



Original Article

TO MANAGE INFANTILE HYPERTROPHIC PYLORIC STENOSIS BY “DOUBLE-Y PYLOROMYOTOMY” IS A BETTER SURGICAL APPROACH

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Abstract:

Background: Different treatment modalities and procedures have been tried for the management of infantile hypertrophic pyloric stenosis. But surgery remains the mainstay for management of IHPS. Ramstedt's pyloromyotomy was described almost over a hundred years ago and to date remains the surgical technique of choice. An alternative and better technique is the double-Y pyloromyotomy, which offer better results for management of this common condition.

Methods: A prospective comparative interventional study of 40 patients with IHPS was carried out over a period of 2 years from July 2008 to July 2010. The patients were divided into 2 equal groups of 20 patients in each. The study was designed that 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, anesthesia complications, postoperative complications including vomiting and weight gain were collected. Patients were followed up for a period of 3 months postoperatively. Statistical assessments were done by using t test.

Results: From July 2008 through July 2010, forty patients were finally analyzed for this study. Any statistical differences were observed in patient population regarding age, sex, weight at presentation, symptoms and clinical condition including electrolytes imbalance and acid-base status were recorded. Significant differences were found in postoperative vomiting and weight gain. Data of post operative vomiting and weight gain in both groups were collected. Vomiting in double-Y(DY) pyloromyotomy group (1.21 ± 0.45 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 (298 ± 57.94 gm vs 193 ± 19.8 gm $p=0.0014$), after 1 month (676.67 ± 149.84 gm vs 466.67 ± 127.71 gm, $p=0.0001$), after 2 months (741.33 ± 278.74 gm vs 490 ± 80.62 gm, $p=0.002$) and after 3 months (582 ± 36.01 gm vs 453.33 ± 51.64 gm, $p=0.0001$). No long-term complications were reported and no re-do pyloromyotomy was needed.

Conclusion: The double-Y pyloromyotomy seems to be a better technique for the surgical management of IHPS. It may offer a better functional outcome in term of postoperative vomiting and weight gain.

Key wards: Pyloric Stenosis, pyloromyotomy, double-Y pyloromyotomy, Alayet's pyloromyotomy.

Introduction:

Infantile hypertrophic Pyloric Stenosis (IHPS) is a common cause of gastric outlet obstruction in infants. It was first described by Blair in an autopsy report in 1717. Its prevalence ranges from 1.5 to 4 per 1000 live births. Different treatment modalities and procedures have been tried for the management of

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this common condition. Simple observation to surgery have all been tried and tested. Pharmacological interventions have been used in a few centers. However, for practical purposes, surgery remains the mainstay for management of IHPS. Many innovations and approaches have been carried out for surgical management of IHPS. First successful surgery was performed by Dufour and Fredet, which was longitudinally splitting of hypertrophic pyloric muscle and transversely closing. But Ramstedt stated that no need of muscle closure and from that period it was known as Ramstedt's pyloromyotomy. Ramstedt's pyloromyotomy was remained the surgical treatment of choice for about a hundred years. Here a new technique focusing on pylorus, which may offer better results for this common condition. Yasen Fayez Alalayet et al in 2008 introduced this new technique known as Alayet's Double-Y Pyloromyotomy.

Materials and Methods:

A prospective comparative interventional study was planned to make a comparison between Ramstedt's pyloromyotomy and our double-Y pyloromyotomy. The approval of the ethical committee was obtained after a detailed discussion of the procedure and study design. A total of 40 patients with infantile hypertrophic pyloric stenosis were included for the period from July 2008 to July 2010. Patients with other congenital problems or comorbid medical conditions were excluded from the study and, additionally, patients who were operated by other surgeons in the department were included. In the end, only 40 patients were included in the study.

