



Congenital Inguinal Hernia Repair with and without Opening the Inguinal Canal

Thesis

*Submitted For Partial Fulfillment of
Master Degree in General Surgery*

By

Omar Khaled Ahmed Ali

M.B.B.Ch

Under supervision

Prof. Dr. Alaa Abbas Sabry

Professor of General Surgery

Faculty of Medicine- Ain Shams University

Prof. Dr. Tarek Ahmed Hassan

Professor of Pediatric Surgery

Faculty of Medicine- Ain Shams University

Dr. Ayman Mostafa Allam

Lecturer of Pediatric Surgery

Faculty of Medicine- Ain Shams University

Faculty of Medicine

Ain Shams University

2019

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

لَسْبَدَانِكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

صدق الله العظيم

سورة البقرة الآية: ٣٢

Acknowledgment

*First and foremost, I feel always indebted to **ALLAH**, the Most Kind and Most Merciful.*

*I'd like to express my respectful thanks and profound gratitude to **Prof. Dr. Alaa Abbas Sabry**, Professor of General Surgery Faculty of Medicine- Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

*I am also delighted to express my deepest gratitude and thanks to **Prof. Dr. Tarek Ahmed Hassan**, Professor of Pediatric Surgery Faculty of Medicine- Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

*I am deeply thankful to **Dr. Ayman Mostafa Allam**, Lecturer of Pediatric Surgery Faculty of Medicine- Ain Shams University, for his great help, active participation and guidance.*

Omar Khaled Ahmed Ali

List of Contents

Title	Page No.
List of Tables	i
List of Figures	ii
Introduction	1
Aim of the Work	3
History	4
Review of Literature	
▪ Anatomy	6
▪ Embryology	13
▪ Pathophysiology	17
▪ Epidemiology	21
▪ Diagnosis	23
▪ Complications	28
▪ Surgical Techniques of Hernia Repair	35
Patients and Methods	43
Results	52
Discussion	60
Summary and Conclusion	64
References	66
Arabic Summary	—

List of Tables

Table No.	Title	Page No.
Table (1):	Comparison between group A AND group B regarding age and side of hernia.....	53
Table (2):	Comparison between group A and group B regarding Intraoperative time.	54
Table (3):	Comparison between open group and without opening group regarding intraoperative complications.....	56
Table (4):	Comparison between open group and without opening group regarding postoperative complications.	57
Table (5):	Comparison between open group and without opening group regarding postoperative pain.	58

List of Figures

Fig. No.	Title	Page No.
Figure (1):	Features of the inguinal canal in the male.....	12
Figure (2):	Migrational path of the primordial germ cells along the wall of the hindgut and the dorsal, mesentery into the-genital-ridge	14
Figure (3):	Descent of the testis in the male fetus.	16
Figure (4):	Diagrammatic representation of different types of inguinal hernias and hydroceles following the descent of the testes into the scrotum.	20
Figure (5):	A case of bilateral inguinal hernia A case of unilateral inguinal hernia.	44
Figure (6):	The spermatic cord is grasped after opening of external oblique aponeurosis.....	48
Figure (7):	Vessels and vas deferens after being peeled from the sac using fine dissecting forceps.	48
Figure (8):	The hernial sac after being separated from attached vessels and vas deferens.....	49
Figure (9):	Mean intraoperative time in both groups.....	55
Figure (10):	Incidence of edema and hydrocele postoperative in both groups.....	58
Figure (11):	Post operative hydrocele (picture taken in our department during follow up, Jan 2019).	59

INTRODUCTION

Congenital inguinal hernia is the protrusion of intra-abdominal contents through a patent processus vaginalis. The processus vaginalis is an outpouching of the peritoneum through the internal inguinal ring, which normally closes spontaneously following testicular descent. Incomplete obliteration of the processus vaginalis may result in an abnormal communication between the abdominal cavity and the inguinal region (*Lloyd et al., 1998; Rescorla Hernias and umbilicus. 1997*). Groin hernias in children are mainly inguinal in nature and they are indirect in more than 99% of cases. Inguinal hernia is the most common surgical problem of childhood.

