

A Clinical and Study and Management of Idiopathic Hypertrophic Pyloric Stenosis

Dr. Basvantrao Patil^{1*}, Dr. Sharanabasappa Harwal², Dr. Amey Talpallikar³

¹Assistant professor, dept of General Surgery, M R M C, Kalaburagi, Karnataka, India

²Professor & dean, dept of general surgery, M R M C, Kalaburagi, Karnataka, India

³Post graduate, dept of general surgery, M R M C, Kalaburagi, Karnataka, India

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***Corresponding author**

Dr. Amey Talpallikar

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Abstract: Idiopathic Hypertrophic Pyloric Stenosis (IHPS) is one of the causes for vomiting in the newborn. The treatment of this condition had high mortality and morbidity until Ramstedt's showed that pyloromyotomy surgery was curative with no mortality and morbidity. Our aim was to study the clinical course of IHPS, the management and outcome of these cases. A prospective study was conducted between December 2015 to July 2017 over 50 cases, admitted in our health services. After subjecting the patient to clinical examination and investigation for confirming the diagnosis, all were subjected to Ramstedt's pyloromyotomy. In the study of 50 cases; the age of the infants ranged from 2 weeks to 12 weeks. Maximum number of cases i.e., 20 (40%) were between 2 to 4 weeks of age. The condition was more common among males than in females with a ratio of 4:1. All the patients presented with vomiting and visible peristalsis dehydration was seen in 42(84%) cases, palpable lump in 34 (68%) cases. Ultrasound abdomen was the investigation of choice and as done in all infants. The pyloric muscle thickness of >3mm was considered diagnostic. Barium meal and air contrast x-ray were other investigation carried out. After correcting the dehydration all the patients were subjected to Ramstedt's Pyloromyotomy. Ramstedt's pyloromyotomy is a curative treatment with no mortality and very low morbidity.

Keywords: Idiopathic hypertrophic pyloric stenosis; Ramstedt's pyloromyotomy.

INTRODUCTION

Idiopathic hypertrophic pyloric stenosis (IHPS) is a common condition affecting young infants. Despite its frequency, it has been recognized only for a little over a century.

Nevertheless, understanding of the condition and of effective treatment has undergone a remarkable evolution in the 20th century, reducing the mortality rate from over 50% to nearly 0%.

In idiopathic hypertrophic pyloric stenosis the antro-pyloric portion of the stomach becomes abnormally thickened and manifests as obstruction to gastric emptying. Typically, infants with IHPS are clinically normal at birth; during the first few weeks of post-natal life, they develop non-bilious forceful vomiting described as "projectile". Gastric outlet obstruction leads to emaciation and if left untreated, may result in death[1].

The incidence of IPHS is approximately 2 to 5 per 1000 births per year in most white population, although it varies with the geographic area. It commonly affects the first born male child with a male to female ratio of approximately 4 to5:1[2].

The visible peristaltic waves are usually seen in left upper abdomen. The clinical diagnosis hinges on palpation of the thickened pylorus or olive shaped mass.

IHPS is not a surgical emergency, but it may be a medical emergency requiring aggressive intravenous resuscitation in a dehydrated and metabolically disordered infant. Surgical treatment is curative[3]. Ramstedt's pyloromyotomy is the procedure of choice with minimal morbidity and no mortality.

OBJECTIVES

- To study the clinical course of IHPS.
- To study the management and outcome of these cases.

One of the causes for vomiting in the newborn babies is idiopathic hypertrophic pyloric stenosis (IHPS). If this condition is not recognized early, will leads to electrolyte imbalance (hypokalemic, hypochloremia, and metabolic acidosis), hypoglycemia and death.

Management of IHPS involves a simple surgery called Ramstedt's pyloromyotomy, after correcting the dehydration.

Hence, early recognition of IHPS, proper pre-operative fluid resuscitation, surgery and food postoperative care will definitely reduce the mortality and morbidity.

MATERIALS AND METHODS

The present prospective study has been conducted from December 2015 to July 2017. All the patients admitted to our medical services in Basaveshwar Teaching & General Hospital, Gulbarga with a clinical diagnosis of IHPS have been the topic of study.