All patients selected for the study were optimized preoperatively with regard to hydration, acid-base status and electrolyte imbalance. Patients were divided into 2 equal groups, of 20 patients in each. Standard preoperative preparation and postoperative feeding regimes (1st feed 4 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 operated on an alternate basis, i.e., one patient by double-Y pyloromyotomy and the next one by Ramstedt's pyloromyotomy. All patients were operated using the standard right upper quadrant (RUQ) transverse incision. Information on patient's demographics, operative times, anesthesia complications, complications, postoperative vomiting and weight gain was collected. Parents were provided with a vomiting record sheet and they record the number of vomits per day and for how long vomiting took place postoperatively, i.e., both the frequency and duration of vomiting were recorded. These records were

analyzed to assess end point vomiting. Patients were followed up for a period of 3 months postoperatively. Data was plotted on Microsoft Excel and analyzed with SPSS version 15 by using the Student's t-test. Results were expressed as mean \pm SD.

Technique:

Ramstedt's pyloromyotomy had been done in the standard manner using the right upper quadrant transverse incision. In the double-Y pyloromyotomy (Alayet's pyloromyotomy), the incision was similar, i.e., a right upper quadrant transverse incision was used. The hypertrophoid 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 center. The sides were made like a V, each V representing the remaining 15% of the incision length, respectively. 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.

Results:

A total of 40 patients were included in the study. 20 under went Ramstedt's pyloromyotomy (RP) and 20 had a double-Y pyloromyotomy (DY). The operative time was the same and no intraoperative complications occurred. 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 39.33 ± 8.06 days vs. RP Group 39.33 ± 5.09 days; $p = 1.000$), sex (DY 9F/11M vs. RP 9F/11 M), weight at presentation (DY 3.09 ± 0.59 kg vs. RP 3.08 ± 0.56 kg; $p = 0.975$), symptoms and clinical condition including electrolyte imbalance and acid-base status (all patients were optimally corrected before proceeding to surgery). Both groups were also equal in terms of general anesthesia. 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 ± 0.45 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 (298 ± 57.94 gm vs 193 ± 19.8 gm $p = 0.0014$), after 1 month (676.67 ± 149.84 gm vs 466.67 ± 127.71 gm, $p = 0.0001$), after 2 months (741.33 ± 278.74 gm vs 490 ± 80.62 gm, $p = 0.002$) and after 3 months (582 ± 36.01 gm vs 453.33 ± 51.64 gm, $p = 0.0001$). No long-term complications were reported and no re-do pyloromyotomy was needed.

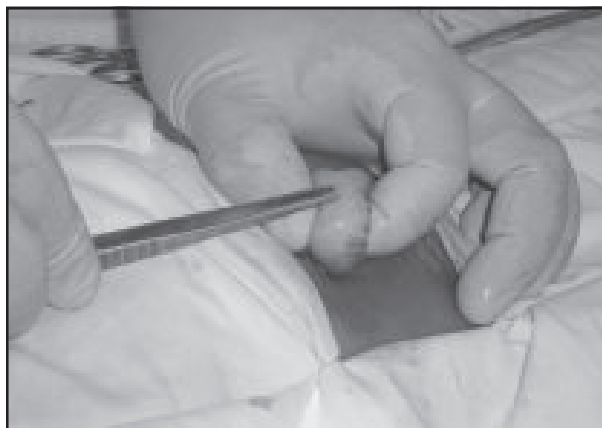


Fig.-1: *Hypertrophied pylorus*

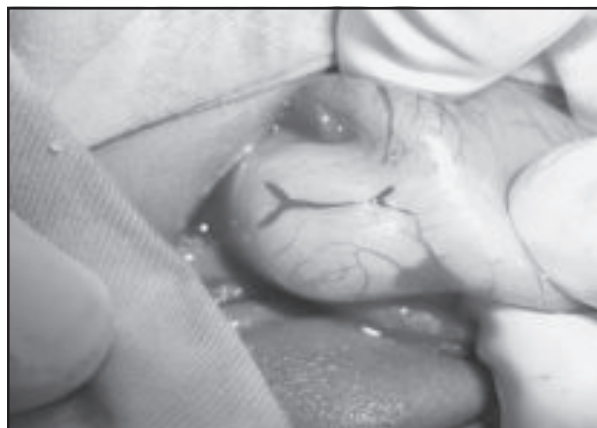


Fig.-2: *Incision along avascular area*



Fig.-3: *Retraction of seromuscular layer*



Fig.-4: *Pouting of mucosa*

Discussion:

