Laparoscopic pyloromyotomy: is a knife really necessary?

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Background: **Laparoscopic pyloromyotomy (LP) is currently accepted as a suitable treatment modality for infantile hypertrophic pyloric stenosis (IHPS). In this report, we describe some technical modifications of LP using a 3- or 5-mm hook with electrocautery as a substitute for a knife for incising the pylorus. The outcomes of LP using a standard retractable pyloromyotomy knife are compared with those of LP using a hook electrocautery.**

Methods: **The patients with ultrasound proven IHPS who had undergone LP in a single institution from December 2008 to April 2010 were retrospectively analyzed. Incision on the pylorus was made with a 3-mm pyloromyotomy knife in the initial 12 cases. However, in the latter part of the study, a 3- or 5-mm hook with electrocautery was used for the incision. A Maryland dissector was used for completing the pyloromyotomy. The results were compared in terms of duration of surgery, complications, time taken to establish the first full feed, requirement of analgesics, postoperative emesis, and postoperative stay in the hospital. Independent sample *t* test and the Chi-square test were used for statistical analysis.**

Results: **Of the 27 patients analyzed, 12 underwent LP using a pyloromyotomy knife and the remaining 15 patients were operated on using a hook with electrocautery instead of the knife. The operating time, time taken to establish the first full feed, and duration of hospital stay were comparable among the two groups with no statistically significant difference. No complications were recorded in either group.**

Conclusions: **Use of hook electrocautery for incising the pylorus provides a bloodless field without affecting the postoperative recovery and outcome. It also obviates any need of specialized instruments like a pyloromyotomy knife or other sharp instruments for pyloric incision.**

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Original article

Introduction

Hypertrophic pyloric stenosis (HPS) is the most common cause of nonbilious projectile vomiting in infants. The treatment of this condition has evolved markedly during the last century. Gastrojejunostomy was the treatment advocated until 1908 when Fredet introduced the technique of longitudinal splitting of the pyloric muscle along with transverse suturing of the split muscle.[1] In 1912, Ramstedt[2] described longitudinal splitting of the pyloric muscle with sparing of the mucosa, a technique which has since withstood the test of time. The safety of laparoscopic surgery in infants was first reported by Gans and Berci in 1973.[3] Almost 80 years after Ramstedt first described his technique of pyloromyotomy, Alain et al[4] described a laparoscopic approach for performing this procedure. The technique of laparoscopic pyloromyotomy (LP) has since been modified, and a retractable pyloromyotomy knife or arthrotomy knife along with a special pyloric spreader is recommended for performing the procedure.[5] Due to limited resources these specialized instruments may not be available to every pediatric surgeon. We present our experience with some technical modifications for performing LP and compare the results of the modified technique with those of conventional procedure using a pyloromyotomy knife.

Methods

Patients

All consecutive infants with HPS proven by abdominal

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ultrasonography (US) (pyloric muscle thickness >4 mm and length >17 mm) at our institution from December 2008 to April 2010 were included in the study. The study was approved by the institutional review board.

Procedures

LP was performed with reusable instruments and devices manufactured by Karl Storz, Germany. A 5-mm port was introduced in the umbilical fold by an open technique to hold a 5-mm 30° telescope. Carbon dioxide pneumoperitoneum was established at a maximum pressure of 8 mmHg. Two stab incisions were made on the right and left flanks medial to the anterior axillary lines, just below and above the umbilicus respectively. A 3-mm port was inserted through each of the incisions. At this point, if exposure of the pylorus was hampered due to overhanging of the liver edge, an additional manoeuvre was performed. Under guidance of the telescope, a 2-0 silk suture was passed from outside to encircle and pull the falciform ligament towards the chest wall. The duodenum was grasped just distal to the pyloric olive by an atraumatic forceps inserted from the right port.

In group I patients, the pylorus was incised in its avascular plane from the prepyloric vein, well into the gastric antrum using a 3-mm retractable knife inserted from the left port (Fig. 1). The muscular layer was then separated with a 3- or 5-mm Maryland dissector. A complete pyloromyotomy was evidenced by ballooning of the intact mucosa and two independently moving pyloric edges. Bleeding was controlled by compressing the raw area against the under surface of the liver. The absence of mucosal perforation was checked by insufflation of air via the nasogastric tube. The fascia of the umbilical wound and ports were closed with 4-0 absorbable sutures, and dermal approximation was performed with 5-0 subcuticular absorbable suture.

A similar procedure was performed in group II patients except for the use of a 3- or 5-mm hook with electrocautery instead of the knife for the initial incision on the serosa as well as the pyloric muscle (Fig. 2). The myotomy was completed using a Maryland dissector as in group I patients. Low-volume feeds were initiated 10 hours after surgery and the volume of the feeds increased progressively. In case of postoperative emesis, one feed was skipped and feeding was subsequently initiated again after an interval. The patients were routinely administered with paracetamol suppository twice in the postoperative period for pain relief. Administration of paracetamol was repeated if the child was irritable or was crying persistently. The patients were discharged once 3 consecutive full feeds were accepted without vomiting and were followed up in the outpatient department for a maximum of six months.

Parameters

The parameters recorded were age at surgery, weight, sex, duration of surgery, complications, time before the first full feed being tolerated after surgery, requirement of analgesics, postoperative emesis, and postoperative length of hospital stay.

Statistical analysis

Independent sample *t* test and the Chi-square test was applied to compare the two groups.

Results

In the 27 patients in the present study, 12 belonged to group I and 15 to group II. There were 20 males and 7 females. The mean age of the patients at presentation was 32 days (range: 23 to 64 days). Their weight at surgery ranged from 1.8 to 3.6 kg, with a mean of 2.4 kg. Both groups were comparable in terms of age at presentation and weight before surgery.

