

**Circumumbilical and Laparoscopic
Approaches for Pyloromyotomy in
Management of Infantile Hypertrophic
Pyloric Stenosis**

An Essay

*Submitted for partial fulfillment of
The Master degree in General Surgery*

Presented by

Nader Nassef Guirguis Ibrahim
M.Sc., M.B, B.Ch.

Under supervision of

Prof. Dr. Sameh Abdelhay Abdelhameed

*Professor in Chief of Pediatric Surgery
Faculty of Medicine, Ain Shams University*

Prof. Dr. Ihab Abdelaziz Elshafei

*Assistant Professor of Pediatric Surgery
Faculty of Medicine, Ain Shams University*

Prof. Dr. Hesham Mohammed Abdelkader

*Assistant professor of Pediatric Surgery
Faculty of Medicine, Ain Shams University*

**Faculty of Medicine
Ain Shams University**

2013



*All gratitude to **God** the Almighty for blessing this work, until it reached its end, as a part of his generous help, throughout my life.*

*Really I can hardly find the words to express my gratitude to **Prof. Dr. Sameh Abdelhay Abdelhameed**, Professor in Chief of Pediatric Surgery, faculty of medicine, Ain Shams University, for his supervision, continuous help, encouragement throughout this work and tremendous effort he has done in the meticulous revision of the whole work. It is a great honor to work under his guidance and supervision.*

*I would like also to express my sincere appreciation and gratitude to **Prof. Dr. Ihab Abdelaziz Elshafei**, Assistant Professor of Pediatric Surgery, faculty of medicine, Ain Shams University, for his continuous directions and support throughout the whole work.*

*I am sincerely grateful to **Prof. Dr. Hesham Mohammed Abdelkader** Assistant professor of Pediatric Surgery, Faculty of Medicine, Ain Shams University, for her kind help and constructive suggestions to achieve this work.*

Last but not least, I dedicate this work to my family, whom without their sincere emotional support, pushing me forward this work would not have ever been completed.

Nader Nassef Guirguis Ibrahim

Contents

List of Abbreviations	i
List of Tables	ii
List of Figure-s	iii
Introduction and Aim of the Work.....	1
Chapter 1:- Review of IHPS	
<u>1. Historical Perspective</u>	<u>4</u>
<u>2. Anatomy</u>	<u>6</u>
<u>3. Pathophysiology</u>	<u>10</u>
<u>4. Acid Base Disturbances</u>	<u>12</u>
<u>5. Diagnosis</u>	<u>14</u>
<u>Chapter 1: Management</u>	<u>25</u>
<u>a. Resuscitation</u>	<u>27</u>
<u>b. Surgery</u>	<u>28</u>
<u>* Bianchi</u>	<u>32</u>
<u>* Laparoscopy</u>	<u>49</u>
<u>* Discussion</u>	<u>62</u>
<u>Summary</u>	<u>85</u>
<u>References</u>	<u>87</u>
<u>1. Historical perspective</u>	<u></u>
<u>2. Anatomy</u>	<u></u>
<u>3. Pathophysiology</u>	<u></u>
<u>4. Acid base disturbances in IHPS</u>	<u></u>

Formatted: Line spacing: 1.5 lines

Formatted: Space Before: 0 pt, Line spacing: 1.5 lines

Formatted: Font: 14 pt, Not Bold, Complex Script Font: Simplified Arabic, 14 pt, Not Bold

Formatted: Font: 14 pt, Not Bold, Complex Script Font: Simplified Arabic, 14 pt, Not Bold

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

...matted

Formatted: Line spacing: 1.5 lines

5. Diagnosis

Chapter 2 : Management

a- Resuscitation

b- Surgery

* Bianchi

* Laparoscopic pyloromyotomy

* Discussion

Summary 165

References 186

Formatted: Space Before: 0 pt, Line spacing: 1.5 lines

Arabic Summary --

Formatted: Line spacing: single

List of Abbreviations

IHPS	:	Infantile Hypertrophic pyloric stenosis
LAP	:	Laparoscopic
RUQ	:	Right upper quadrant
UMB	:	Circumumbilical
RP	:	Ramstedt pyloromyotomy
CUI	:	Circumumbilical incision
MOT	:	Mean operative time
LP	:	Laparoscopy
LOS	:	Length of hospital stay
SSFI	:	Supraumbilical skinfold incision

