

LAPAROSCOPIC EXPLORATION FOR INFANTILE HYPERTROPHIC PYLORIC STENOSIS: AN EXPERIENCE AT TERTIARY CARE HOSPITAL

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ABSTRACT

Objectives: This study aims to share our experience of laparoscopic exploration for infantile hypertrophic pyloric stenosis.

Material and methods: This retrospective study was conducted in the Department of Pediatric Surgery, Khyber Teaching Hospital, Peshawar from June 2017 to July 2020. This study includes all patients whose diagnosis of infantile hypertrophic pyloric stenosis (IHPS) was confirmed through ultrasound parameters and laparoscopic pyloromyotomy was performed. Data was retrieved from the laparoscopic surgery record. Retrieved data was tabulated and fed in SPSS 25 for analysis.

Results: This study included 42 patients with a mean age of 50.28 ± 18.5 days and a mean weight of 3.35 ± 0.76 kg. Male patients were 57 % while females were 43 %. The mean time to resuscitate the patient pre-operatively was 34.6 ± 15.4 hours while the mean postoperative hospital stay was 45 ± 12.47 hours. The mean operative time was 31.6 ± 10.4 min. Operative time decreased with time depicting improvement in our learning curve ($p=0.004$). The method of working instrument placement had no impact on operative time ($p=0.337$). Meantime to full oral feed was 9.7 ± 5.1 hours. We did not encounter mucosal perforation or incomplete myotomy. No surgery was converted to open.

Conclusion: Laparoscopic pyloromyotomy is a safe and effective method of treatment for infantile hypertrophic pyloric stenosis.

Keywords: laparoscopic pyloromyotomy, pyloric stenosis, IHPS

This article may be cited as: Imran M, Ali S, Rahman FU, Saeed K, Ghayur MS. Laparoscopic Exploration For Infantile Hypertrophic Pyloric Stenosis: An Experience At Tertiary Care Hospital. J Med Sci 2024 january;32(1):18-21

INTRODUCTION

Infantile hypertrophic pyloric stenosis (IHPS) is one of the common surgical conditions in neonates and infants. The initial presentation is with non-bilious vomiting usually starting at the age of two weeks, leading to metabolic derangement of hypokalemia, hypochloremia, and metabolic alkalosis.¹ Ultrasonography parameters are used as the method of choice to confirm the diagnosis. A pyloric canal length of greater than 16mm and pyloric muscle thickness of greater than 4mm is considered diagnostic².

Pyloromyotomy is the treatment of choice after ini-

tial resuscitation. Ramstedt introduced the standard procedure of pyloromyotomy, in which the pylorus seromuscular layer is split longitudinally to expose the mucosa. Open pyloromyotomy was practiced widely around the globe with excellent results. Currently, minimally invasive surgery is on the rise and reported with many advantages over conventional open procedures. Likewise, laparoscopic pyloromyotomy (LPM) was practiced by different centers in the world, with published results comparable with open techniques.³ No clear benefit of LPM has been reported in the literature, although it has been labeled as a safe procedure in experienced hands.⁴ A laparoscopic-assisted pyloromyotomy is also a modification published with excellent results and as the transition of open to the laparoscopic technique.⁵ As with other procedures, LPM has a learning curve and the complication rate decreases with experience as reported.

LPM is gaining popularity and has been adopted by many pediatric surgeons throughout the world. The purpose of this study is to further clarify the issue of the procedure of choice of IHPS by sharing our early experience of laparoscopic pyloromyotomy.

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Date received: 29/12/2022

Date revised: 24/12/2023

Date accepted: 09/01/2024

MATERIAL AND METHODS

This retrospective observational study was conducted in the pediatric surgery unit of Khyber Teaching Hospital from June 2017 to July 2020. This study includes a total of 42 patients who were admitted to the unit for management of IHPS. IHPS diagnosis was confirmed using ultrasound parameters of a pyloric canal length of greater than 16mm and pyloric thickness of 4mm. Patients diagnosed with IHPS and operated by laparoscopic technique were included in the study.

Data was collected from the laparoscopic record after permission for the study was granted by the Institutional Research and Ethical Board (IREB) of Khyber Medical College. Collected data included age, gender, weight, preoperative resuscitation time, operative time, time to full oral feed, postoperative hospital stays, and complications of the procedure. The collected data was revised, tabulated, coded, and fed in PC using the statistical analysis program SPSS-25. Data was presented and statistical analysis was carried out according to the type of data. Mean and standard deviation were calculated for numerical data like age, weight, gender, operative time, hospital stay, pre-operative resuscitation time, and time to full oral feed. While frequency and percentages were calculated for categorical data like operative time distribution, and method of working instrument placement. The Chi-square test was used for categorical data.

RESULTS

During the study period of 3 years, a total of 42 patients underwent laparoscopic exploration for infantile hypertrophic pyloric stenosis. The mean age of the patients was 50.28 ± 18.5 days (minimum 25 days and maximum

120 days). Further distribution showed, patients, having an age less than 4 weeks were 14.3%, 4 to 8 weeks were 64.3%, and above 8 weeks 21.4%. The weight of the patients was 3.35 ± 0.76 kg. Further distribution showed that patients having weight less than 3 kg were 21.4%, 3 to 5 kg were 69%, and above 5 kg were 9.5%.

