

Research Article

Double Y Pyloromyotomy versus Ramstedt's Pyloromyotomy in Management of IHPS.

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Abstract

Introduction: Various treatment modalities have been applied for the management of infantile hypertrophic pyloric stenosis. However surgery remains the mainstay of treatment for IHPS of which Ramstedt's pyloromyotomy remains the surgical technique of choice.

Patient and methods: A prospective randomized study of 60 patients with IHPS was done at paediatric surgery unit at Minia university hospital over a period of 3 years from September 2012 to December 2014. The patients were divided into 3 equal groups of 20 patients in each. All patients selected for study were optimized preoperatively regarding to hydration, acid-base status and electrolytes imbalance. All surgeries were performed after obtaining informed consent. Standard preoperative preparation and postoperative feeding regimes were used. The patients were operated on an alternate basis, i.e., one patient by Double-Y Pyloromyotomy (DY) and the next by a Ramstedt's Pyloromyotomy (RP). Data on patient demographics, operative time, anaesthesia complications and postoperative complications including vomiting and weight gain were collected. Patients were followed up for a period of 3 months postoperatively. **Results:** A total of 60 patients were included in the study. 20 underwent Ramstedt's pyloromyotomy (RP) and 20 had a double-Y pyloromyotomy (DY). No significant statistical differences were found in the patient population with regard to age (DY Group 49.2 ± 23.06 days vs. RP Group 51 ± 13.04 days; $p = 0.038$), sex (DY 1F/2M vs. RP 1F/2M), weight at presentation (DY 3.37 ± 0.81 kg vs. RP 3.38 ± 0.91 ; $p = 0.442$). However a significant difference between DY vs. RP groups was noted with regard to vomiting and weight gain. Patients were followed up for a period of 3 months postoperatively. Vomiting in double-Y (DY) pyloromyotomy group (1.21 ± 0.40 days) vs Ramstedt's pyloromyotomy (RP) group (3.03 ± 0.27 days) ($p = 0.001$). Weight gain after 1st 10 days DY vs RP is (34 ± 117.37 gm vs 22 ± 53.74 gm ($p = 0.035$), after 1 month 107 ± 196.07 . **Conclusion:** Double-Y pyloromyotomy (Alayet's pyloromyotomy) may offer a better functional outcome as seen by the lower frequency of vomiting in this study. The increased weight gain in the double-Y group may also indirectly indicate a wider and more effective opening of both ends of the pyloric canal. However more studies are needed to assess this new technique.

Key words: Pyloric stenosis, Double Y pyloromyotomy, Ramstedt's pyloromyotomy

Introduction

Hypertrophic pyloric stenosis (HPS) is a condition affecting infants, in which the pyloric portion of the stomach becomes abnormally thickened and manifests as obstruction to gastric emptying. The infant presents in the first 2 to 12 weeks of life with forceful or projectile non-bilious vomiting after feeding. With protracted vomiting, the emesis may become blood-tinged because of gastritis. Jaundice occurs

in about 2% of infants with HPS secondary to defective hepatic glucuronyl transferase activity, which resolves after surgery.⁽¹⁾

IHPS is a common cause of gastric outlet obstruction in infants and the prevalence ranges from 1.0-1.0/1000 live births among whites though the incidence is lower in black Americans and Asians.⁽¹⁾ The male to female ratio is ranges between 2:1 and 3:1.⁽¹⁾ The majority of cases present between the 3rd and 6th week of age, although some cases are diagnosed at

birth⁽⁷⁾ and some have even been diagnosed in utero.⁽⁸⁾ The basis for higher male susceptibility is unknown. There is evidence both for and against an increased incidence in the first-born child, and there is familial clustering of IHPS, but not in a Mendelian pattern.⁽⁹⁾

