Balloon Catheter Dilatation In Infantile Hypertrophic Pyloric Stenosis (Ihps).

A H SHEIKH M SALEEM M SHAUKAT R ULLAH A RAUF J SADIQ
Department Of Paediatric Surgery Quaid-E-Azam Medical College Bahawal Pur And The Children's Hospital & The Institute Of Child Health Lahore.
Correspondence:To:Dr Muhammad Saleem

This is a prospective study conducted at Mayo hospital Lahore from January 1990 to December 1992. A total of 50 cases were dealt with during this period. The purpose of this study was to evaluate the results of balloon catheter dilatation in IHPS and compare the results with the standard Ramstedt's pyloromyotomy. For study purposes 50 cases were divided into two equal groups. Group 1st was taken as control and Ramstedt's pyloromyotomy was performed in all . Duodenal perforation occurred in two cases and one case had to be reoperated due to intraperitonial haemorrhage. In group 11 balloon catheter dilatation was performed peroperatively by introducing the balloon perorum guided by the operating surgeon into the pyloric canal. Complete disruption occurred in two cases(8%) and partial in 12 cases(48%) . It failed completely in 11 cases{44%}.The effectiveness was 56% opposite to 100% in classical Ramstedt's operation.It is concluded that balloon catheter dilatation is not as effective as the time tested Ramstedt's pyloromyotomy.

Key Words: Infantile hypertrophic pyloric stenosis, congenital hypertrophic pyloric stenosis, Ramstedt's pyloromyotomy, Balloon catheter dilatation in IHPS, Gastric outlet obstruction.

Infantile hypertrophic pyloric stenosis is the most common cause of gastric outlet obstruction in infancy[1]. Balloon catheter dilatation has been used for treatment of cardiac achalasia and gastric outlet obstruction in children[2,3] as well as in adults[4,5].We have evaluated the safety and and efficacy of balloon catheter dilatation in IHPS. We compared the results with Ramstedt's pyloromyotomy.

Materials And Methods:

A prospective study was conducted at the department of paediatric surgery Mayo hospital Lahore from January 1990 to December 1992. During this period a total of 53 cases were admitted in the unit with the provisional diagnosis of IHPS. Three patients were excluded from the study because one died due to aspiration pneumonia and the other two refused surgical treatment. The remaining 50 cases were divided in two groups comprising of 25 cases each. Allocation into groups was random.

Detailed history, clinical examination and laboratory investigation including blood count, serum electrolytes, and arterial blood gas analysis were done in all cases. All the patients had an ultrasound scan of the abdomen. If ultrasound and clinical examination were negative then only a contrast study was performed. After resuscitation the patients were operated upon.

Table 01 Specification Of Balloon Catheter

Balloon catheter	Medi-Tech-Inc.	Cook-Medi-Inc
Balloon length	3 cm	3 cm
Inflated diameter	15 mm	20 mm
Catheter length	100 cm	100 cm
Catheter size	8 Fr	8 Fr

All patients assigned to group 1 had a standard Ramstedt's pyloromyotomy. Patients allocated to group 11 were subjected to balloon catheter dilatation. The balloon catheter was passed orally by the anaesthetist and guided into position by the operating surgeon peroperatively.

Two different sized balloon, one by Medi-Tech-Inc and other by Cook-Medical -Inc USA were used.

The hand inflation syringe and pressure gauge monitor were devised by the author. The syringe is used to inflate the balloon slowly and steadily and to maintain the required pressure in balloon for the required length of time. The pressure gauge is used to measure the pressure in the balloon. The procedure was done under general anaesthesia. After opening the abdomen by an upper transverse incision, the balloon is passed by the anaesthetist and guided by the operating surgeon in the narrowed pylorus. Then it is inflated with air by using a syringe. A maximum of 35 Psi pressure is used for 2 minutes. The pylorus is observed by the surgeon for grading the results.

The results are evaluated and declared successful if it fulfil the following criteria:

1. Complete or partial disruption of hypertrophic pyloric musculature which is seen visually by change of colour, it changes to pink from the original white at the site of disruption.
2. The surgeon can actually feel the disruption on palpation.
3. Free passage of air and fluid into the duodenum from the stomach.

If the above mentioned criteria are not fulfilled the procedure is declared unsuccessful and pyloromyotomy is performed in the same sitting.

Feeding Is started after 24 hours of operation. The volume and osmolarity is gradually increased as tolerated by the patients.

Results:

In the first group duodenal perforation occurred in two cases(8%). It was repaired with 4/0 silk. One case (4%) had to be reexplored due to intra peritonial haemorrhage .The procedure is successful in all cases. In the second group complete disruption of pyloric muscle occurred in only two cases(8%), and partial disruption occurred in 12 cases(48%). In group 11, in one case with partial disruption, pylorus was perforated because of rupture of balloon needing repair and Ramstedt's pyloromyotomy . The procedure failed completely in 11 cases(44%) { Table 2} and Ramstedt's pyloromyotomy had to be performed in all these cases.