The mean pre-operative resuscitation time was 34.6 ± 15.4 hours while the mean post-operative hospital stay was 45 ± 12.47 hours. Time to full oral feed was calculated with a mean of 19.7 ± 5.1 hours. Time to full oral feed was further cross-tabulated with the learning curve and decreased time in patients operated on in the second half.

A stab incision was given in 33.3% of patients as a method of working instrument placement while formal ports were inserted in 66.7% of patients.

The mean operative time was 31.6 ± 10.4 min (minimum of 15 min and maximum of 60 min). Further distribution was done, with patients having operative time less than 25 min were 23.8 %, operative time of 25 to 40 min were 57.1%, and operative time greater than 40 min were 19%. Operative time was cross-tabulated with the learning curve and method of working instrument placement (stab incision/port placement). A decline in Operative time was observed with increasing cases depicting improvement in the learning curve ($p=0.04$) while the method of working port placement had no impact on operative time ($p=0.337$) (Tables 1 and 2)

Complications of laparoscopic pyloromyotomy were analyzed. Conversion to open surgery was zero percent. Mucosal perforation and incomplete myotomy rate were also recorded as 0%.

DISCUSSION

Table 1: Cross-tabulation of operative time with the learning curve

		Learning curve		Total	P Value
		Initial half	Second half		
Operative time	Less than 25 min	1	9	10	0.004
	25 to 40 min	13	11	24	
	> 40 min	7	1	8	
Total		21	21	42	

Table 2: Cross-tabulation of operative time with the method of working instrument placement

		Mechanism of working instrument placement		Total	P Value
		Ports placement	Stab incision		
Operative time	Less than 25 min	6	4	10	0.377
	25 to 40 min	15	9	24	
	> 40 min	7	1	8	
Total		28	14	42	

Pyloromyotomy was introduced as a treatment of choice for IHPS by Conrad Ramstedt. Since then, through a period of transformation, this procedure became the standard in treating IHPS.⁶ Pyloromyotomy was initially performed through the upper midline incision and then later on modified to the right upper transverse incision.⁷ Currently, some centers use semicircular supraumbilical incisions to perform pyloromyotomy. More recently double-Y pyloromyotomy has been introduced.⁸ Laparoscopy has been extended to various pediatric procedures. In 1991 1st laparoscopic pyloromyotomy was introduced by Alian. Since then, this procedure has gained popularity amongst pediatric surgeons worldwide and is reported as an effective technique in expert hands.⁹

IHPS is an acquired condition and still, Children are usually diagnosed and present late for treatment having a deranged metabolic profile of hyperkalemic metabolic alkalosis. Such a deranged metabolic profile needs resuscitation pre-operatively for improved outcomes.¹⁰ Age of presentation varies among reports and gestational age also affects presentation age.¹¹ The age of presentation was 50.28 days in the current study. Late diagnosis and referral were the main reasons for such a late presentation. Pre-operative resuscitation was required for all patients with a mean time of 34.6 hours.

Operative time has been an important variable to support the technique of pyloromyotomy. The literature review showed that the mean operative time for LPM ranges from 20 min to 60 min.^{12,13} Initial in the learning curve of LPM, the operative time has been reported as high.¹⁴ Cambel et al report a slightly higher operative time for LPM as compared to open.¹⁵ The operational definition of operative time has been lacking in most of the reports on pyloromyotomy. We calculated the operative time from 1st incision to the last stitch. Operative time in the current study is 31.6±0.4 min. Operative time was high initially in the learning curve and then decreased significantly in cases operated in the second half of the series (p=0.04). the same result regarding the learning curve has been published by Oomen et al.¹⁶

Postoperative hospital stays have been reported in different studies in the range of 48 to 72 hours.⁸ Postoperative hospital stay is mostly related to full oral feed in LPM. Postoperative emesis prolongs hospital stay. In the current study mean postoperative hospital stay is 45±12.47 and the learning curve has an impact on it, as this time decreases with improvement in the learning curve. Less operative time, excellent recovery, and aggressive feeding postoperatively have it role in decreasing stay after surgery.¹²

Stab incision as a method for instrument placement has been used in certain pediatric surgery procedures to minimize cost and improve cosmesis. Working instruments that are not repeatedly exteriorized were mainly

used through stab incisions.¹⁷ We used Stab incision for access of two working instruments in 14 cases and proper ports were inserted in the rest of the cases. Analysis clarified that the mechanism of access of the working instruments has no effect on operative time in the current study.

Conversion of LPM to open is one of the complications reported in the literature. One meta-analysis reports a conversion rate of 3 to 5 %. Technical issues and the low experience of the surgeon were the reasons for this conversion.^{18,19} In the current series, none of the procedures was converted to open. The experience of the surgeon is the main factor²⁰. We haven't experienced such complications in our study.

CONCLUSION

Laparoscopic pyloromyotomy is a safe and effective procedure for infantile hypertrophic pyloric stenosis. There is a learning curve for laparoscopic pyloromyotomy. Operative time significantly decreases with the experience of the surgeon in LPM. A randomized controlled trial is required to evaluate the comparative benefits of LPM and conventional open surgery.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Imran M	✓	✗	✓	✗	✓	✗
Ali S	✓	✓	✗	✓	✓	✗
Rahman FU	✓	✗	✗	✓	✗	✗
Saeed K	✗	✗	✓	✓	✗	✓
Ghyur MS	✗	✗	✓	✓	✗	✓

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Khyber Medical College Vide No. 839/ADR/KMC. Dated: 23 04 2020



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