There were in total 50 cases of IHPS. The diagnosis was made on the clinical grounds and confirmed by radiological and ultrasound studies. Patients with other clinical conditions mimicking IHPS were not included in the study.

A detailed history was taken in a systematic and chronological order as soon as patient was admitted. A thorough clinical examination was carried out to establish clinically the presence of IHPS. It was later confirmed by radiological investigations.

The information sought in IHPS was,

- Type of vomiting, its quantity, color and contents.
- Visible peristalsis
- Tumor
- Signs and symptoms of dehydration.

A meticulous physical examination after a detailed history is most of the time sufficient to establish the diagnosis of IHPS. After the initial examination, all the findings were recorded. These baseline findings were useful for comparison in cases, which require repeated examination for diagnosis and to study the progress of the disease.

RESULTS

This present prospective study of idiopathic hypertrophic pyloric stenosis is conducted during December 2015 to July 2017. In all 50 patients with IHPS, admitted in Basaveshwar Teaching & General Hospital, Gulbarga.

In the present series of 50 cases the age of the patient ranged from 2 weeks to 12 weeks at the onset of the condition.

Table-1: Age Distribution of cases

Age in weeks	No. of Cases	Percentage
2-4	20	40
5-7	16	32
8-10	8	16
11-12	6	12
Total	50	100

In the present study maximum i.e., 20 (40%) cases were between 2-4 weeks of age, followed by 16 (32%); 8 (16%) and 6 (12%) infants, were between 5-7, 8-10 and 11-12 weeks respectively.

As compared to the occurrence of the idiopathic hypertrophic pyloric stenosis in first born, my study indicates as follows:

Table-2: Birth order of cases

Birth order	First		Second		Fourth		Five & above		Total	
	No	%	No	%	No	%	No	%	No	%
Male	20	40	14	28	2	4	4	8	40	80
Female	06	12	2	4	2	4	-	-	10	20
Total	26	62	16	32	4	8	4	8	50	100

Amongst 50 cases 40 were males and 10 were females. The ratio of occurrence in male: female stands 4:1. Among them 20 were first-born males, 6 were first-born females, 14 were second born males and 2 females. 2 were the fourth born males and 2 female issues. 4 of them, both males were of 5th and above in their birth order.

So the occurrence of IHPS in first born male stands at 40 percent in this study.

Religion

Of the 50 cases, 34 were Hindus and 16 being Muslims.

Symptoms and Signs

The symptoms in this case study varied from 1 week to 7 weeks. The following are the symptoms with which the patients presented.

The common symptoms in all patients were projectile vomiting and left to right visible gastric peristalsis. Dehydration was the next common presentation seen in 42(84%) patients varying from mild to severe degree.

Table-3: Religion wise distribution of infants

Religion	No. of Cases	Percentage
Hindu	34	68
Muslims	16	32
Total	50	100

Table-4: Signs and Symptoms

Symptoms	No. of Cases	Percentage
Projectile vomiting	50	100
Visible gastric peristalsis	50	100
Dehydration	42	84
Palpable lump	34	68
Constipation	04	08
Jaundice	02	04
Other symptoms	04	08
Total	50	100

Pyloric tumor was palpable in 34 (68%) cases usually after vomiting. Constipation occurred in 04 (8%) patients who had severe dehydration. Four (8%) patients had associated symptoms like hiccough, dyspnea, bronchitis and respiratory tract symptoms. Two children presented with jaundice.

blood urea, serum creatinine, serum electrolytes and blood grouping. Hemoglobin was between 9 and 18 gram percent.

Investigations

Investigations were carried out in all the 50 cases to rule out any other causes of pyloric obstruction. Following are the investigations performed routinely.

The WBC count varied from 5,800 to 9,500 cells/ curnm indicating to be a normal limit in all the 50 cases. Blood urea, serum creatinine and blood sugar tests were found to be normal in all the cases. This was done to rule out any co-existing diabetes or renal disease.

Complete Hemogram: Hemoglobin percentage, total count differential count, ESR, RBS,

Blood Grouping: The blood grouping study shows as follows

Table-5: Blood Group

Blood group	No.	Percentage
'O' positive	38	76
'A' positive	06	12
'B' positive	02	4
'AB' positive	02	4
'O' negative	02	4
Total	50	100

76% of cases had 'O' positive, indicating its preponderance in patients with idiopathic hypertrophic pyloric stenosis.

