Original Article

Laparoscopic Pyloromyotomy for Congenital Hypertrophic Pyloric Stenosis: Our Experience with Twenty Cases

Jaishri Ramji, Rakesh S. Joshi

Department of Pediatric Surgery, B. J. Medical College and Civil Hospital, Ahmedabad, Gujarat, India

Abstract

Purpose: Laparoscopic pyloromyotomy for hypertrophic pyloric stenosis has become quite popular over the past decade. There have been many modifications in the technique initially described by Alain *et al*. in 1991. We describe our experience of the laparoscopic procedure performed in twenty cases. **Materials and Methods:** This study includes twenty patients of pyloric stenosis who underwent laparoscopic pyloromyotomy from March 2017 to March 2020. All the infants had classical clinical symptoms and abdominal ultrasound confirming the diagnosis of pyloric stenosis. Two 3-mm ports and one 5-mm port were used. The duodenum was grasped to stabilise the olive; a stab knife cut to 10 mm and mounted on a needle holder was introduced through the 3-mm trocar in the left hypochondrium to perform the myotomy, and subsequently, the myotomy was spread with a 5-mm Maryland forceps. Feeding was started 6 h postoperatively. **Results:** Twenty patients with congenital idiopathic pyloric stenosis underwent laparoscopic pyloromyotomy by this technique. The average operating time was 42 min. There were no peri- or post-operative complications. The post-operative hospital stay ranged between 36 h and 54 h. **Conclusion:** Laparoscopic pyloromyotomy using a stab knife mounted on a needle holder is a technically feasible, safe and effective surgical procedure for pyloric stenosis.

Keywords: Congenital hypertrophic pyloric stenosis, laparoscopy, pyloromyotomy, stab knife

Introduction

Hypertrophic pyloric stenosis is one of the common surgical conditions in early infancy. Ramstedt's pyloromyotomy, introduced over a century ago, in 1912, has withstood the test of time as the procedure of choice for this condition.[1] However, laparoscopic approach for this procedure has become quite popular over the past decade. The technique of laparoscopic pyloromyotomy was initially described by Alain *et al*. in 1991; since then, there have been many modifications in the technique.[2] Special instruments such as retractable pyloromyotomy knife or arthrotomy knife and pyloric spreader have been devised for this procedure.[3] Often, these expensive instruments may not be readily available for use by the paediatric surgeon. Here, we describe our experience of the laparoscopic procedure in twenty cases.

Materials and Methods

We present a cohort of twenty cases of pyloric stenosis who underwent laparoscopic pyloromyotomy from March 2017 to March 2020. All the infants had classical clinical symptoms and abdominal ultrasound confirming the diagnosis with pyloric length >16 mm and muscle thickness >4 mm. Adequate resuscitation to normalise blood gases and correct electrolyte imbalances was ensured preoperatively. Laparoscopic pyloromyotomy was performed using two 3-mm ports at the umbilicus and left hypochondrium and one 5-mm port in the right iliac fossa [Figure 1]. Pneumoperitoneum was created by open method at the umbilical port with 8 mmHg pressure and 1–2 L/min flow. After visualising the olive, an incision was made in the right iliac fossa through which a 5-mm Maryland forceps was introduced directly without the trocar and the duodenum was held firmly to stabilise the pylorus. For the myotomy, a stab knife was cut at 10-mm length from the tip and mounted on a needle holder; after mounting, the length of the knife is 4 mm [Figure 2]. The stab knife was held with

Received: 17-08-2020 **Revised:** 27-09-2020 **Accepted:** 02-11-2020 **Available Online:** 16-02-2021

Access this article online

Quick Response Code:

Website: www.afrjpaedsurg.org

DOI: 10.4103/ajps.AJPS_119_20

Address for correspondence: Dr. Jaishri Ramji, Department of Pediatric Surgery, B. J. Medical College and Civil Hospital, Asarwa, Ahmedabad - 380 016, Gujarat, India.
E-mail: rjaishri95@gmail.com

How to cite this article: Ramji J, Joshi RS. Laparoscopic pyloromyotomy for congenital hypertrophic pyloric stenosis: Our experience with twenty cases. Afr J Paediatr Surg 2021;18:14-7.

a haemostat; after measuring the length to be cut (10 mm), another haemostat was used to break the knife at that point. The length to be cut was measured using a sterile disposable ruler [Figures 2 and 3]. A new stab knife was used for every procedure, and it was cut in the sterile field at the time of surgery.

