Laparoscopic Management of Intra-abdominal Complications of Ventriculoperitoneal Shunt

An Essay

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بسم الله الرحمن الرحيم

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LIST OF ABBREVIATIONS

CSF	**C**erebro**S**pinal **F**luid
VP shunt	**V**entriculo**P**eritoneal Shunt
ICP	**I**ntra**C**ranial **P**ressure
NPH	**N**ormal **P**ressure **H**ydrocephalus
HCP	**H**ydrocephalus
CT	**C**omputerized **T**opography
MRI	**M**agnetic **R**esonance **I**maging
Fig.	**F**igure

INTRODUCTION

Hydrocephalus is a pathologic condition in which there is an increase in the volume of cerebrospinal fluid (CSF) within enlarged intracranial CSF spaces, most frequently the cerebral ventricles. Hydrocephalus is not a disease per se, but the result of one of a heterogeneous group of congenital and acquired pathologic lesions that impede the normal flow of CSF through intracranial fluid pathways. Obstruction to CSF flow results in an imbalance between CSF production and absorption, and a net accumulation of CSF within intracranial fluid-containing spaces [1].

The Ventriculoperitoneal (VP) shunts are the most common surgical procedures for treatment of hydrocephalus [2]. The goal of this procedure is to drain CSF from the ventricles to the peritoneal cavity, thus to decrease the intracranial pressure. The peritoneal cavity is considered the best site to drain CSF because of its capacity for absorption and low rate of complications [3]. The complications of this surgical procedure usually occur at the peritoneal side of the VP shunt [4].

Since its introduction by Kausch in 1905, a variety of complications of VP shunt have been described in the published literature. The overall abdominal complication rate in patients with VP shunt remains high, ranging between 5 and 47% [4]. The most common intraperitoneal complications are VP shunt obstruction, shunt disconnection, intestinal perforation, intestinal obstruction, CSF ascites, pseudocyst formation, development of inguinal hernia and chronic peritoneal infection [4, 5]. These complications may present either as local abdominal signs or with elevated intracranial pressure.

Complications of VP shunts are a surgical emergency due to the potential elevation of intracranial pressure [6].There are several management options described: (1) conversion to ventriculoatrial or ventriculopleural shunt, (2) external ventricular drainage, (3) computed tomography (CT) guided needle aspiration and (4) laparotomy with adhesiolysis and catheter tip repositioning [4].

Until recently laparotomy was the first treatment option for complicated VP shunt, but lately several case reports of laparoscopic management for abdominal complications were done [4, 5, 7].

Since the 1980s, laparoscopy has become the preferred approach to various types of pathology calling for surgical intervention. In 1993, Basauri (1993) and his team, reported a laparoscopic approach to the placement of the peritoneal portion of Ventriculoperitoneal shunt [8]. The advantages of the laparoscopic technique were: 1) enabling of direct visualization of peritoneal cavity; and 2) providing the ability to place the catheter tip into a selected region in an optimal location and test its function. Different minimally invasive techniques were described for Ventriculoperitoneal shunt catheter placement [9, 10, 11]. The successful application of laparoscopy has been reported for retrieval of a fractured catheter, revision of a malfunctioning shunt, and placement of a new shunt catheter [12, 13].

AIM OF THE WORK

The aim of this study is to outline the role of laparoscopy either diagnostic or therapeutic in the management of intra-abdominal complications of Ventriculoperitoneal shunt.

ANATOMY OF ABDOMINAL WALL LAYERS AND THE PERITONEUM

Soft Tissue

The Superficial Fascia:

The superficial fascia of the abdomen consists, over the greater part of the abdominal wall, of a single layer containing a variable amount of fat; but near the groin it is easily divisible into two layers, between which are found the superficial vessels and nerves and the superficial inguinal lymph glands [14].

The superficial layer (fascia of Camper) is thick, areolar in texture, and contains in its meshes a varying quantity of adipose tissue. Below, it passes over the inguinal ligament, and is continuous with the superficial fascia of the thigh [14].