- Barium Meal: It was done in 12 cases after a thorough stomach wash. 8 cases were referred to us with this investigation already done. Depending on the narrowing of the pylorus, the X-ray showed following features:
 - Dilated stomach
 - Narrowed pylorus

- Rat tail sign or string sign.
- Double tract appearance
- Beak sign at the junction of stomach and the antrum.
- Mushroom effect of pyloric mass indenting duodenal cap.
- Delayed emptying of the stomach, showing little or no barium distally.
- Prior to surgery, care was taken to see that all the barium was washed out by Ryle's tube irrigation.

- Air Contrast X-Ray of Abdomen: 15 patients underwent this study. Through the nasogastric tube about 50-60cc of air was injected and plain x-ray of the abdomen was taken. The findings were:
 - Dilated stomach.
 - Delayed emptying of the stomach with little air seen distal to the pylorus.
- Ultrasonography: All the 50 cases were subjected to non-invasive, cost effective Investigation of

ultrasound, which now is the investigation of choice in IHPS. The findings were;

- Dilated stomach.
- Thickened pylorus measuring > 3 mm
- Elongated pyloric channel measuring > 16 mm.

Treatment

Out of 50 patients, 16 had been referred to us with the diagnosis of IHPS i.e., 32% of cases

Table-6: Type of admission

Type of admission	Number	Percentage
Referred	16	32.0
Direct	34	68.0
Total	50	100

After admitting the patients, all were subjected to routine investigations. Surgery was never hurried because we came to a conclusion that pre-operative preparation for the patient is a must for a better outcome post-operatively.

The standard pre-operative management followed in our studies was as follows: Correction of dehydration, electrolyte imbalance and secondary infection:

- Ryle’s tube aspiration and stomach wash with normal saline.
- 250-500cc electrolyte-P, IV in 24 hours.
- Injection KCl 10-20 mEq/Kg in drip.
- Injection calcium gluconate 2-3 cc in drip.
- Injection ceftriaxone 75 mg/ Kg body weight/ day IV in two divided doses.
- Injection gentamycin 2-5 mg/Kg body weight/ day IV in two divided dose.

Occasionally

- Injection deriphylline I mg/kg/dose
- Injection sodium bicarbonate 1mEq/kg/dose
- Blood transfusion 20ml/kg— given in 3 patients.

Preoperative Preparations

- Nil by mouth
- Stomach washes with normal saline.
- Written consent

Operative Procedure

All the patients in my study underwent Ramstedt’s pyloromyotomy. The surgery was performed under general anesthesia and local anesthesia with intravenous sedation. All were opened through a transverse right subcostal skin incision.

After the skin incision was made all the layers were cut in the line of incision and stomach was picked by the greater curvature and traced down to the tumor. After holding the tumor firm an incision was made on the avascular area and by the help of back of the scalpel

handle and an artery forceps the musculature was separated till the mucus membrane bulged out. Care was taken not to intervene at the duodenal end too much because the musculature their being very thin and curving. Hence, there was every chance of perforating the mucosa. Only 4 cases in our study were perforated, but were closed by 3-0 vicryl. Hemostasis was maintained throughout the procedure. Wound was closed in layers, soft tissue with vicryl and subcuticular skin suture with 4-0 prolene suture materials.

Complications

- Four cases had perforation of the duodenal mucosa, intraoperatively.
- Two had bronchial spasm due to aspiration of the gastric contents, postoperatively.
- Wound dehiscence was seen in no cases.

Post-Operative Management

The nasogastric tube was kept for 6 hours postoperatively and then removed as feeding were initiated. It was delayed by 24 hours further in the patients who had perforation of duodenal mucosa.

Routine Management Included

- TPR chart.
- Input/Output chart
- Injection ceftriaxone 50—75 mg/Kg/day in 2 divided doses.
- Injection metrogyl 15-20 mg/Kg/day in 3 divided doses.
- Injection paracetamol 5mg/kg/dose IM.
- Injection ranitidine 2mg/kg/day in divided doses.
- Injection Metachlorpropamide (perinorm) 0.1 mg/kg/dose
- Isolyte-P 100 ml/kg IV for 24 hours.