Elective repair of an inguinal hernia, the most common surgery performed by pediatric surgeons, is universally accepted as the treatment of choice. The exact technique and steps involved in the repair differ widely among pediatric surgeons. Many pediatric surgeons open the roof of the inguinal canal while preserving the external ring or by including the ring as described by Ferguson and Gross. This repair is known as a modified Ferguson repair. This technique allows exposure of the internal inguinal ring to ensure high ligation of the sac at that level. In infants, the inguinal canal is so short that the external and internal rings virtually lie over each other, therefore other surgeons prefer to do all of the surgery distal to

the unopened external ring this technique described by Mitchell–Banks (*Levitt et al., 2002; Kurlan. 1972*).

Up till now and since 19 century there is still some debates about hernia surgical repair, to open the canal or not, to twist the sac or not, double ligate the sac or not, etc. In this research our main concern is to compare between modified Ferguson & Mitchell-Banks' technique.

In such a very common surgical operation that is nearly done every day it's our duty to choose the safest and the best technique for the children to improve their quality of life.

AIM OF THE WORK

To compare between congenital inguinal hernia repair with and without opening the inguinal canal regarding operative time, intraoperative complications (bleeding, cord injury), and post operative complications (edema, hydrocele, hematoma formation, ascending testis & recurrence).

HISTORY

Inguinal hernias were found in Egyptian mummies, but the first documented case was described in the Ebers Papyrus in 1552 B.C (*Fraser & Snyder, 2014*).

Also What appears to be an inguinal hernia has been found on an ancient Greek statuette; (*Glick & boolanger, 2012*) not-to mention that the word hernia is derived from the greeic word 'hernios', meaning offshoot, bud or rupture (*Fraser & Snyder, 2014*).

Perhaps it was called so in 129 A.D. by Galen who described, the anatomy of the processus vaginalis; however, he believed that hernias were the result of "rupture" of the peritoneum with stretching of overlying muscle and fascia. This is where the slang.term for hernia, "rupture," may have had its derivation (*Click & Boulanger, 2012*). He also advised surgical repair. Celsus is thought to have performed hernia repairs in 50 A.D (*Fraser & Snyder, 2014*).

Modern hernia surgery began in the nineteenth century when an accurate understanding of the anatomy of the inguinal canal became available. Richter, Camper, and Scarpa, among others, contributed to the field during this period. Cooper in 1804 described the transversalis fascia and pectineal ligament, or Cooper ligament. In 1811 Colles described the reflection of the inguinal ligament, and in 1817 Cloquet described the processus. vaginalis and noted that it was rarely closed at birth (*Click & Boilanger, 2012*).

Although these basic anatomical studies have been known in early nineteenth century, effective sequelae-free surgical correction did not occur until the latter part of the 19th century as modern hernia surgery had only to await the development of general anesthesia, surgical equipment, aseptic techniques of surgery, all of this led to the development of operations that laid the foundations of inguinal hernia repair (*Micheal et al., 2014*).

In 1871 Marcy described an operation still in use by pediatric surgeons to this day: high ligation of an unopened sac through the external ring and tightening of the-internal ring. This technique, however, had an unacceptably high recurrence rate in adults. In 1887 Bassini reported his results using a technique involving opening the external oblique, high ligation of the sac, tightening of the external ring, and reconstruction of the posterior inguinal floor. Along with Halsted, Bassini is credited with the development of the modern hernia repair (*Click & Boulanger, 2012*).

Chapter 1

ANATOMY

The inguinal region of the body, also known as the groin, is located on the lower portion of the anterior abdominal wall with the thigh inferiorly, the pubic tubercle medially, and the anterior superior iliac spine (ASIS) superolaterally and in between the inguinal ligament is attached (*Hansen, 2010*).

Understanding of the anatomy of the anterior abdominal wall is mandatory as it's our door step to reach the inguinal canal through the inguinal region.