IHPS appeared to be more common in bottle-fed infants.⁽¹⁰⁾ In rural populations⁽¹¹⁾ and in the summer months (Langer and coworkers, unpublished data). Although IHPS is the most common surgical condition producing emesis in infancy⁽¹²⁾, its etiology is unknown. Whether the condition is congenital or acquired is debated. Variations in IHPS incidence, trending over time, suggest that unknown environmental factors have an impact.⁽¹³⁾ Deficiency of nerve terminals, markers for nerve-supporting cells, peptide containing nerve fibers, mRNA production for nitric oxide synthase and interstitial cells of Cajal have all been found in the muscular layer of the pylorus⁽¹⁴⁾, as well as increased insulin-like and platelet-derived growth factors.^(15,16) This abnormal innervation is postulated to lead to failure of relaxation of the pylorus muscle, increased synthesis of growth factors, and subsequent hypertrophy.⁽¹⁷⁾ It is likely that a spectrum of genetic mutations involving the production of nitric oxide may be responsible for many cases of IHPS.⁽¹⁸⁾ Various treatment modalities have been applied for the management of infantile hypertrophic pyloric stenosis. However surgery remains the mainstay of treatment for IHPS of which Ramstedt's pyloromyotomy remains the surgical technique of choice. Here a new technique focusing on pylorus, which may offer better results for this common condition. Alalay et al.,⁽¹⁹⁾ introduced this new technique

known as Alalay's Double-Y Pyloromyotomy.

Patients & Methods

A prospective comparative study was conducted in the Paediatric Surgery Unit at Minia University hospital during the period between September 2012 and December 2014. Sixty cases of IHPS were included in the study. Thirty cases were operated by Double Y pyloromyotomy technique (**Group 1**) and the other 30 cases were operated by Ramstedt's pyloromyotomy technique (**Group 2**). Infant less than 3 months were included in the study while patients with other congenital problems or comorbid medical conditions were excluded from the study and all patients selected for the study were optimized preoperatively with regard to hydration, acid-base status and electrolyte balance. Standard preoperative preparation and postoperative feeding regimes (1st feed 12 hours after surgery with dextrose water moving to half-strength milk and proceeding to full feeds within the first 24 postoperative hours) were used. All surgeries were performed after obtaining informed consent. Patients were randomized at a ratio 1:1. All patients were operated using the standard right upper quadrant (RUQ) transverse incision. Information on patient's demographics, operative time, anaesthesia complications, postoperative vomiting and weight gain were collected. Parents were provided with a vomiting record sheet and were recorded the number of vomits per day and for how long vomiting took place postoperatively. Patients were followed up for a period of 3 months postoperatively. Data was collected and results were expressed as mean±SD (Fig. 1).



Fig. (1): Contrast study of one patient.

Technique

Ramstedt's pyloromyotomy had been done in the standard manner using the right upper quadrant transverse incision (Fig. 2). In the double-Y pyloromyotomy (Alayet's pyloromyotomy), the incision was similar like a right upper quadrant transverse incision was used. The hypertrophied pylorus was delivered and holding with thumb and index. A straight incision was made along 70% of the length of the hypertrophied

pylorus in the centre. The sides were made like a V and each V represented the remaining 15% of the incision length. The final appearance of the incision resembled double-Y. The straight line was dilated first by using the reverse sides of an artery forceps, then V-incision were dilated for putting of mucosa. After checking of any mucosal perforation, abdominal closure was closed in layers (Fig. 2, 3 & 4).



Fig. (2): Ramstedt's pyloromyotomy.

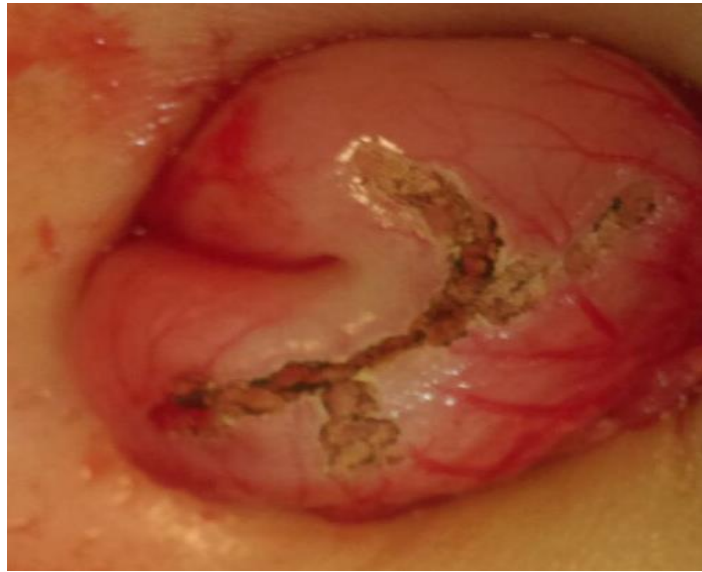


Fig. (3): Double Y incision of Alayet's pyloromyotomy.