Table 02 Results of balloon catheter dilatation.n=25

Status of pylorus	No of patients	%age
Complete split of pyloric musculature	02	08
Partial split	12	48
No split	11	44
Balloon rupture	01	04

Table 03 Operative Complications Of Both Procedures n=25

Complications	Ramstedt's pyloromyotomy n=	%age	Balloon catheter dilatation n	%age
Duodenal mucosal perforation	02	08%	00	00%
Balloon rupture & pyloric perforation	00	00	01	04%
Intra pertonial bleeding	01	04%	00	00%

Feeding was started after 24 hours in both groups. Vomiting was a major problem in group two. Those patients(12) who needed operation after failure of balloon dilatation were excluded from the study. Majority of the patients suffered from either grade 2 or grade 3 vomiting and some had grade 4 vomiting. In group one majority of patients suffered from grade 1 or 2 vomiting as reflected in table {3}. The vomiting settled in a few days.

Table 04 Grades Of Vomiting

Grade of vomiting	Ramstedt's pyloromotomy n= 25		Balloon catheter dilatation n=13	
	No of patients	%age	No of patients	%agee
1st	04	16%	00	00%
2nd	18	72%	06	46.15%
3rd	03	12%	05	38.46%
4th	00	00%	02	15.38%

Wound infection occurred in 3 cases (12%) in group 1 and in 3 cases(23.07%) in group 11. Wound dehiscence occurred in one case (4%) in group 1. One patient died in immediate postoperative period in each group. The patient in group 1 died due to septicaemia on 5th postoperative day. The patient in group 11 died due to complication of anaesthesia. He never recovered from anaesthesia and died on 7th postoperative day. {Table 4}

The mean duration of procedure was 25 minutes in group 1st and 62 minutes in group IInd.

Table 05 Early Postoperative Complications Of Both Procedures

Complications	Ramstedt's pyloromyotomy(n=25)		Balloon catheter dilatation(n=13)	
	No of patients	%age	No of patients	%age
Wound infection	03	12%	02	15.38 %
Wound dehiscence	01	04%	00	00%
Death	01	04%	01	07.69 %

Table 06 Duration Of Procedure

Duration of procedure	Group 1st	Group 2nd
Mean duration	25 minutes	62 minutes
Minimum duration	20 minutes	34 minutes
Maximum duration	35 minutes	96 minutes

Average post operative hospital stay was 6.5 days in group 1 and 8.5 days in group 11{Table 6}

Table 07 Post Operative Hospital Stay

Post operative stay	Group 1st	Group 2nd
Mean post operative stay	6.5 days	8.5 days
Minimum post operative stay	03 days	04 days
Maximum post operative stay	16 days	20 days

Discussion:

Gastric outlet obstruction in infancy and childhood can be congenital or acquired[1]. Common congenital causes include antral diaphragm, pyloric web and annular pancreas. Common acquired causes are acid peptic disease and surgery resulting in damage to the vagus nerve, the later being a physiological cause for delayed gastric emptying. IHPS is the commonest cause of gastric outlet obstruction in this age group[1].

In early 20th century mechanical dilatation was tried by Nical J[6] and Burghard FF[7] for the treatment of this condition independently without much success. Ramstedt's pyloromyotomy introduced in 1912 became the standard treatment subsequently[8]. Lately laparoscopic pyloromyotomy has been reported with successful results[9,10].

Balloon catheter dilatation has been described for the treatment of cardiac achalasia and gastric outlet obstruction in adults with good results[4,5,11]. In children there has not been sufficient experience with this technique. Heyman's et al in 1990 presented the first report of successful treatment of gastric outlet obstruction by balloon catheter dilatation in children[3]. Later on Chan and Saing also reported the similar results with balloon

catheter dilatation for pyloric stenosis in children due to acid peptic disease[12]. Results of our series do not compare favourably with Heyman's and Chan's experience. We had a limited success and only in 8% of cases a complete disruption and in 48% cases partial disruption of pyloric musculature could be achieved. In 44% of cases there was a complete failure of the procedure and pyloromyotomy had to be performed. These obviously cannot be compared with Ramstedt's operation.

The complications noted in group 11 were higher than in group 1st. . The reported incidence of post operative vomiting varies from 65 to 90% and it is serious in 10% of cases[13]. In our series in group 1st, 72% of the patients vomited occasionally and no modification in feeding schedule was required. While 12% of the patients in group 1 showed more frequent vomiting and needed modification in feeding schedule. In group 11, 100% of the patients had vomiting with majority of patients having grade 11 and 111 vomiting. Fifteen percent of the patients had grade 1V vomiting. All patients with vomiting of grade 11, 111, and 1V needed modification in feeding schedule.

