The Role of the Operative Cholangiomanometry in Detection and Management of Sphincter of Oddi Disorders

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By
Mourad Hilmy Samy
(M.Sc., General Surgery)

Supervised by

Prof. Dr. Mohamed Sameh Zaki Mohamed
Professor of Surgery
Faculty of Medicine - Ain Shams University

Prof. Dr. Adly Farid Galy
Professor of Pathology
Faculty of Medicine - Ain Shams University

Dr. Alaa El-Din Abdalla Farrag
Assistant Professor of Surgery
Faculty of Medicine - Ain Shams University

Dr. Emad Ahmad Hessain
Assistant Professor of Surgery
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University

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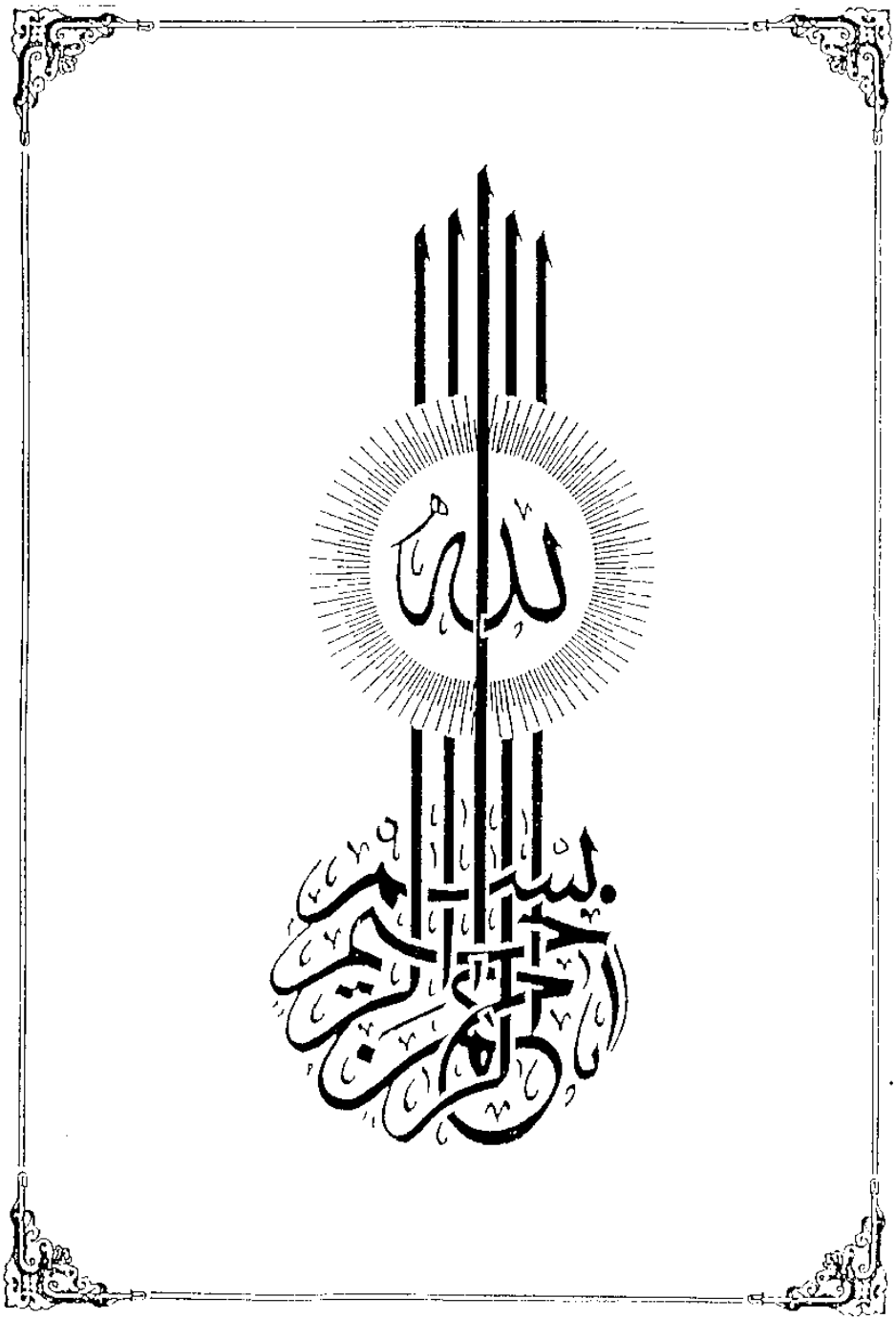