Occasionally

- Injection gentamycin 2-5 mg/Kg/day in 2 divided doses.
- Injection vitamin K intramuscularly.
- Blood transfusion 50 to 100 ml.

- Injection calcium gluconate 2—3 cc in drip IV.

All the patients were discharged from the hospital on the 10th day after sutures were removed. Patients were asked for follow-up after a month for any recurrence or residual of symptoms. All the patients were healthy during the follow-up period without any symptoms or signs, which were advised for one year, follow up.

DISCUSSION

Idiopathic hypertrophic pyloric stenosis is a common condition among the newborn requiring

surgery. IHPS occur most commonly in males. In this study of 50 cases, 40 cases were males and 10 females. In Frieda Hulka study 81% of patients were male infants, 84% patients were male in Kiely PD study as compared to 80% male infants in this study.

In the present study, the male to female ratio was 4:1 with 40 males and 10 females. Maher M showed a ratio of 3.6:1, it was 5.5:1 in Adeistein P study. Chiou JY study showed a high male to female ratio of 11:1, whereas it was 2:4:1 in Yip WC study.

Table-7: Male to Female Ratio

Study	Ratio
Present study	4:1
Maher M <i>et al.</i>	3.6:1
Adeistein P <i>et al.</i>	5.5:1
Chiou J Y <i>et al.</i>	11:1
Yip W C <i>et al.</i>	2.4:1

26 infants (52%) were first born issues among them 20 (40%) were males. In Kiely PD study, 32%

infants were first born, whereas it was 46% in Chiou JY study.

Table-8: Percentage of First born issues

Study	Percentage
Present study	52
Kiely PD <i>et al.</i>	32
Chiou JY <i>et al.</i>	46

In the present study, the age of patients were 2-4 weeks in 20 (40%) of cases. 5 to 7 weeks in 16 (32%) cases, 8 to 10 weeks in 08 (16%) cases. 11 to 12 weeks in 06 (12%) of cases respectively. Indicating that IHPS occurred in patients of age between 2 weeks to 12 weeks in the present study.

The incidence of IHPS decreases as the age of infants increases. In Chiou JY study, 50% of cases had symptoms beginning between age of 2-4 weeks.

All the 50 cases in the present study did present within 2 weeks to 12 weeks of onset of their symptoms. Patients usually presented with:

- Projectile vomiting
- Visible peristalsis
- Dehydration
- Palpable lump (pyloric tumor).

The symptoms that occurred not infrequently were constipation, jaundice, hiccoughs, bronchitis and dyspnea. Projectile Vomiting: This symptom was present in all the 50 cases of pyloric stenosis. This followed immediately after breast feeding. This varied at times from 5 to 11 times a day. Patients used to bring

out whole milk. The milk used to be curdled when it came after few minutes of breast feeding.

The idea derived for occurrence of the vomiting was stretching of the stomach over the obstruction and induction of anti-peristalsis.

Visible Peristalsis

This was as predominant as was projectile vomiting in all the 50 cases of IHPS. Visible peristalsis was usually from left to right. They were found to occur after feeds. It occurs as a ball on the left upper quadrant and disappears at the midline. Other way to initiate to stroke the abdomen, which was done as a routine. In Chiou JY study, the visible gastric peristalsis waves were seen in 41.7% of cases.

Dehydration

Dehydration was seen in all the patients, due to excess of vomiting and decreased retention of gastric content. Signs of dehydration were loss of skin elasticity, sunken eyes, dry tongue, and irritability. There was loss of weight noted.

Pyloric Tumor

Table-9: Palpable Pyloric Tumor

Study	Percentage
Present study	68
Lemessa D <i>et al.</i>	35.3
Chiou J Y <i>et al.</i>	66.7
Yip WC <i>et al.</i>	91.7
Maher M <i>et al.</i>	92.6

Out of 50 cases, palpable pyloric lump was possible in 34 cases (68%). It was felt as a firm round structure. This was felt in the upper abdomen towards the right half and felt clearly after a bout of vomiting. It was palpable in 35.3% cases in Lemessa D study, 66.7% in Chiou JY study, 91.7% in Yip WC study, whereas it was 92.6% in Maher M study compared to 68% in our study.

