

# Introduction of transumbilical surgical access in patients with hypertrophic pyloric stenosis at Karl Heusner Memorial Hospital

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## Abstract

Hypertrophic pyloric stenosis is one of the most common surgical diseases in young infants. A descriptive study was carried out including eleven infants diagnosed with hypertrophic pyloric stenosis, who underwent surgery at the Karl Heusner Memorial Hospital in Belize City, from March 2018 to February 2019. The incidence of this condition was high compared to international reports. Males were predominant, and the average age was 33.5 days. The most frequent symptom was non-bilious vomiting and the pyloric olive was not palpated in most cases. Preoperative electrolyte imbalances were uncommon. Abdominal ultrasound was the confirmative study in all cases. The transumbilical surgical access described by Tan and Bianchi was performed for the first time in this institution, with excellent cosmetic results and no increase in morbidity. Only one patient had dehiscence of the wound with evisceration that required reoperation. The average hospital stay was 3.9 days. No other complications or mortality were reported. Transumbilical access represents a safe and effective route for the surgical treatment of this condition.

## Keywords

hypertrophic pyloric stenosis, infants, surgery

## ■ INTRODUCTION

Hypertrophic pyloric stenosis (HPS) is one of the most common surgical conditions in newborns and young infants. It is reported to occur at a rate of 1 to 4 per 1000 live births, especially in Caucasian population. Males are more often affected than females in a ratio of 1 out of 4, as well as first born infants.(1).

It is not really a congenital malformation but a genetically programmed condition that causes progressive hypertrophy of the pyloric muscular layer resulting in obstruction of the gastric outlet. As a consequence, these babies start with non-bilious vomiting usually around the second week of

life, but the onset could be later in preterm infants. Other symptoms include constipation and less frequently diarrhea. Dehydration and malnutrition are often found in late diagnosed cases.(1,2) Palpation of the pyloric olive has been replaced by the use of ultrasound that confirms the diagnosis with high accuracy.(3)

After being described by Ramsted, extramucosal pyloromyotomy has become the gold standard for the treatment of these patients. Pyloromyotomy can be performed by the standard open technique or by the minimally invasive approach.(4) In 1986, Tan and Bianchi described a circumumbilical incision to access the peritoneal cavity, which was performed in 40 patients with good results.(5)

There were no reports of this access route having been used in Belize, and, since there are no technical resources for the

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laparoscopic approach, this variant represents an alternative to conventional laparotomy, with the advantage of being less invasive and having excellent aesthetic results.

The aim of this study was to characterize the patients diagnosed with hypertrophic pyloric stenosis operated by transumbilical access.

## METHODS

A cross-sectional descriptive study was carried out in children who underwent extramucosal pyloromyotomy by transumbilical access at the Karl Heusner Memorial Hospital from March 2018 to April 2019.

There were 13 patients with positive ultrasonographic diagnosis of HPS in the period of study. Two of them were excluded. The reasons for exclusion were the use of a transverse incision and the finding of duodenal stenosis after laparotomy. Finally, 11 patients were included.

All data were taken from the clinical charts and Belize Health Information System (BHIS) records. The variables included were: age, sex, symptoms, signs, electrolyte panel results, complications, hospital stay, incidence and mortality. Descriptive statistics that include absolute and relative frequencies of the variables, measures of central tendency (arithmetic mean and standard deviation) were used. Verbal and written consent were obtained from parents before performing the procedure. All the information was exclusively used for the purpose of the study.

## RESULTS

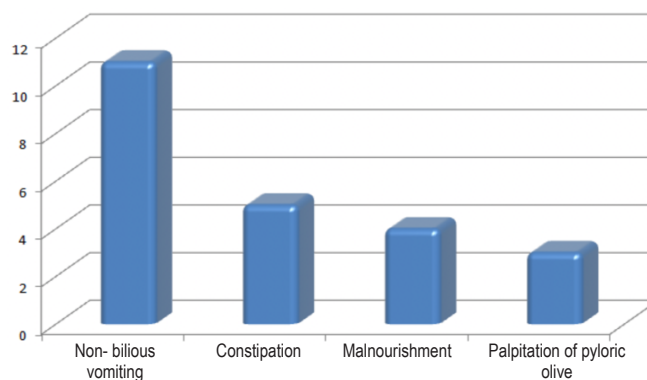
Table 1. Distribution of patients according to age and sex

Sex	Male		Female		Total	
Age (days)	No.	%	No.	%	No.	%
0-14	-	-	1	9,1	1	9,1
15-28	3	27,3	-	-	3	27,3
29-45	5	45,5	-	-	5	45,5
46-60	1	9,1	1	9,1	2	18,2
Total	9	81,8	2	18,2	11	100