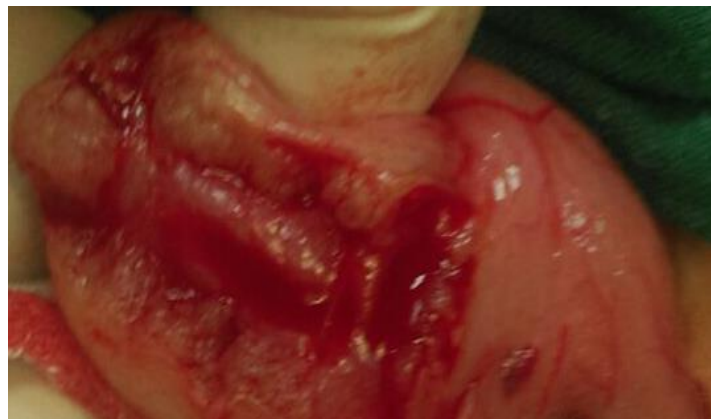


Fig. (4): Alayet's pyloromyotomy.

Results

A total of 60 patients were included in the study. 30 underwent Ramstedt's pyloromyotomy (RP) and 30 had a double-Y pyloromyotomy (DY). The operative time was the same and no intraoperative complications occurred apart from mucosal perforation which occurred in 2 cases in the group operated by Double-Y pyloromyotomy (DY) technique while occurred in 2 cases in the group operated by Ramstedt's pyloromyotomy (RP) technique. No wound infections were encountered and no redo-

pyloromyotomies were needed. No significant statistical differences were found in the patient population with regard to age (DY Group 9.2 ± 23.06 days vs. RP Group 9.1 ± 13.08 days; $p = 0.038$), sex (DY 16F/14M vs. RP 10F/20M), weight at presentation (DY 3.37 ± 9.41 kg vs. RP 3.38 ± 3.91 ; $p = 0.442$), symptoms and clinical condition including electrolyte balance and acid-base status (All patients were optimally corrected before proceeding to surgery). Both groups were also equal in terms of general anaesthesia. However a significant

difference between DY vs. RP groups was noted with regard to vomiting and weight gain. Patients were followed up for a period of 3 months post operatively. Vomiting in double-Y(DY) pyloromyotomy group (1.21 ± 0.40 days) vs Ramstedt's pyloromyotomy (RP) group (3.03 ± 0.37 days) (p= 0.0001).

Weight gain after 1st 10 days DY vs RP is (340 ± 117.37gm vs 230 ± 53.74 gm (p=0.030), after 1 month 1070 ± 196.07gm vs 990 ± 206.00gm, (p< 0.001) No long-term complications were reported and no re-do pyloromyotomy was needed.

Table (1): Sex distribution.

Sex	RP (n = 30)	DY (n = 30)
Male	24 (80%)	20 (66.7%)
Female	6 (20%)	10 (33.3%)

Table (2): Comparison between mean age for two groups.

	RP (Mean ± SD)	DY (Mean ± SD)	P-value
Age (days)	51.0 ± 13.08	49.2 ± 23.06	0.538**

* Significant.

** Non significant.

Table (3): Preoperative weight.

	RP (Mean ± SD)	DY (Mean ± SD)	P-value
Weight (gm)	3.38 ± 3.91	3.37 ± 9.41	0.442**

* Significant.

** Non significant.

Table (4): Mucosal perforation during surgery.

	RP (n=30)	DY (n=30)
Number of mucosal perforation	2 (6.7%)	4 (13.3%)

Table (5): Postoperative vomiting and weight gain.