The trocar at the 3-mm port in the left hypochondrium was inserted in as far as possible to reach up to the olive. The needle holder with knife was introduced through this trocar; as the trocar was at the pylorus, the chances of injury to other structures while introducing the knife were minimal. The pre-pyloric vein was visualised and a longitudinal myotomy was made on the anterosuperior surface of the pyloric tumour, from the level of the vein to the antrum [Figure 4]. As the knife length protruding from the needle holder was only 4 mm, the depth of the incision was never more than the muscle thickness and the chances of injuring the mucosa were minimal. Utmost care is needed at this step to ensure that the needle holder remains securely locked from the point of insertion up to the time it is completely withdrawn. This is essential to prevent inadvertent dislodging of the knife intraperitoneally. In view of the danger of the knife getting dislodged inadvertently, care was taken to keep the field in view clearly throughout the time the knife was inside and till it was removed. Before introducing the needle holder, its lock was secured and double-checked to ensure secure grasp. The needle holder was withdrawn and a 3-mm Maryland forceps was introduced to widen the myotomy and hold its upper lip. Then, the duodenum was released and the 5-mm Maryland forceps was used to spread the myotomy adequately and complete it till the mucosa was seen bulging. Few drops of saline were poured through the port and air was injected through the feeding tube to check for any inadvertent mucosal injury. Adequacy of myotomy was also checked by grasping both halves of the olive and moving them independently. The port sites were closed with 4-0 absorbable sutures.

Postoperatively, low-volume feeds were started 6 h after surgery and volume was advanced gradually. In case of emesis, one feed was omitted and then feeds were reinstituted. The baby was discharged after 24 h of taking feeds adequately.

