Role of Laparoscopy in Treatment of Diaphragmatic Hernia in Adults:

Prospective Study

Thesis

Submitted for Partial Fulfillment of Master Degree in General Surgery

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2018

First and foremost, Thanks are due to **ALLAH** *the most merciful and the mightiest to whom I relate my success in achieving any work in my life.*

I would like to express my sincere gratitude and deepest appreciation to **Prof. Dr. Abd Al-Rahman Mohamed Al-maraghy.** *Professor of General Surgery, Ain Shams University, for his kindness, precious advice, continous encouragement and guidance throught out the preparation of this work.*

I am deeply greatfull to **Prof. Dr. Mahmoud Saad Farahat,** *Professor of General and Endocrine Surgery, Ain Shams University for his guidance and help in this work.*

I really express my gratitude to **Dr. Ramy Mikhael Nageeb,** *Assistant Professor of General Surgery, Ain Shams University, for his support, attention and supervision throw out this work.*

Finally no words can express the warmth of my feelings to ***my family,*** *to whom I am forever indebted for their patience, support and help.*

✍ **Ahmed Atef Al-Menawy**

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List of Abbreviations

Abb.	Full term
ABG	Arterial blood gas
ACS	Abdominal compartment syndrome
BH	Bochdalek hernia
CBC	Complete blood count
CDH	Congenital diaphragmatic hernia
CT	Computed tomography
CXR	Chest X-ray
EMG	Electromyography
GERD	Gastroesophageal reflux disease
MIS	Minimally invasive surgery
MRI	Magnetic resonance imaging
MVCs	Motor vehicle crashes
NCS	Nerve conduction study

Introduction

The laparoscopic approach was firstly reported by Kuster *et al.* in 1992 for repair of Morgagni diaphragmatic hernia in a 67-year-old woman with symptoms of partial colon obstruction is described. The patient had a prompt and complete recovery with no evidence of recurrence one year after surgery ***(Kuster et al., 1992).***

Diaphragmatic hernia consists of a defect of the diaphragm, generally located on the left side that allows passage of the abdominal viscera into the thorax ***(Tovar, 2012).***

The most common cause of acquired diaphragmatic disorders is trauma, either blunt or penetrating. Motor vehicle accidents are the leading cause of blunt diaphragmatic injury, whereas penetrating injuries result from gunshot or stab wounds ***(Baloyiannis et al., 2011).***

It is not feasible to estimate the occurrence of diaphragmatic hernia due to blunt abdominal trauma as a significant number of patients manifest late and some are diagnosed while being evaluated for other pathologies ***(Kelly et al., 2008).***

Penetrating injuries to the chest or abdomen also may injure the diaphragm. This specific injury is seen

commonly where penetrating trauma is prevalent ***(Melo et al., 2011).***

Almost 88% of the patients presented with complications between 9 and 12 months. Left sided injuries occurred in 68.5% of the patients, 24.2% had right-sided rupture, and 1.5% had bilateral rupture. The most commonly herniated organs on the left side are the stomach (80%), omentum, small intestine, colon, and spleen ***(Farooq et al., 2013).***

Diaphragmatic dysfunction can be classified as paralysis, weakness, or eventration. It is often initially suggested by diaphragmatic elevation at chest radiography ***(Qureshi, 2009).***

However, the most common etiology is acquired, which is caused by phrenic nerve injury during a traumatic birth or thoracic surgery for the correction of congenital heart disease ***(Camerano et al., 2014).***

Congenital diaphragmatic hernia has been classified into the following different types: Eventeration of diaphragm, posterolateral hernia of Bochdalek (aka, BH), parasternal hernia of Morgagni-Larrey, pertioneopericardial hernia and the central tendon hernias ***(Debergh and Fierens, 2014)***.

The commonest congenital diaphragmatic hernia is bochdalek. Adult presentation, however, is rare. The incidence is reported to be 0.17%with the majority of hernias occurring on left side ***(Somani et al., 2010)***.

Morgagni hernia is one kind of relatively rare congenital diaphragmatic hernias, which is asymptomatic and discovered incidentally in adulthood ***(Aydin et al., 2014).***

Most adults present with chronic atypical symptoms, such as chronic dyspnea, chest pain, recurrent chest infections, pleural effusion, recurrent abdominal pain, postprandial fullness, and vomiting ***(Tokumoto et al., 2010).***

Surgical repair should be performed to avoid potential intestinal obstruction and strangulation except for those who cannot tolerate surgical repair due to sever underlying diseases ***(Godazandeh and Mortazian, 2012).***

The hernia can be repaired by a variety of surgical approaches including laparotomy, thoracotomy, thoracoscopy, laparoscopy but the laparoscopic approach has been the gold standard and the initial step for repair ***(Kaida et al., 2014).***

The procedure of choice depends on the surgeon's experience. Small defects are easier to repair, but larger one

may involve a reduction of the intra-abdominal contents and reinforcement of the defect with a mesh ***(Toydemir et al., 2012).***

Pneumothorax has been recognized as potential complication during laparoscopic diaphragmatic repair. The risk, however, is minimal in patients with chronic hernia due to the presence of intrathoracic adhesions and the presence of sac ***(Debergh and Fierens, 2014).***

Usually when present, the symptoms of pneumothorax are minimal and can be dealt with by lowering the insufflation pressure and adding positive end-expiratory pressure. Patients with persistent pneumothorax would need intercostal tube insertion in the postoperative period ***(Machado, 2016).***

If large hernias are reduced, it is crucial to monitor post operatively for abdominal compartment syndrome ***(Zhou et al., 2014)***.

Potential complications also include injury to gut including perforation and bleeding while reducing and handling an oedematous gut, Moreover disruption of the spleen with bleeding or injury to the tail of pancreas during manipulation ***(Nakashima et al., 2011).***

Aim of the Work

The aim of the study is to assess the efficacy of laparoscopy in treatment of diaphragmatic hernia in adults.

Anatomy & Embryology

Embryology of diaphragm:

Embryologically, the development of diaphragm occurs during the fourth week of gestation, and by the sixth week the pleuroperitoneal folds on the lateral body wall grows medially to fuse with the septum transversum. The fusions of these two muscle groups, which occur at the final stage of development, are regions anatomically vulnerable to developing hernia ***(Slesser et al., 2011).***

The diaphragm develops from multiple embryonic sources. The muscle and its associated connective tissue and central tendon develop from three sources: the septum transversum, the pleuroperitoneal folds, and the somites ***(Stuelsatz et al., 2012).***

The septum transversum is the first structure present in the developing diaphragm and serves as the initial barrier between the thoracic and abdominal cavities. In all vertebrates, the septum transversum is a thin, mesodermal sheet of tissue that separates the heart from the liver ***(Perry et al., 2010).***