Constipation and Jaundice

Only 8% of cases had constipation as a result of excessive vomiting.

Investigations

All the patients were thoroughly investigated. Most of the patients had no evidence of anemia, except for two cases, but they did present with variable degrees of dehydration from mild to severe.

Leucocyte count and ESR were normal but were high in 2 cases that had symptoms of respiratory infections. None of the patients had any systemic manifestation of congenital heart disease or any other associated anomalies. The urinary picture provided no significant. Abnormalities but for the acidic picture in cases with severe dehydration

Barium Meal Study

It was conducted in 12 cases, which showed following features:

- Dilated stomach — due to narrowed and elongated pylorus
- Rat tail sign — due to narrowed and elongated pylorus
- Double track appearance — due to narrowed and elongated pylorus
- Shouldering effect of the antrum.

- Delayed emptying even after 45 minutes to 1 hour.

Ultrasonography

Ultrasound examination was carried out on all 50 cases. USG was accurate, rapid, non-invasive imaging technique, which was the investigation method of choice.

USG shows distended stomach, hypertrophied pyloric musculature with intervening mucosa crowded, thickened to a variable degree, and protruding into the distended portion of the antrum (the Nipple sign). The length of the hypertrophied canal is variable and may range from as little as 14mm to more than 20mm. The muscle thickness which is more reliable, ranging between 3 and 4.5mm.

Treatment

As nonoperative management is only to correct the electrolyte imbalance, dehydration, anemia, malnutrition, the definitive treatment to date stands to be operative one. This was an accidentally discovered one by Ramstedt. Hence, it is named as Ramstedt's pyloromyotomy.

All patients were given pre-operative care and subjected to Ramstedt's pyloromyotomy. The basic principle of the operation being that the hypertrophic musculature was incised and spread till the mucosa bulged out of the wound, hence dilating the pyloric canal.

Feeding was started postoperatively after 24 hours and delayed for 48 hours in 4 patients (8%) who had duodenal mucosal injury.

Table-10: Intraoperative complications (Mucosal injury)

Study	Percentage
Present study	08
White JS <i>et al.</i>	19
Zeidan B <i>et al.</i>	08

In white JS *et al.* study mucosal injury was seen in 19% of cases, whereas it was 8% in Zeidan B et al study group patients. No patients had wound dehiscence post operatively i.e., 0% of cases.

Table-11: Post-operative wound dehiscence

Study	Percentage
Present study	0.0
White JS <i>et al.</i>	1.9
Zeidan B <i>et al.</i>	0.0

In White JS *et al.* study this complication was seen in 1.9% of infants while it was 0% in Zeidan B *et al.* study. Vomiting receded and all patients gained weight post operatively.

CONCLUSION

The present study sample included 50 infants, who presented with vomiting in early post-natal period of life. The incidence of IHPS was more in males than in females. The condition commonly affects first born child.

All patients presented with vomiting and the age at presentation ranged between 2 weeks to 12 weeks. Visible peristalsis was seen in all infants typically after feeding the child. Dehydration was next common symptom seen in 84% of cases, while palpable lump was present in 68% of cases.

Routine blood and urine investigations were carried out on all infants. All the patients were subjected to ultrasound abdomen and the measurement of pyloric thickness of >3mm was considered diagnostic. Barium meal and air contrast x-rays were carried out in some patients to rule out other causes leading to vomiting.

Surgery was never hurried in any case. Medical treatment was given in the dehydrated infants and the general condition stabilized. Ramstedt's pyloromyotomy was performed in all the infants and there was no mortality.

However, four infants had duodenal mucosal injury intraoperatively, which were promptly treated. So IHPS is a condition, if recognized early and subjected to Ramstedt's pyloromyotomy after correcting the medical condition, has no mortality and very low incidence of morbidity.

LIMITATIONS

- The cases admitted in other hospital/nursing homes could not be included in the present study, because of time constraints and operational feasibility.
- The investigations Barium Meal and Air Contrast X-ray could not be done in all the cases because of the financial constraints and physical condition of the patient.

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