The mean (±SD) duration of surgery was 40 (±5.7) minutes in group I and 38 (±6.9) minutes in group II (*P*=

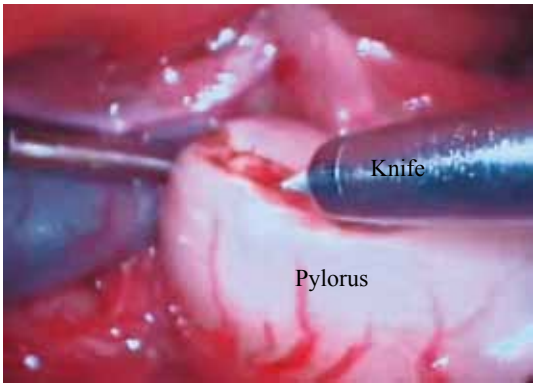

Fig. 1. A pyloric incision made with a knife.

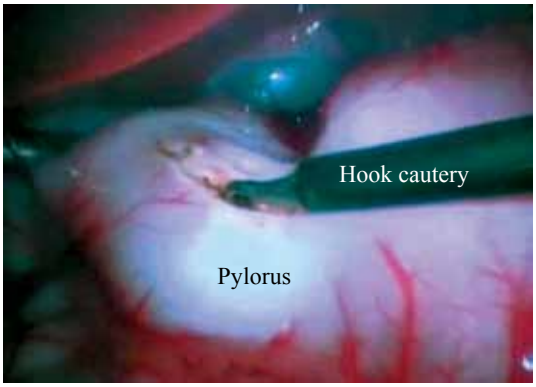

Fig. 2. A pyloric incision made with a hook electrocautery.

0.3). The mean (±SD) time to full oral feeds was 24.5 (±2.5) hours in group I and 23.8 (±2.5) hours in group II, whereas postoperative length of hospital stay was 35.6 (±3.9) hours in group I and 36 (±3.5) in group II with a *P* value of 0.5 and 0.8, respectively.

Two patients in each group needed additional postoperative analgesia. Postoperative emesis was present in 3 of the 12 (25%) infants in group I and 5 of the 15 (33%) infants in group II. The differences in analgesia requirement and postoperative emesis were not significant between the two groups with a *P* value of 0.7 and 0.6 respectively.

In both groups, no perforation of the pyloric mucosa, nor conversion to open surgery or incomplete pyloromyotomy was observed. The cosmetic results at follow-up were satisfactory with a barely visible operative scar.

Discussion

LP, first described in 1990, has gained popularity over the last decade with the advancement in laparoscopic technology and the development of instrumentation suitable for use in infants.[4] It is still a source of controversy and debate among pediatric surgeons as to whether LP is superior to open pyloromyotomy (OP). Till date, 5 prospective randomized controlled trials and one prospective cohort study have been performed to answer this question.[6-11] A meta-analysis of these studies was performed by analysis of a total of 625 patients (303 LP, 322 OP).[12] Combined estimates indicated that LP had a lower total complication rate (P=0.04), mostly due to a lower rate of wound complications. Patients who underwent LP also had a shorter time before full oral feeding could be instituted (mean difference [MD], −11.52 hours; P<0.001) and a shorter postoperative length of hospital stay (MD, −5.71 hours; P=0.0005). No statistically significant differences were noted in the rates of mucosal perforation, wound infection, postoperative emesis, and operating time.

At present, as the equivalence, if not supremacy of LP over OP is fairly well established, more pediatric surgeons are shifting towards performing LP. A retractable pyloromyotomy knife and a special laparoscopic pyloric spreader are considered indispensible for performing LP. However these instruments are not readily available to every pediatric surgeon. The use of an indigenous knife made by cutting the tip of a No. 11 or 15 surgical blade and placing it in a laparoscopic needle holder has been described.[13] However, accidental opening of the lock of the needle holder may release the blade into the abdominal cavity and further complicate the procedure.

The need for an alternative for the pyloromyotomy knife is also being felt as most pediatric surgeons in the US earlier used a single-use disposable arthrotomy knife which was no longer available for sale from 2009. Many pediatric surgeons have therefore started using a needle-tip cautery for the initial incision on the pylorus. The use of alternatives like a myringotomy knife has also been reported.[14] In our study we found that the use of a 3- or 5-mm hook with electrocautery as an alternative to the pyloromyotomy knife was effective and resulted in a bloodless operative field, thus facilitating complete spreading of the pyloric muscle by a Maryland dissector. The use of cautery for deepening the incision has a risk of injury to the mucosa but as the size of the hook (3 mm) was always less than the thickness of the pyloric muscle (>4 mm), the chance of injury to the mucosa was minimal. The hook could therefore be inserted liberally in the pylorus to divide the muscle at depth. Complete separation of the hypertrophied muscle could then easily be achieved using a 3 or 5 mm Maryland forceps.

Encircling the falciform ligament by using a U stitch to retract the liver edge and allow more operating space has been reported.[15] Compressing the raw myotomy area against the undersurface of the liver helps to achieve complete hemostasis.

The results in both groups of patients were nearly identical with no significant difference in operative time, time for establishing full oral feeding, postoperative hospital stay, and postoperative emesis. LP resulted in a barely imperceptible operative scar. The modification of the procedure by using a hook with electrocautery for incising the serosa and the pyloric muscle at depth and then spreading it with the readily available Maryland dissector was simple, safe and effective. Another advantage of the modified technique is that as a sharp instrument is not used for incising the pylorus, bleeding is less. Morever, the procedure uses basic laparoscopy instruments which are easily available to all pediatric laparoscopic surgeons.

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