Source: Clinical charts, BHIS

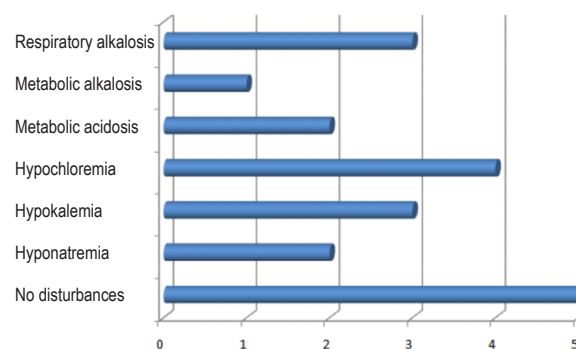
Regarding age, most of the patients were diagnosed after the second week of life, with a peak from 29 to 45 days, representing 45.5 %. The age average was 33.5 days (std.  $\pm 11.9$ ). Male patients were predominant, 9 (81.8 %) and 2 females (18.2 %).

As widely described in the literature, non-bilious vomiting was present in all patients included in the study. Five out of eleven had constipation (45.5%) and the pyloric olive was palpated only in three (27.3 %).



Source: Clinical charts, BHIS

Graphic 1. Distribution of infant mortality according to gestational age, Belize District 2016-2018



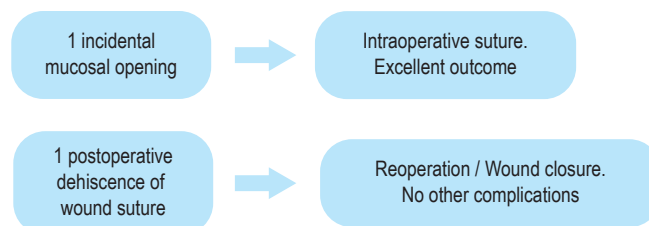
Source: Clinical charts, BHIS

Graphic 2. Distribution of infant mortality by sex, Belize District 2016-2018

Almost half of the patients had no electrolyte imbalance prior to surgery (45.5 %). The most common disturbances were hypochloremia, diagnosed in 4 patients (36.4 %), followed by hypokalemia and respiratory alkalosis (3 cases each, 27.3 %).

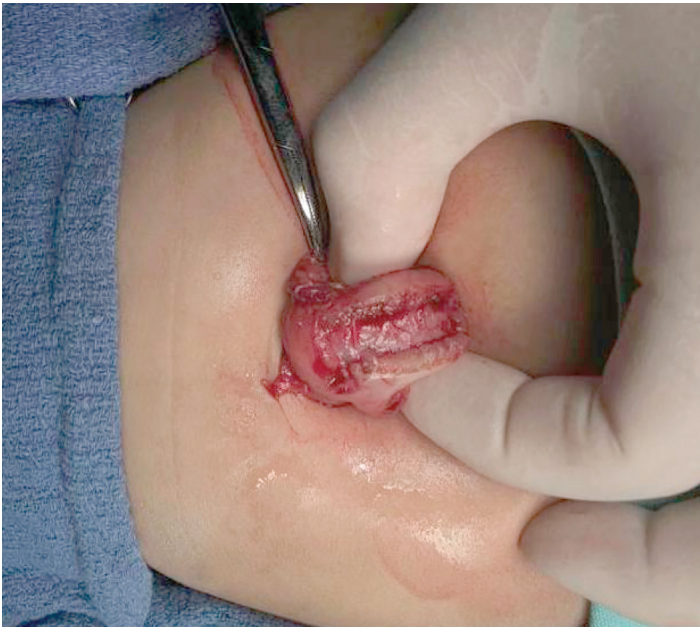
In all cases, pyloromyotomy was performed extracting the pyloric olive from the peritoneal cavity, with or without extension of the cutaneous wound in the midline. (Picture 1).

Complications related to surgery occurred in 2 out of 11 infants (18.2 %); however, they did not depend on the type of surgical approach. One patient had an incidental opening of the duodenal mucosa that was identified and sutured



Source: Clinical charts, BHIS

Graphic 3. Intra and postoperative complications and their management



Picture 1. Pyloromyotomy



Picture 2-Cosmetic result 10 days after surgery

immediately. No postoperative complications were found in this patient. The other case required reintervention on the second day after surgery due to evisceration. After wound closure, the outcome was successful. No incomplete pyloromyotomy or postoperative peritonitis was found.

Pictures 2 and 3 show an example of the cosmetic results achieved with this approach. The first one was taken 10 days after surgery and the second one two months later. The visible scar is less evident than with the classic transverse incision.

With reference to the hospital stay, 6 patients, representing 54.5 %, were admitted for 3 days or less after surgery was performed. The average stay was 3.9 days. The longest stay was related to complications in two patients, 6 and 8 days, respectively.

