Comparative study of sensitivity of detection of diaphragmatic injuries between laparoscopy and CT in haemodynamically stable patients with thoracoabdominal trauma

Thesis

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Trauma is the fourth most common cause of death in the population less than 45 years of age. Conventional open surgery is associated with significant morbidity and long convalescence. Laparoscopic surgery has been widely used as a minimally invasive surgery to treat diverse benign diseases such as benign gall bladder disease. Laparoscopy can be a valuable diagnostic tool in identifying diaphragmatic injury. It is best suited for those hemodynamically stable, asymptomatic patients who are at risk for diaphragmatic injury but who have no other indication for abdominal exploration.

The benefit of laparoscopic surgery in comparison with open surgery have been suggested with respect to decreased morbidity, decreased pain, faster recovery and shorter hospital stay.

Conclusion: In our study we compared between CT and Diagnostic laparoscopy in detection of diaphragmatic injury. The CT couldn't detect any injury but laparoscopy detected 5 injuries and used to treat one of them. There was no relation between mode of trauma, age of the patients, site of trauma and diaphragmatic injury. There is significant difference between the CT findings and diaphragmatic injury as detected by laparoscopy. So, clinical and radiographic findings can be unreliable at detecting occult diaphragmatic injury. Diagnostic laparoscopy provides a vital tool for detecting occult diaphragmatic injury among patients who have no other indications for formal exploration.

Keywords:

Diaphragmatic injuries
Laparoscopy
CT
Haemodynamically stable
Thoracoabdominal trauma

INTRODUCTION

The first endoscopic examinations of the peritoneal cavity were accomplished early in the 20th Century. In 1901, Dimitri Ott, a German gynecologist described "ventroscopy," a technique in which a speculum was introduced through an incision in the posterior vaginal fornix. Ott wore head mirrors to reflect light and augment visualization. Also in 1901, George Kelling, a German surgeon, reported using a cystoscope to examine the intra-abdominal viscera of a dog after insufflating the peritoneal cavity with air, and coined the term "celioscopy." Jacobeus performed the first human celioscopy in Sweden in 1910, advocating the technique for the evaluation of patients with ascites (Haubrich et al., 1987).

In recent years, laparoscopic surgery has become a matter of growing interest. Since its introduction in the late 1980s and the subsequent recognition of its advantages,minimally invasive surgery has been applied to almost all areas of abdominal surgery.

The first description of a traumatic diaphragmatic rupture was made by Sennertus in 1541(Christie et al., 2007).

Diaphragmatic rupture following blunt or penetrating trauma is a relatively common occurrence (Erwin et al., 2007).

Diaphragmatic rupture is frequently not recognized at the time of trauma because of the non-specific, varied and confusing clinical signs and radiographic findings (Vermillion et al., 2001).

CT imaging has some limitations in visualization of the diaphragm since the axial plane is tangential to the dome of the diaphragm. (Iochum et al., 2002).

Laparoscopy can be a valuable diagnostic tool in identifying diaphragmatic injury. It is best suited for those hemodynamically normal, asymptomatic patients who are at risk for diaphragmatic injury but who have no other indication for abdominal exploration (Erwin et al., 2007).

REVIEW OF LITERATURE

Embryology of the diaphragm

The separation of the pleural and peritoneal cavities is affected by the development of the diaphragm. This forms from a portion of the septum transversum mesenchyme above the developing liver. The septum transversum is a population of mesenchymal cells that arises from the coelomic wall of the caudal part of the pericardial cavity. As the population proliferates, it forms a condensation of mesenchyme, caudal to the pericardial cavity and extending from the ventral and lateral regions of the body wall to the foregut. Dorsal to it on each side is the relatively narrow pleuroperitoneal canal. The endodermal hepatic bud grows into the caudal part of the septum transversum, whereas the cranial portion will form the diaphragm (Harding et al., 1999).

The septum transversum undergoes a progressive alteration in relative position. In a 2-mm human embryo, the dorsal border of the septum transversum lies opposite the second cervical segment but, as the embryo grows and the heart enlarges, it migrates caudally. At first the ventral border moves more rapidly than the dorsal, but after the embryo has attained a length of 5 mm, the dorsal border migrates more rapidly. When the dorsal border of the septum transversum lies opposite the fourth cervical segment, the phrenic nerve (C3, 4 and 5) and portions of the corresponding myotomes grow into it and accompany it in its later migrations. It is not until the end of the second month that the dorsal border of the septum transversum is opposite the last thoracic and first lumbar segments, the final position occupied by some of the dorsal attachments of the diaphragm. However, the

main derivatives of the central part of the diaphragm lie at considerably more cranial levels (Harding et al., 1999).

The components of the diaphragm are therefore the oesophageal mesentery and paired pleuroperitoneal membranes (posteriorly); septum transversum mesenchyme (ventrally); and excavated body wall (laterally) (Harding et al., 1999).

Congenital anomalies of the diaphragm

1- Diaphragmatic agenesis (Pelizzo et al., 2000)
2- Accessory and Duplicate Diaphragms (Becmeur et al., 1995)
3- Congenital diaphragmatic hernias (Kluth et al., 1993)

Anatomy of the diaphragm

The word diaphragm is of Greek derivation: dia, meaning “in between” and phragma meaning “fence” (Erwin et al., 2007).

The diaphragm is a curved musculofibrous sheet that separates the thoracic cavity from the abdominal cavity. Its mainly convex upper surface faces the thorax, and its concave inferior surface is directed towards the abdomen (Celli, 1998).

The muscle fibres of the diaphragm arise from the highly oblique circumference of the thoracic outlet; the attachments are low posteriorly and laterally, but high anteriorly. Although it is a continuous sheet, the muscle can be considered in three parts, sternal, costal and lumbar, which are based on the regions of peripheral attachment. The sternal part arises by two fleshy slips from the back of the xiphoid process, and is not always present. The costal part arises from the internal surfaces of the lower six costal cartilages and their adjoining ribs on each side, and interdigitates with transversus abdominis. The lumbar part arises from two aponeurotic arches, the medial and lateral arcuate ligaments and from the lumbar vertebrae by two pillars or crura (Celli, 1998).

The lateral arcuate ligament is a thickened band in the fascia that covers quadratus lumborum, and it arches across the upper part of that muscle. It is attached medially to the front of the transverse process of the first lumbar vertebra, and laterally to the lower margin of the twelfth rib near its midpoint. The medial arcuate ligament is a tendinous arch in the fascia that covers the upper part of psoas major. Medially, it is continuous with the