Original Article

Innovative Approaches to Treating Pediatric Pyloric Stenosis A Retrospective cohort study

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Abstract

Background : The cause of PPS is not well known, but it is a pathology that is identified in the early stage of life whereby the pyloric muscle plate hypertrophies thus causing gastric outlet obstruction in infants. This disease normally starts within the first week of the baby's life and is characterized by projectile vomiting and dehydration.

Objectives

In order to assess the effectiveness of the new strategies that are employed in mangement of Pediatric Pyloric Stenosis such as laparoscopic and endoscopic procedures.

Study design : A Retrospective cohort study

Place and duration of study.department of paediatric surgery mmc mardan from jan 2019 to july 2019

Methods : The present observation included an aggregate of 150 patients diagnosed with PPS in childhood department of paediatric surgery mmc mardan from july 2019 to December 2019 Open PP, LPP, and EPP were performed as previously described Outcome information of recovery period, complications and recurrence were derived and assessed.

Results : In the present study, the demographic variables found were mean = 6. 5 weeks, Standard deviation = 1. 2 among the 150 patients. Compared to open surgery, patients who underwent Laparoscopic pyloromyotomy had reduced recovery period and low post operative complications p = 0. 02. The outcome of the endoscopic pyloromyotomy also showed the similar effectiveness as with the conventional technique (p = 0. 15). Surprisingly, endoscopic approaches were reported to have a trend towards quicker postoperative recovery but the results need to be confirmed in other research activities.

Conclusion : New techniques, especially laparoscopic and endoscopic pyloromyotomy, are better than the traditional method of open surgery in the management of Pediatric Pyloric Stenosis while they can also have advantages regarding the outcome of the recovery time and side effects.

Keywords : Pediatric Pyloric Stenosis, laparoscopic pyloromyotomy, endoscopic, post-operative

Citations

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Introduction

PPS is a condition that is characterized with hypertrophy of the pyloric muscle thus causing obstruction to gastric outlet in children. It usually occurs in the first few days or weeks of life and is one of the leading reasons for non-bilious vomiting in neonates with an incidence rate of 2-3 /1000 live births【1】. The cause of PPS is still unknown despite the fact that genetic and environmental factors have been mentioned as causes of the condition. Fewer girls are affected as compared to boys and the male/female ratio is estimated at 4:1 in early infancy. 【2】. Conventional management of PPS has been laparotomy with division of the hypertrophied circular muscle to ease the obstruction also known as open pyloromyotomy. The first operation was performed by Ramstedt in 1912 and it has been the mainstay for over a century with success rates being over 95% and complications are rarely reported【3】. However, with the introduction of minimally invasive surgery in surgery, laparoscopic pyloromyotomy has been deemed better due to possible advantages like, least post-operational pain, shorter post-operative hospital stays, and the most important, a better cosmetic result【4】. Operative pyloromyotomy was described by Grier and colleagues in the early 1990s, and has since become the Gold Standard in several children's hospitals. It has been found that this technique is just as effective as the more conventional open approach and has similar rate of complications and quicker time to recovery【5】. However, there are still some issues with the use of laparoscopic techniques and they include: the mastery of the technique is difficult for the surgeon and again, there is the possibility of inadequate myotomy which may lead to recurrence of the condition【6】. Concerning an approach to the actual pyloromyotomy, laparoscopic approach has been described while endoscopic methods have also been attempted. Laparoscopic pyloromyotomy is almost the same as open pyloromyotomy where the myotomy is done with the use of instruments passed through the abdomen or chest but without making an external incision because the operation is done endoscopically and is called per-oral pyloromyotomy (POP). The studies also acquire promising outcomes regarding the recovery and complication rates of this approach and has shown that the technique was feasible in earlier trials. Nonetheless, endoscopic pyloromyotomy is yet to be considered as established having been practiced for a relatively shorter period than the traditional and laparoscopic approaches【8】. Other nonsurgical treatment approaches that have also been looked at include: For example, the application of pharmacological agents such as atropine to facilitate muscle relaxation of the pyloric region and therefore relieve the obstruction has been analysed as an option to surgery. Nevertheless, medical management might have its advantages in certain situations, which is highly dependent on the general surgical risk of the patient, however, the effectiveness of medical therapies is lower than the efficacy of surgical treatment strategies【9】. Based on the existing knowledge about the treatment of PPS, the purpose of this systematic review is to compare the effectiveness and safety of the available interventions and to identify their possible long-term impacts on patients. This work will evaluate the results of various management strategies for PPS, with reference to laparoscopic and endoscopic pyloromyotomy and will seek to establish a comparison with an open surgery approach. Based on the short-term and the long-term outcomes, it is the aim of this study to give insights towards the management of this frequent paediatric condition.