The incidence of HPS in the period studied was 1.36 per 1000 live births. No mortality associated to this disease was reported.

## ■ DISCUSSION

The incidence of HPS varies depending on sex, ethnicity and other epidemiological factors (1,2). One of the biggest studies published on the prevalence of HPS was conducted in the United States from 1999–2010, and the overall prevalence was estimated as 2.01 per 1000 live births (6). Our results do not differ from the ones reported in the literature.

Some theories have been postulated to explain the hypertrophy of the pyloric muscle at this specific age. The possible association between the use of macrolides and HPS has been reported. A meta analysis published in 2019 concluded that there is an association between erythromycin use during infancy and HPS development in



Picture 3. Cosmetic result 2 months after surgery

infants. However, no significant association was found when macrolides were used during pregnancy or breastfeeding.(7) On the other hand, the theory of hyperacidity has been recently highlighted.(8)

The classic age at diagnosis is around the sixth week of life, but in preterm babies, the onset can be as late as in the third month. Constanzo et al. reported that a greater degree of prematurity was associated with an older chronological age of presentation ( $P < 0.0001$ ). In that study, prematurity was significantly associated with an increase in overall postoperative morbidity.(9)

Proper identification of the symptoms is essential. Even though these have been described centuries ago, late



diagnosis is still occurring.(1,10) This leads to severe electrolyte balance repercussions that could be life threatening.(11)

Shankar et al., carried out a study comparing the results of umbilical pyloromyotomy and previously published laparoscopic pyloromyotomy studies.(12) They concluded that the umbilical approach is a reliable alternative to laparoscopy, with similar surgical time and excellent cosmetic results. Huddart SN et al. compared circumumbilical vs. transverse approach, with a higher incidence of wound infection in the first group, but less incidence of postoperative hernia (13). Others (14) have compared laparoscopic and modified Bianchi approaches with similar results regarding intraoperative complications and postoperative outcomes.

One disadvantage of the circumumbilical access is that delivering a large pyloric tumor into the wound to perform the pyloromyotomy, can be fairly difficult and time consuming and may damage the gastric or duodenal serosa by tearing. An alternative to the classic technique was moving the incision to the right, opening the sheath of the rectus abdominis muscle and accessing the peritoneal cavity through a vertical incision (14-17). The pylorus could be delivered in all our patients; however, in three cases due to the size of the olive, a longitudinal extension of the skin incision was necessary, as described by Besson et al.(18) At the moment of wound closure, a skin plasty was done to avoid excessive scarring.

Recent randomized controlled trials have demonstrated the safety and efficacy of laparoscopic pyloromyotomy.(19,20) However, in limited resource settings, the tendency should not only be to follow these most up to date sources, but to find solutions that improve patients' care at low costs and with adequately trained human resources (21,22).

## ■ CONCLUSIONS

Most of the patients treated were male and between 29 to 45 days of age. All of them presented with non-bilious vomiting and half of them had electrolyte imbalances on admission. There were few complications related to surgery, which were properly treated and the final results were good. Tan-Bianchi transumbilical incision was effectively performed in this period with good postoperative and cosmetic results

### **Introducción de la técnica de acceso quirúrgico transumbilical en pacientes con estenosis hipertrófica del píloro en el Karl Heusner Memorial Hospital**

#### **Resumen**

*La estenosis hipertrófica del píloro es una de las enfermedades quirúrgicas más frecuentes del neonato y lactante pequeño. Se realizó un estudio descriptivo en once lactantes con diagnóstico de estenosis hipertrófica del píloro, intervenidos quirúrgicamente en el Karl Heusner Memorial Hospital de la Ciudad de Belice, entre*

*marzo de 2018 y febrero de 2019. La incidencia de esta enfermedad fue alta en comparación con los reportes internacionales. Predominaron los varones con una media de edad de 33,5 días. El síntoma fundamental fueron los vómitos no biliosos y no se palpó la oliva pilórica en la mayoría de los casos. Los trastornos electrolíticos preoperatorios fueron infrecuentes. El diagnóstico fue confirmado por ecografía en todos los casos. Por primera vez en el hospital se utilizó el acceso transumbilical de Tan y Bianchi que tiene resultados estéticos excelentes sin incremento de la morbilidad. Solo un paciente presentó dehiscencia de la herida con evisceración postoperatoria que requirió reintervención. La media de la estadía hospitalaria fue de 3,9 días. No se reportaron otras complicaciones ni hubo mortalidad. El acceso transumbilical constituyó una vía segura y eficaz para el tratamiento quirúrgico de esta enfermedad.*

#### **Palabras clave**

*Estenosis hipertrófica del píloro, lactantes, cirugía*

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