The deep layer (fascia of Scarpa) is thinner and more membranous in character than the superficial, and contains a considerable quantity of yellow elastic fibers. It is loosely connected by areolar tissue to the aponeurosis of the Obliquus externus abdominis, but in the middle line it is more intimately adherent to the linea alba and to the symphysis pubis, and is prolonged on to the dorsum of the penis, forming the fundiform ligament; above, it is continuous with the superficial fascia over the rest of the trunk; below and laterally, it blends with the fascia lata of the thigh a little below the inguinal ligament; medially and below, it is continued over the penis and spermatic cord to the scrotum, where it helps to form the dartos [14].

The Transversalis Fascia:

The Transversalis fascia is a thin aponeurotic membrane which lies between the inner surface of the Transversus and the extraperitoneal fat. It forms part of the general layer of fascia lining the abdominal parities, and is directly continuous with the iliac and pelvic fascia. In the inguinal region, the Transversalis fascia is thick and dense in structure and is joined by fibers from the aponeurosis of the Transversus, but it becomes thin as it ascends to the diaphragm, and blends with the fascia covering the under surface of this muscle. Behind, it is lost in the fat which covers the posterior surfaces of the kidneys [14].

Extraperitoneal Connective Tissue:

Between the inner surface of the general layer of the fascia which lines the interior of the abdominal and pelvic cavities, and the peritoneum, there is a considerable amount of connective tissue, termed the extraperitoneal or subperitoneal connective tissue [14].

The parietal portion lines the cavity in varying quantities in different situations. It is specially abundant on the posterior wall of the abdomen, and particularly around the kidneys, where it contains much fat. On the anterior wall of the abdomen, except in the public region, and on the lateral wall above the iliac crest, it is scanty, and here the Transversalis fascia is more closely connected with the peritoneum. There is a considerable amount of extraperitoneal connective tissue in the pelvis [14].

The visceral portion follows the course of the branches of the abdominal aorta between the layers of the mesenterics and other folds of peritoneum which connect the various viscera to the

abdominal wall. The two portions are directly continuous with each other [14].

Anterolateral Muscles Of The Abdomen

Rectus abdominis, pyramidialis, external oblique, internal oblique and transversus abdominis constitute the anterolateral muscles of the abdomen. They act together to perform a range of functions, some of which involve the generation of a positive pressure within one or more body cavities, although many of these activities such as expiration defecation and micturition, may be aided by the generation of a positive intra-abdominal pressure [14].

External Oblique:

Attachments

External oblique is the largest and the most superficial of the three lateral abdominal muscles **Fig. (1)**. It curves around the lateral and anterior parts of the abdomen and is attached to the external surfaces and inferior borders of the lower eight ribs. The attachments rapidly become muscular and interdigitate with the lower attachment of serratus anterior and latissimus dorsi along an oblique line that extends downwards and backwards. The upper attachments are close to the cartilages of the corresponding ribs, the middle ones arise from the ribs at some distance from their cartilages and the lowest are close to the apex of the cartilage of the 12th rib. The fibers of external oblique diverge as they pass to their lower attachments. Those from the lower two ribs pass nearly vertically downwards and are attached to the anterior half or more of the outer lip of the anterior segment of the iliac crest. The middle and upper fibers pass downwards and forwards and end in the anterior aponeurosis. The posterior

border of the muscle is free [15].

The inguinal ligament is formed by the margin of the aponeurosis of external oblique extending between the anterior superior iliac spine and the pubic tubercle [15].

Vascular supply

External oblique is supplied by branches from the lower posterior intercostal and subcostal arteries, the superior and inferior epigastric arteries, the superficial and deep circumflex arteries and the posterior lumbar arteries.

Innervation

External oblique is innervated by the terminal branches of the lower five intercostal nerves and the subcostal nerve from the ventral rami of the lower six thoracic spinal nerves [15]

Actions

External oblique contributes to the maintenance of abdominal tone, increasing intra-abdominal pressure and lateral flexion of the trunk against resistance [15].

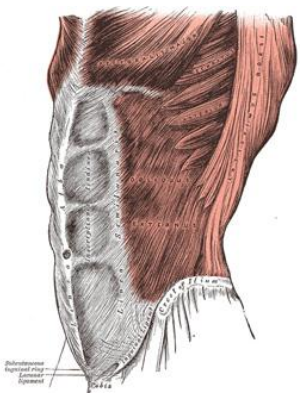

Figure 1: The Obliquus Externus Abdominis [14].