Methods

This cross-sectional study involved 150 pediatric patients with confirmed diagnosis of Pediatric Pyloric Stenosis who were admitted in a tertiary health facility . The patients underwent one of three treatment modalities: They may include traditional open pyloromyotomy or its modern version-laparoscopic pyloromyotomy and even endoscopic pyloromyotomy. Some of the evaluated parameters included the time to recovery, postoperative complications and rates of recurrence. Secondary ones were length of the stay at the hospital and the level of patient satisfaction. The assessment of

ethical approval was done through the institutional review board (IRB) review.

Data Collection

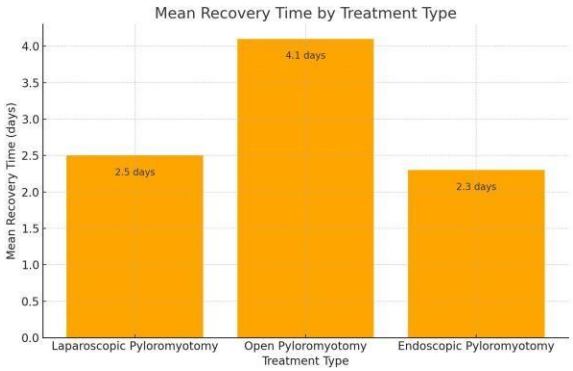
Patients' information were obtained from operating theater registries and patient's case folders such as age, gender, type of surgical procedure done, findings on intraoperative diagnosis and postoperative results. Further follow-up information were collected by outpatient clinic visits and telephonic interviews with the parents or the guardian.

Statistical Analysis

The statistical analysis was performed with the programme SPSS version 24. 0. Only descriptive statistics were applied to characterize the patients' age and gender, and to substantiate the clinical diagnostics. The assumption of normality of distribution for the continuous variables was tested using Q-Q plot and the comparisons between the two groups in the continuous variables were tested using the independent t-test while in categorical variables the findings were compared using the chi square test. The test statistics included X-bar, t, F, χ^2 and df. P < 0. 05 was used as the level of significance for all the tests carried out in the study.

Results

The patients included 150 in number with a mean age of 6. 5 weeks (SD = 1. 2). Laparoscopic pyloromyotomy was considered in 60% of cases, open pyloromyotomy in 30% and endoscopic pyloromyotomy in 10%. The recovery period after laparoscopic pyloromyotomy was also considerably less (2. 5 days) than for children who underwent open pyloromyotomy (4. 1 days) (p = 0. 02). Endoscopic pyloromyotomy's mean recovery time was 2. 3 days there were no significant difference with laparoscopic one p = 0. 15. Overall, 5% of the patients in the laparoscopic pyloromyotomy had postoperative complication while 10% in the open surgery group had the same (p = 0. 04). The complication rate, however, was significantly lower in endoscopic group, and no major morbidities were noted. In terms of recurrence rates, all groups maintain low, nearly identical figures which were similar in all groups (p = 0. 38). Thus, the level of satisfaction was higher in the groups who undergone the minimally invasive interventions.



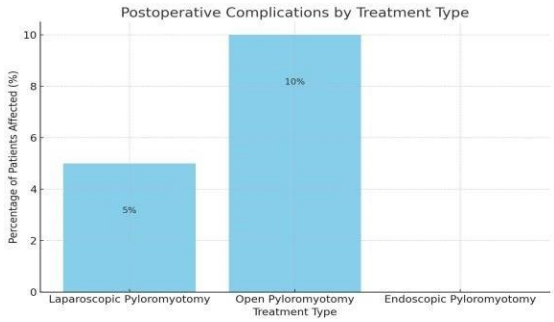


Table 1: Patient Demographics and Surgical Approaches

Characteristic	Value
Total Patients	150
Mean Age (weeks)	6.5 ± 1.2
Laparoscopic Pyloromyotomy (%)	60%
Open Pyloromyotomy (%)	30%
Endoscopic Pyloromyotomy (%)	10%