Formatted: Font color: Auto

List of Tables

<u>Table</u>	<u>Title</u>	<u>Page</u>
1	<u>Preoperative Patient Characteristics</u>	64
2	<u>Intraoperative and Postoperative Data Comparison</u>	65
3	<u>Complications</u>	72
4	<u>Operative and perioperative results</u>	73
5	<u>Comparison summary of included studies LP vs OP</u>	75
6	<u>Included studies LP vs OP meta-analysis</u>	76
7	Comparison of time to full feeding	77
8	Comparison summary of included studies LP vs OP	77
9	Included studies LP vs OP meta-analysis	78

List of tables

<i>Table</i>	<i>Title</i>	<i>Page</i>
1		
2		
3		

- Formatted Table
- Formatted: Bullets and Numbering
- Formatted: Bullets and Numbering
- Formatted: Bullets and Numbering

Formatted: Left

List of Figures

<u>Fig.</u>	<u>Title</u>	<u>Page</u>
1	<u>(a) Schematic of gastric segmental anatomy. (b) Endoscopic photograph of open pyloric sphincter.</u>	<u>6</u>
2	<u>Illustration of pyloric antrum in IHPS</u>	<u>8</u>
3	<u>Infant with IHPS</u>	<u>8</u>
4	<u>Endoscopic photograph of pyloric sphincter in a patient with IHPS</u>	<u>9</u>
5	<u>Tubular handling of HCO₃</u>	<u>13</u>
6	<u>Transverse ultrasonographic image in a patient with proven hypertrophic pyloric stenosis demonstrates the target sign .</u>	<u>17</u>
7	<u>Antral nipple sign</u>	<u>18</u>
8	<u>Double track sign on ultrasonography</u>	<u>18</u>
9	<u>Supine radiograph of active gastric peristalsis</u>	<u>22</u>
10	<u>Lateral view from an upper gastrointestinal study demonstrates the double-track sign</u>	<u>22</u>
11	<u>String sign</u>	<u>23</u>
12	<u>Incision of the myotomy</u>	<u>29</u>
13	<u>Bulging of intact mucosa after myotomy</u>	<u>30</u>
14	<u>New modification of circumumbilical incision</u>	<u>34</u>
15	<u>A right semicircular incision is performed at</u>	<u>35</u>

Formatted Table

	<u>umbilical skin fold.</u>	
--	-----------------------------	--

-iii-

List of Figures (Cont.)

<i>Fig.</i>	<i>Title</i>	<i>Page</i>
16	Alberti et al., modification for the Bianchi incision	<u>36</u>
17	(A) Delivery of <u>the stomach and pylorus</u> (B) Pictures after <u>one year follow-up</u>	<u>36</u>
18	<u>Operative field arrangement</u>	51
19	<u>Laparoscopic pyloromyotomy</u>	52
20	<u>An effective pyloromyotomy length in infants undergoing laparoscopic pyloromyotomy</u>	53
21	<u>Photographs of the postoperative incisions</u>	67
22	<u>Typical postoperative appearance 1 year after laparoscopic pyloromyotomy</u>	70

List of Fig.s

<i>Fig.</i>	<i>Title</i>	<i>Page</i>
<u>1</u>		
<u>2</u>		
<u>3</u>		

Formatted: Centered

-iv-

Introduction

Formatted: Line spacing: single

Hypertrophic pyloric stenosis is a common problem that is often seen in daily care in the pediatric surgical unit. The incidence of HPS is approximately 1-3 per 1,000 live births. HPS is seen more often in males, with a male-to-female ratio of 4:1. The surgical treatment of choice in the last century has been the longitudinal splitting of the seromuscular layer of the pylorus without suturing, which is defined as pyloromyotomy, which is known as Ramstedt pyloromyotomy. The gold standard operation for HPS and since then no modification has been suggested to it. (*Oomen et al.,2012*).

The operation traditionally has been performed through a classical right-upper-quadrant (RUQ) transverse incision. This operation is effective at providing excellent exposure of the pylorus but results in an abdominal scar that grows with the patient and becomes quite significant with time, potentially impacting on the psychological well-being of the patient, particularly during adolescence. (*Oomen et al., 2012*).

Circumumbilical incision was introduced in 1986 by Tan and Bianchi, hence it is referred to as the Tan-Bianchi procedure, designed to camouflage the scar within the natural umbilical skin folds. The procedure is increasing in use among surgeons as the umbilical skin-fold incision permits access to the pylorus for pyloromyotomy, whilst leaving an almost undetectable scar (*Tan and Bianchi, 2004*).