The reported incidence of duodenal mucosal perforation in different series is 2.4%, 7% and 12%[14,15,16] It was 8% in our series in group 1, while in group 11 in one case perforation of pylorus on the antral side along the lesser curvature along with rupture of balloon occurred which had to be repaired. This is a serious complication with 10% mortality if not detected peroperatively.

The incidence of wound infection was 12% in group 1 and 15.38% in group 11. The reported incidence of wound infection is 4%, 9%, and 10% in different series[17,16,15].The incidence of wound dehiscence is reported to be 6.7% by Harvey et al[18]. It was 4% in our series.

The average hospital stay was also higher in group 11 incurring in more financial burden on the parents and hospital. The duration of procedure was 2.5 times long in group 11. There is no need of special surgical instruments in pyloromyotomy . The balloon catheters are very costly and there is a chance of rupture of the balloon, making it necessary to use two such catheters in one patient.

Conclusion:

It is concluded from the above study that;Balloon catheter dilatation is not as effective as Ramstedt's pyloromyotomy.The procedure is more expensive than Ramstedt's operation as special balloon catheters are needed which are expensive.The duration of procedure and post operative hospital stay are longer than standard pyloromyotomy.

References:

1: Markowitz RI, Wolfson BJ, Huff DS, et al: Infantile hypertrophic pyloric stenosis—Congenital or acquired. J Clin gastroenterol: 1982:4:39-44.

2: Boyle JT, Cohen S, Watkins JB: Successful treatment of achalasia in childhood by pneumatic dilatation. J Pediatr: 1981:99:1:35-40.

3: Heymans HAS, Bartelman JWFM, Herweijer TJ: Endoscopic balloon dilatation as treatment of gastric outlet obstruction in infancy and childhood. J Pediatr Surg: 1988:23:2:139-140.

4: Vantrappen G, Hellemans J, Deloof W; et al : Treatment of achalasia with pneumatic dilatation. Gut: 1971: 12: 268.

5: Faca A; Moreno M; Hernandez A: Endoscopic management of pyloric stenosis in patients with high surgical risk. Rev-Gastroenterol Mex. 1993:58:3:223-224.

6: Nicoll J: Congenital hypertrophic stenosis of the pylorus. Br Med J: 1990: 2:571-573.

7: Burghard FF: Contribution to meeting of the clinical sociaty of London . Br Med J. 1907: 1: 627-630.

8: Benson CD: Infantile pyloric stenosis. Historical aspects and current surgical concepts. Prog Pediatr Surg . 1970: 1: 63-80.

9: Alain JL, Grousseau D, Terrier G: Extramucosal pyloromyotomy by laparoscopy. J Pediatr Surg. 1991: 26:10:1191-1192.

10: Greason KI, Thompson WR, Downey FC, Lo-Sasso-R: Laparoscopic pyloromyotomy for infantile hypertrophic pyloric stenosis: Report of 11 cases. J Pediatr Surg. 1996:30:11:1571-1574.

11: Benjamin SB; Glass RL; Cattau EL; et al: Prelaminary experience with balloon dilatation of the pylorus. Gastrointest Endosc. 1984: 30: 93-95.

12: Chan KI, Saing H: Balloon catheter dilatation of peptic pyloric stenosis in children. J Pediatr Gastroenterol Nutr. 1994:18:4:465-468.

13: Spitz L: Vomiting after pyloromyotomy for infantile hypertrophic pyloric stenosis. Arch Dis Child. 1979:54: 886-889.

14: Benson CD: Infantile hypertrophic pyloric stenosis in Welch KJ; Randolph JG; Ravitch MM; O' Neill JA; Rowe MI; (Eds). Pediatric surgery Vol 11, 4th ED. Chicago; Year Book Medical Publishers: 1986: 891-895.

15: Carle G; Davidson AI; Infantile pyloric stenosis in the north east of Scotland. Results of Ramstedt's operation in 264 cases. J. Roy. Coll. Surg. Edin. 1985: 30: 30-32.

16: Dube S; Dube P; Hardy JF; Rosenfeld RE: Pyloromyotomy of Ramstedt.. Experience of non specialized centre. Can. J. Surg. 1990:33: 295-296.

17: Rasmussen L; Hansen LP; Pedersen SA: IHPS: The changing trend in the treatment in a Dansih Country. J. Pediatr. Surg. 1987: 22(10): 953-955.

18: Harvey MH; Humphery G; Fieldman N; George JD; Ralphs DNL: Abdominal wall dehiscence following Ramstedt's operation. A review of 170 cases of CHPS. Br. J. Surg. 1991:78:81-82.