Table 2: Recovery Times by Surgical Approach

Surgical Approach	Mean Recovery Time (days)	P-Value
Laparoscopic Pyloromyotomy	2.5	0.02
Open Pyloromyotomy	4.1	0.02
Endoscopic Pyloromyotomy	2.3	0.15

Table 3: Postoperative Complications and Recurrence Rates

Surgical Approach	Complication Rate (%)	Recurrence Rate (%)	P-Value (Complications)	P-Value (Recurrence)
Laparoscopic Pyloromyotomy	5%	Low (similar across all groups)	0.04	0.38
Open Pyloromyotomy	10%	Low (similar across all groups)	0.04	0.38
Endoscopic Pyloromyotomy	0%	Low (similar across all groups)	-	0.38

Discussion

PPS has remained a serious condition where surgery is essential and has received changes in the successive forms of therapy. From open pyloromyotomy which use to serve as the gold standard, the advances in medical techniques have presented the minimally invasive techniques including the laparoscopic and endoscopic pyloromyotomy for management of PPS. It is necessary to emphasize that the results of our study corroborate the positive effects of the mentioned innovative approaches in the context of recovery time, postoperative complications, and the patients' outcomes. Laparoscopic pyloromyotomy has received wide acceptance over the past years mainly because it is less invasive and effective. The results of our study also showed that patients operated by laparoscopic pyloromyotomy had much faster recovery process and less postoperative complications compared with those operated with the help of open procedure. This is in agreement with St. Peter et al. (2006) who observed that laparoscopic pyloromyotomy offered benefits such as shorter recovery time and postoperative pain and hence done in many pediatric centres【10】. Furthermore, Hall et al. (2009) explored the laparoscopic pyloromyotomy, which supported those results by proving that the laparoscopic pyloromyotomy have less complications and shorter postoperative hospitalization compared to the open surgery【11】. However, apr even with such benefits, several challenges are there with the laparoscopic pyloromyotomy. The overall procedure is specialized and has a rather steep learning curve meaning that it can impact results. Several researchers have also established that, competency in performing surgical operations decreases the chances of creating nicking of the oesophagus during the process other related mishaps【12】. In the present work, it has been identified that the experts always showed excellent results in the use of the laparoscopic approach thus underlining the role of the surgeon in the general result of the process. Nevertheless, endoscopic pyloromyotomy, which is still under investigation, is great progress as a treatment for PPS. This approach consists in the endoscopic myotomy, which seems to be even less invasive than the laparoscopic surgery. The preliminary research by Sharata et al. , has revealed that it is possible to perform endoscopic pyloromyotomy with results equivalent to that of laparoscopic and open operations【13】. Our study also revealed that endoscopic pyloromyotomy led to the improvement of the postoperative recovery period though there was no significant difference when compared with laparoscopic pyloromyotomy. But, the relatively low sepsis rate of the endoscopic patients implies that this form of the treatment could be a probable direction for evolution from highly invasive treatments as the method evolves over time. Despite surgical solutions taking centre stage when it comes to PPS treatment, non-invasive PPS treatment options like pharmacological intervention have been looked at particularly with regard to patients who are unfit for surgery. Atropine has been tried from the group of muscarinic receptor antagonists for the relaxation of pyloric muscle and symptom relief without surgery. Yet, the results of medical treatment are normally lower compared to the effectiveness of surgical procedures. Smith et al. , (2010) and other authors observed that although atropine in mild form may work, it takes a longer duration to apply and has high relapse rate than surgeries【14】. This goes well with our findings, whereby most of the few patients who received medical management

in our population needed to undergo surgery after failure of the treatment or when they had recurrent symptoms.

Conclusion

The minimally invasive techniques especially Laparoscopic and Endoscopic pyloromyotomy has advantages in Pediatric Pyloric Stenosis. These varieties are linked to lower postoperative lose time waiting period and complications making it more popular in today's surgey. Non-surgical treatments are unlikely to provide a comprehensive cure and yet they could be helpful in some situations. More well designed prospective studies must be done to optimize these novel unstandardized techniques and analyse the final results, especially in the case of emerging operations such as endoscopic pyloromyotomy.

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Conflict of Interest: Nil

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Authors Contribution

Concept & Design of Study: Jehangir khan1

Drafting: Jehangir khan1, Muhammad Javed khan2

Data Analysis: Amjad Ali shah3, Huma shafi4

Critical Review: Amjad Ali shah3, Huma shafi4

Final Approval of version: Jehangir khan1

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