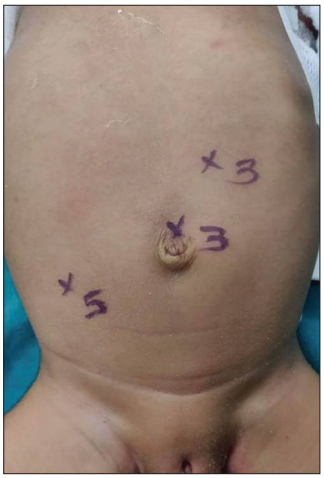

Figure 1: Marking of port sites

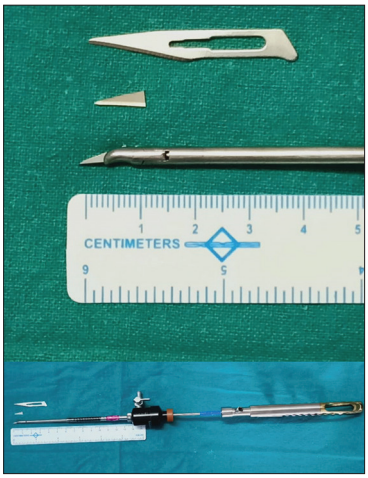

Figure 2: Stab knife cut and mounted on a 3-mm needle holder

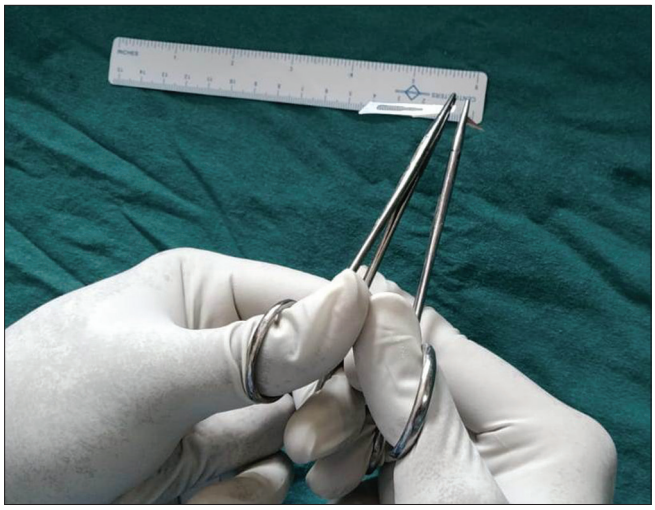

Figure 3: New sterile stab knife being measured and cut

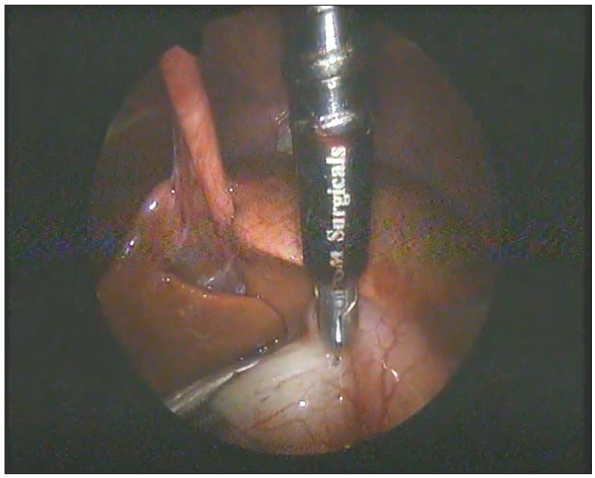

Figure 4: Myotomy being performed with cut stab knife mounted on a 3-mm needle holder

Ethical clearance from the institutional review board was obtained for a retrospective study of these case records.

Results

Over a period of 3 years, 59 cases of pyloric stenosis have been operated at our department. Of these, twenty cases were done laparoscopically. The patients were randomly selected for laparoscopy, while others underwent open Ramstedt's pyloromyotomy. Being a teaching institute, demonstration and training in open technique was given priority. The age of presentation ranged between 3.5 weeks and 8 weeks. The weight ranged from 1.8 kg to 4 kg, with a mean weight of 3.1 kg. There were 17 male and 3 female patients. All cases were completed laparoscopically, and none required to be converted to open. The operating time ranged from 30 min to 50 min, with an average of 42 min. There were no peri- or post-operative complications. The post-operative hospital stay ranged between 36 h and 54 h. There were no port-site complications. All the babies had satisfactory weight gain on follow-up.

Discussion

Ramstedt's pyloromyotomy has been the gold standard for pyloric stenosis for more than a century. Laparoscopic pyloromyotomy has gained popularity over the last decade with advances in technology and the development of specialised instruments suitable for use in infants. It has been shown to be equally effective while being technically simple, feasible and safe.[3-5] Various modifications of the laparoscopic technique have been described. A retractable pyloromyotomy knife and a special laparoscopic pyloric spreader are considered indispensable for performing laparoscopic pyloromyotomy.[3] The use of alternatives like a myringotomy knife has also been reported.[6] However, all paediatric surgeons may not have ready access to these instruments. The use of a no. 11 knife cut and mounted on a needle holder is a simple but effective alternative to the pyloromyotomy. It is also sharper and more precise.[7] The main concern with this technique is the possibility of the blade getting released in the cavity due to accidental release of the lock of the needle holder. Hence, utmost care should be taken to keep the needle holder locked during the entire period, from introducing the knife, performing the myotomy and till it is removed out of the trocar the abdominal cavity. Fortunately, we have not had a single incidence of dislodgement of the knife. Admittedly, in the event of such an occurrence, we would have to explore to extract it.

There have been other studies recently in the literature that have demonstrated the role of single-incision laparoscopic surgery to complete pyloromyotomy.[8,9] Bertozzi *et al*. performed laparoscopic-assisted pyloromyotomy technique with a 12-mm Hasson trocar.[10]

A good alternative in centres where the pyloromyotomy knife and spreader are not available is the technique described by Jain *et al*.[11] They used the hook electrocautery to make the initial pyloric incision, and a 3-mm Maryland forceps was used to split the pyloric muscle after incision.

An adequate pyloromyotomy is one which balances between the risk of perforation and the risk of incomplete myotomy.[12] The depth of the incision made with the blade is never more than 4 mm, as the blade has been cut to this length. This is the minimum thickness of the muscle in pyloric stenosis, which is the logic behind cutting the blade thus, so that there is no inadvertent mucosal injury.