Skin and subcutaneous fasciae:

The skin is loosely attached to the underlying structures except at the umbilicus, where it is tethered to the scar tissue. To minimize scarring, incisions of the anterior abdominal wall and flank should follow Langer lines of cleavage. These lines parallel dermal collagen fibers and are oriented along lines of stress. They correspond to the segmental thoracic and lumbar nerves (*Ching, 2012*). The skin is backed by a superficial fascia only which is divided into a superficial fatty layer (Camper's fascia) and a deep membranous layer (Scarpa's fascia). Camper's fascia is a loose layer of fatty tissue that varies in thickness with the nutritional status of the patient and

it is continuous with the superficial fat over the rest of the body (*Snell, 2012*).

The superficial circumflex iliac, external pudendal, and superficial inferior epigastric vessels branch from the femoral vessels to run in this layer. The superficial inferior epigastric vessels are encountered during inguinal incisions and can cause troublesome bleeding. Scarpa's fascia-forms a distinct thin membranous layer deep to Camper's fascia, although it may be difficult to discern in older patients. Superiorly and laterally, it blends with Camper fascia. Inferiorly, it fuses with the deep fascia of the thigh 1 cm below the inguinal ligament along a line from the anterior superior iliac spine to the pubic tubercle. Medially, it is continuous with Colles fascia of the perineum (*Chung, 2012*).

Abdominal musculature:

The abdominal musculature lies immediately below Scarpa fascia. They consist of three broad thin sheets that are aponeurotic in front; from exterior to interior they are the external oblique, internal oblique, and transverses abdominis. On either side: of the midline anteriorly is, in addition, a wide vertical muscle, the rectus abdominis. As the aponeuroses of the three sheets pass forward, they enclose the rectus abdominis to form the rectus sheath. The lower part of the rectus sheath might contain a small muscle called the pyramidalis (*Sneii, 2012*).

The inguinal canal:

The inguinal canal can be thought of as a tunnel that travels from an "entrance" the deep (internal) inguinal ring, which is lateral and deep, as the transversalis fascia pouches out, creating an opening through which structures can leave the abdominal cavity to an "exit" the superficial -(external) inguinal ring, which is medial and superficial and its formed by the splitting; of the diagonal fibers of the external abdominal: oblique aponeurosis. A lateral crus and a medial crus are formed. The lateral crus which is folded on its self and form the inguinal ligament that is attached to the pubic tubercle, while the medial crus attaches to the pubic crest (Latin, crus = resembling leg or legs).

The canal extends downward, forwards & medially above the medial 1/2 of inguinal ligament. During the development of the gonads there are structures that travel through the canal in this way. It, like a tunnel, also has a roof, a floor, and two walls with inlet and exit (*Moore et al., 2013*).

The boundaries of the canal are as follows:

After birth the internal and external inguinal rings are nearly superimposed, so the inguinal canal is poorly developed and some studies indicate a canal length of 4-23 mm in children aged 0-12 years,, however growth of the baby leads to diverging of both rings with continuous increasing of the length

of the canal to reach around 4cm in adolescent (*Tanyei et al., 2000*) where is the deep (internal) inguinal ring lies 1/2 inch above the midpoint of inguinal ligament and the superficial (external) inguinal ring lies 1/2 inch above & medial to the pubic tubercle.

- **Posterior wall:** transversalis fascia laterally; conjoint tendon medially which is the joining of internal abdominal oblique medially and transversus abdominis aponeuroses laterally.
- **Anterior wall:** internal oblique muscle laterally and aponeurosis of external oblique muscle.
- **Roof:** internal oblique and transversus abdominis muscles.
- **Floor:** Inguinal ligament and lacunar ligament (medially) (*Skandalakis, 2009*).

The contents of the inguinal canal in males consist of the spermatic cord and the ilioinguinal nerve. For females, the contents include the round ligament and the ilioinguinal nerve. It should be noted that the ilioinguinal nerve passes through the superficial ring but does not completely run through the entire inguinal canal (*Mitchell et al., 2010*).

The spermatic cord begins at the deep inguinal ring by gathering of its contents (Fig 1). It enters through the deep ring into the inguinal canal, traverses it & exits through superficial ring. Then, it passes down in front of pubic bone, crossing the scrotal neck down to the scrotum where it is attached to the back of the testis.