3–5]. As with the three-port laparoscopic technique, percutaneous ligation has also been shown to reduce the risk of metachronous hernia when compared with open repair [6]. Besides the cosmetic advantage, percutaneous ligation is also faster than the traditional laparoscopic repair and there are no differences in complication rates or hospital stay [7]. Previous reports have also indicated that the risk factors for recurrent hernia after this technique include: single purse-string ligation versus double ligation, and hernia ring defects $>$2.5 cm [5,7]. The type of suture (absorbable vs non-absorbable) was not associated with recurrences [3].

At the time of initial adoption of this SEAL technique by the present institution, a majority of cases were performed with absorbable sutures (2-0 polyglactin). However, after reviewing the initial outcomes and noting what seemed to be a larger than expected number of recurrent hernias, practice patterns were changed, and by the end of the study period all of the involved providers were using non-absorbable sutures (2-0 polyester). It was, thus, hypothesized that absorbable sutures may be associated with an increased rate of recurrent hernias. The goal of this study was to describe the results of laparoscopic percutaneous hernia ligation in consecutive pediatric patients, emphasizing the impact of suture materials (absorbable vs non-absorbable) on rates of recurrent hernias.

Materials and methods

Study design and population

After IRB approval, a retrospective review was performed of a prospectively collected database, which included all prepubertal patients who underwent transperitoneal laparoscopic subcutaneous ligation of a symptomatic hernia and/or communicating hydrocele at a single institution from 9/1/2011 to 5/1/2013 by four surgeons. Patients were excluded if they had previously undergone open or laparoscopic hernia repair or other inguinal surgery, or who were Tanner stage 2 or higher. The data reviewed included: age at surgery, patient weight, type and number of sutures used, surgical outcome, and complications. Success of the procedure was defined as clinical resolution of hernia, as documented by the surgeon at a post-operative evaluation.

Data analysis

The overall surgical success rates and complications were reviewed. In addition, as it was hypothesized that absorbable sutures may have been associated with an increased rate of recurrent hernias, the success of the procedure and number of sutures used were compared with Fisher's exact test between cases performed with absorbable or non-absorbable sutures. Continuous variables were compared with unpaired *t*-tests. As the secondary objective was to assess for potential risk factors for failure of hernia repair, the specific risk factors for surgical failure (patient age, patient weight, number of sutures used, and suture type) were also assessed with logistic regression performed with STATA® 11 (StataCorp LP, 4905 Lakeway Drive, College Station, Texas 77845-4512, USA). An alpha of $<$0.05 was considered statistically significant. As this was a retrospective study, no power analysis was performed.

Laparoscopic hernia repair technique

The laparoscopic percutaneous hernia ligation was performed with the same technique by all surgeons and was similar to the SEAL technique previously described [3]. After administration of general anesthesia the patient was placed in a supine position. A 3-mm or 5-mm incision was made at the umbilicus, and a 3-mm or 5-mm port was placed for a zero degree laparoscopic camera. Both sides of the internal ring were visualized and both sides of the scrotum were examined to ensure that the contralateral side did not insufflate. On the side of the hernia, a 2-mm stab incision was made on the lateral border of the internal ring and subcutaneous tissues were spread with a fine hemostat. A 2-0 polyglactin or polyester suture on a CT-1 needle was preperitoneally passed around the internal ring under direct vision, passing on top of the spermatic vessels and the vas. Ninety five percent of the needle was brought out through the skin medial to the internal ring. The back of the needle was then passed under the skin and out of the initial stab incision. The suture was tied and intra-operative success was declared if there was visual occlusion of the hernia, plus lack of insufflation of the ipsilateral scrotum (which signified no further communication with the peritoneal cavity). If the hernia still appeared to be open or there was continued scrotal insufflation, another suture was placed with the technique described above. Patients were awoken from anesthesia and discharged home after adequate recovery in the post-anesthesia care unit. Patients were seen in the office for a post-operative visit and physical exam approximately 6 weeks and then 6 months after the original procedure.