Infantile hypertrophic pyloric stenosis (IHPS) was first described by Blair in an autopsy specimen in 1717¹. A few other reports were published over the next 100 years, but the first detailed account was given by Harold Hirschsprung in 1888². IHPS remained an untreatable and usually fatal condition until 1907. First successful surgery was performed by Dufour and Fredet³ in 1908. They suggested splitting the muscle and then suturing transversely. However, in 1912, Ramstedt described his classical operation and stated that there was no need for muscle closure; his procedure has remained in general use up until the present day⁴. IHPS is a common cause of gastric outlet obstruction in infants. Its prevalence ranges from 1.5–4.0/1000 live births among whites, but the incidence is lower in black Americans and Asians. The male to female ratio is between 2:1 and 5:1⁵. The majority of cases present between the 3rd and 5th

week of age, although some cases are diagnosed at birth⁶ and some have even been diagnosed in utero⁷. The exact etiology 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 vs. bottle) and seasonal variability have been implicated⁸. Prenatal prescription of macrolides has been implicated in the pathophysiology of IHPS⁹. Decreased numbers of interstitial cells of Cajal and heme oxygenase-2 have been found in the smooth muscle of IHPS¹⁰. Increased vascularity has been shown to be an integral component of the pylorus in IHPS¹¹. An increased amount of desmin in the hypertrophied pylorus may be the cause of incoordination of contraction and relaxation¹². Management has come a long way from simple observation to treatment with i.v. atropine sulphate,

although this is not favored by most centers¹³. Traumamyoplasty (crushing with Babcock forceps) has been carried out satisfactorily at few centers¹⁴. Endoscopic balloon dilatation and endoscopic pyloromyotomy using endoscopic electro-surgical needle or a sphincterotome¹⁵ have also been described. However surgery remains the mainstay of the treatment and is safely and routinely done at most centers. The classical Ramstedt's procedure is conventionally done through a right upper transverse incision. Tan and Bianchi modified it to be done through a supra-umbilical semicircular incision for better cosmesis¹⁶. An umbilical sliding window technique introduced in Japan has reduced the incidence of postoperative wound infection further than the Bianchi procedure¹⁷. A right semicircular umbilical technique offered superior results, especially for large tumors, compared to Bianchi's procedure¹⁸ 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 route¹⁹. Transumbilical pyloromyotomy has been described as an alternative to laparoscopy²⁰. Since a significant period of time pyloromyotomies have been carried out laparoscopically. Double-Y pyloromyotomy also can be done laparoscopically. In our study postoperative vomiting is significantly less in the double-Y group compared to the Ramstedt procedure group. The weight gain in our patients is comparable to that in a study done a few years ago²¹. Double-Y pyloromyotomy (DY) had proved to be equally safe and efficacious compared to the Ramstedt's procedure. However in a meta-analysis, it was found that the functional outcome of the Double-Y technique was a better to others procedure.

Conclusion:

It 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 Ramstedt's pyloromyotomy where the ends are sharply narrowed. As the end force on the mucosa is divided into 2 directions it may be that the chances of perforation are lower. The method is suitable for both conventional and laparoscopic surgery. A double-Y pyloromyotomy (Alayet's pyloromyotomy) may offer a better functional outcome as seen by the lower frequency of vomiting in our patients. 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 need to be done on this technique to prove its efficacy and establish it as a standard technique for the future.

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