	RP (Mean ± SD)	DY (Mean ± SD)	P-value
Vomiting (days)	3.03 ± 0.37	1.21 ± 0.40	0.0001*
Weight gain after 1st 10 days (gm)	230 ± 53.74	340 ± 117.37	0.030*
Weight gain after 1 month (gm)	990 ± 206.00	1070 ± 196.07	0.001*

* Significant.

** Non-significant.

Discussion

Infantile hypertrophic pyloric stenosis (IHPS) was first described by Blair⁽¹⁴⁾ in an autopsy specimen. A few other reports were published over the next 100 years, but the first detailed account was given by Hirschsprung.⁽¹⁵⁾ IHPS remained an untreatable and usually fatal condition until 1907. First successful surgery was performed by

Dufour and Fredet.⁽¹⁶⁾ They suggested splitting the muscle and the suturing transversely. However Ramstedt⁽¹⁷⁾ described the classical operation and stated that there was no need for muscle closure and the procedure has remained in general use up until the present day. Here a new technique focusing on pylorus, which may offer better results for this common

condition. Alalayet et al.,^(1*) introduced this new technique known as Alayet's Double-Y Pyloromyotomy. The exact aetiology is unknown and why this usually occurs in the first-born child is also a question that still awaits an answer. Persons with a positive familial history and certain ABO blood groups show a higher incidence. Among the acquired factors, the methods of feeding (breast versus bottle) and seasonal variability have been implicated.^(1^A) Prenatal prescription of macrolides has been implicated in the pathophysiology of IHPS.^(1^B) Decreased numbers of interstitial cells of Cajal and hemeoxygenase- γ have been found in the smooth muscle of IHPS.^(1^C) Increased vascularity has been shown to be an integral component of the pylorus in IHPS.^(1^D) An increased amount of desmin in the hypertrophied pylorus may be the cause of in-coordination of contraction and relaxation.^(1^E) Management has come a long way from simple observation to treatment with intravenous atropine sulphate although this is not favored by most centers.^(1^F) Traumamyoplasty (crushing with Babcock forceps) has been carried out satisfactorily at few centres.^(1^G) Endoscopic balloon dilatation and endoscopic pyloromyotomy using endoscopic electro surgical needle or a sphincterotome^(1^H) have also been described. However surgery remains the mainstay of the treatment and is safely and routinely done at most centres. The classical Ramstedt's procedure is conventionally done through a right upper transverse incision. Tan and Bianchi^(1^I) modified it to be done through a supra-umbilical semicircular incision for better cosmesis. An umbilical sliding window technique introduced in Japan has reduced the incidence of postoperative wound infection further than the Bianchi procedure.^(1^J) A right semicircular umbilical technique offered superior results, especially for large tumours compared to Bianchi's procedure^(1^K) with much less damage to the pylorus and superior results in terms of infection. A squeeze technique is useful especially for the delivery of large pyloric tumors through the supra-umbilical route.^(1^L) Trans umbilical pyloromyotomy has been described as an

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alternative to laparoscopy.^(1^M) Since a significant period of time pyloromyotomy have been carried out laparoscopically. Double-Y pyloro-myotomy also can be done laparoscopically. In this study postoperative vomiting is significantly less in the double-Y group compared to the Ramstedt procedure group. The weight gain in the patients is comparable to that in a study done a few years ago.^(1^N) Double-Y pyloro-myotomy (DY) had proved to be equally safe and efficacious compared to the Ramstedt's procedure. The method is suitable for both conventional and laparoscopic surgery.

Conclusion

Double-Y pyloromyotomy seems to offer a better and wider opening of the pylorus by creating a wider opening of the pyloric canal at the ends with a wide angle compared to other methods like Ramstedt's pyloromyotomy, where the ends are sharply narrowed. A double-Y pyloromyotomy (Alayet's pyloromyotomy) may offer a better functional outcome as seen by the lower frequency of vomiting in this study. The increased weight gain in the double-Y group may also indirectly indicate a wider and more effective opening of both ends of the pyloric canal.

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