A good Maryland forceps is equally good as a pyloric spreader to widen the myotomy adequately so that the mucosa can bulge. No complication of incomplete myotomy with this technique was found in any of our patients, although an inability to palpate the divided pylorus makes the evaluation of these risk challenging.[12]

The operating time in the initial part of the learning curve is understandably longer than the time for open pyloromyotomy. However, with increasing experience and more number of cases, the time difference becomes insignificant. All the cases were done by a single surgeon. Consequentially, the duration of surgery decreased with subsequent cases.

Although some authors have demonstrated a higher risk of inadequate pyloromyotomy and duodenal perforation because of a longer learning curve,[13,14] others like Ostlie *et al*. reported an absence of complications in a large series of Laparoscopic Pyloromyotomy (LP).[5] In our series also, there were no technical failures or peri- and post-operative complications.

Overall, the technical ease of the procedure and effectiveness of the instruments make this a suitable alternative to open pyloromyotomy.

Conclusion

Laparoscopic pyloromyotomy provides satisfactory results at par with the gold standard, making it a viable alternative option to open pyloromyotomy. The use of a stab knife mounted on a needle holder is technically feasible, safe and effective.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Ramstedt C. For the operation of congenital pyloric stenosis. Med Klinik 1912;8:1702-5.
2. Alain JL, Grousseau D, Terrier G. Extramucosal pyloromyotomy by laparoscopy. Surg Endosc 1991;5:174-5.
3. Bufo AJ, Merry C, Shah R, Cyr N, Schropp KP, Lobe TE. Laparoscopic pyloromyotomy: A safer technique. Pediatr Surg Int 1998;13:240-2.
4. Hall NJ, Pacilli M, Eaton S, Reblock K, Gaines BA, Pastor A, *et al*. Recovery after open versus laparoscopic pyloromyotomy for pyloric stenosis: A double-blind multicentre randomized controlled trial. Lancet 2009;373:390-8.
5. Ostlie DJ, Woodall CE, Wade KR, Snyder CL, Gittes GK, Sharp RJ, *et al.* An effective pyloromyotomy length in infants undergoing laparoscopic pyloromyotomy. Surgery 2004;136:827-32.
6. Abu-Kishk I, Stolero S, Klin B, Lotan G. Myringotomy knife for pyloromyotomy. Surg Laparosc Endosc Percutan Tech 2010;20:e47-9.
7. Shah AA, Shah AV. Laparoscopic Pyloromyotomy using an indigenous endoknife. J Indian Assoc Pediatr Surg 2004;9:46-7.
8. Muensterer OJ, Adibe OO, Harmon CM, Chong A, Hansen EN, Bartle D, *et al*. Single-incision laparoscopic pyloromyotomy: Initial experience. Surg Endosc 2010;24:1589-93.
9. Kozlov Y, Novogilov V, Podkamenev A, Rasputin A, Weber I, Solovjev A, *et al*. Single-incision laparoscopic surgery for pyloric stenosis. Pediatr Surg Int 2012;28:347-50.
10. Bertozzi M, Prestipino M, Nardi N, Appignani A. Preliminary experience with a new approach for infantile hypertrophic pyloric stenosis: The single-port, laparoscopic-assisted pyloromyotomy. Surg Endosc 2011;25:2039-43.
11. Jain V, Choudhury SR, Chadha R, Puri A, Naga AS. Laparoscopic pyloromyotomy: Is a knife really necessary? World J Pediatr 2012;8:57-60.
12. Leclair MD, Plattner V, Mirallie E, Lejus C, Nguyen JM, Podevin G, *et al*. Laparoscopic pyloromyotomy for hypertrophic pyloric stenosis: A prospective, randomized controlled trial. J Pediatr Surg 2007;42:692-8.
13. Ford WD, Crameri JA, Holland AJ. The learning curve for laparoscopic pyloromyotomy. J Pediatr Surg 1997;32:552-4.
14. Campbell BT, McLean K, Barnhart DC, Drongowski RA, Hirschl RB. A comparison of laparoscopic and open pyloromyotomy at a teaching hospital. J Pediatr Surg 2002;37:1068-71.