Currently the Tan-Bianchi procedure and its subsequent modifications are being used as an alternative to the open abdominal approach in infants with hypertrophic pyloric stenosis. The procedure allows access to the pylorus for pyloromyotomy while effectively hiding the scar within the naturally occurring umbilical folds. Modifications to the technique have been designed in an attempt to optimize the

Introduction and Aim of The Work

efficient removal of larger pyloric masses (*Tan and bianchi, 2004*).

Formatted: Line spacing: single,
Don't adjust space between Latin and
Asian text

An increasing number of pediatric surgeons are using the laparoscopic approach to treat pyloric stenosis. (*Campbell et al., 2002*).

Formatted: Line spacing: single

Laparoscopic pyloromyotomy (LP) was described by *Alain et al., in 1991*. Initial access is through a 2- to 3-mm trocar in the umbilicus, and instruments are placed through 2 tiny incisions in the left and right upper quadrants. The approach is quickly becoming the standard approach at a number of children's hospitals. (*Obinna et al., 2006*).

Formatted: Line spacing: single,
Don't adjust space between Latin and
Asian text

Since then, the laparoscopic approach has gained popularity, and pediatric surgeons around the world have described their experience with this technique. The advantages of laparoscopic pyloromyotomy, however, remain unproven. (*Campbell et al., 2002*).

Formatted: Line spacing: single

There are several modifications to the Ramstedt pyloromyotomy, but it is difficult to determine which of them is the most effective for the treatment of IHPS. The Tan-Bianchi operation offers a better cosmetic result than open Ramstedt pyloromyotomy, but infection, mucosal perforation and prolonged gastroparesis can occur. Laparoscopic approaches are reported to reduce operating time and tissue trauma and offer a better cosmetic result compared to open abdominal access, but scarring is still greater than when using the Tan-Bianchi. (*Tan and Bianchi, 2004*).

Therefore, the original vertical midline incision has evolved to a transverse right upper-quadrant incision and subsequently to a circumumbilical approach. With technological advances and the general increase in minimally invasive surgery, laparoscopic pyloromyotomy has come into

vogue, advocating an improved cosmesis among its potential advantages. (*Denis et al., 2008*).

Formatted: Line spacing: single

Aim of the work

To review literature as regard the circumumbilical and the laparoscopic approaches for pyloromyotomy as regard both operative and postoperative criteria.

Formatted: Font: (Default) Monotype Corsiva, 15 pt, Not Bold, Complex Script Font: Simplified Arabic, 15 pt,

Formatted: (Complex) Arabic (Egypt)

Formatted: Line spacing: single

Review of Literature

Historical

Perspective

Historical Perspective

IHPS is familiar to most pediatric practitioners and is the most common condition requiring surgery in infants. Despite its frequency among Western populations in the northern hemisphere, it was virtually unknown prior to 1627, when a clinical description with survival was reported by Fabricius Hildanus. Over the subsequent 2 centuries, only approximately seven additional cases were described, some without pathologic proof and of doubtful origin.

At the German Pediatric Congress in Wiesbaden in 1887, Harald Hirschsprung described two infant girls with pathologically proved IHPS, and his article, published in 1888, triggered a profusion of scientific interest in the condition. By 1910, approximately 2 decades later, 598 cases had been recognized. Nevertheless, even as late as 1905, its existence was still occasionally doubted.

Formatted: Line spacing: single

As we enter the 21st century, the etiology of the condition remains elusive, yet great strides have been made in the diagnosis and treatment of IHPS. (*Hernanz-Schulman, 2003*)

Formatted: Font: (Default) Monotype
Corsiva, 15 pt, Not Bold, Complex
Script Font: Simplified Arabic, 15 pt,

Formatted: (Complex) Arabic (Egypt)

Review of Literature

Historical

Perspective

Historical Perspective on Diagnosis of IHPS

Practitioner and Year Description:

Formatted: Line spacing: single

- **Fabricious Hildanus, 1627.**
- First reported clinical description with survival
- **Patrick Blair, 1717.**
- Postmortem description, with lack of omentum, which was believed to be related to cause of lesion.
- **Christopher Weber, 1758.**
- Postmortem description.
- **George Armstrong, 1777.**
- Two cases, familial occurrence.
- **Hezikiah Beardsley, 1788.**
- First account in United States: Child died at age 5 years; most likely a case of antral diaphragm.
- **Michael Underwood, 1799.**
- Postmortem description.
- **Thomas Williamson, 1841.**
- Postmortem description.
- **Siemon-Dawosky, 1842.**
- Postmortem description includes “hypertrophy of the submucous cellular tissue”
- **Harald Hirschprung, 1888.**
- Rigorous description of two proved cases.
- Various, 1910 Descriptions of 598 cases
(Hernanz-Schulman, 2003)