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Introduction and aim of the work

INTRODUCTION AND AIM OF THE WORK

The aim of cholangiomanometry is to provide, during the course of biliary surgery, a means of detecting and locating any obstruction to the major bile duct or of confirming that there is no hindrance to the normal flow of bile (Daniel, 1972).

Cholangiomanometry appears to be the method of choice in the operative diagnosis of functional, and anatomical disorders of the sphincter of Oddi (Blumgart, 1982).

Some patients who underwent cholecystectomy suffer from post-cholecystectomy symptoms which are attributed in a sector of them to some pathology in the sphincter of Oddi (Tanaka et al., 1985).

It is believed that cholangiomanometry can be a safe, less time consuming, less expensive and less invasive manoeuver in most biliary operations. In absence of equipment for peroperative cholangiography, as in most of our hospitals in Egypt, manometric biliary studies become even of greater value.

In this study, operative cholangiomanometry was used in 76 cases of biliary surgery, in an attempt to clearly identify the role of manometric studies in biliary surgery in the detection of sphincter of Oddi disorders to avoid post-cholecystectomy symptoms.

The study includes 20 patients that prove during cholecysctectomy or other biliary surgery to have a problem in the sphincter of Oddi as proved by measuring the yield pressure of the sphincter and the flow rate through it in a unit time. These cases will be managed by transduodenal sphincteroplasty and biopsy of this sphincter will be taken for histopathology.

Patients will be followed up for 6 months for the development of post-cholecystectomy symptoms.

REVIEW OF LITERATURE

ANATOMY AND PHYSIOLOGY OF THE CHOLEDOCHODUODENAL JUNCTION

The choledochoduodenal junction is one of the most important diminutive areas of the human body to the surgeon. Here is implanted an intricate musculature which causes the filling of the gall bladder, which regulates the outflow of bile and of pancreatic enzymes and which directly or indirectly is a factor to be reckoned with in pancreatitis and the post-cholecystectomy syndrome (Boyden, 1957).

The common bile duct passes dorsal to the first part of the duodenum lying in a groove either within or posterior to the head of the pancreas and enters the second part of the duodenum through the major duodenal papilla in association with the pancreatic duct of Wirsung. The junction of the terminal common bile duct, pancreatic duct and duodenum at the papilla assumes one of three configurations that may be likened to a Y, V or U. In approximately 70% of subjects, the ducts open into a common channel and thus, have a Y configuration. This common channel drains into the duodenum through a single orifice on the duodenal papilla of Vater (extraduodenal junction). In approximately 20% of subjects, the common channel is almost non-existent and the two ducts have a common V shaped opening on the papilla (intraduodenal wall junction). In 10% of subjects, the common bile duct and pancreatic duct have separate openings on the tip of the papilla and give a U shaped configuration (no junction at all). The terminal parts of the common bile duct and pancreatic duct, the common channel and major duodenal papilla of Vater

are invested by varying thickness of smooth muscle and together form the sphincter of Oddi segment (Figure 1) (Linder, 1988).

The ampulla of Vater is formed within intraduodenal portion of the common bile duct as a result of junction of the lumina of the common bile duct and the pancreatic duct. Depending upon whether there is an extraduodenal junction of two ducts, an intraduodenal wall junction, or no junction at all, the length of the ampulla of Vater will vary markedly. The ampulla extends from point of confluence of the two ducts to just proximal to their exit through a single opening on the duodenal papilla (Anson, 1971).

Early investigations showed that sphincteric apparatus about the terminal segment of the common duct developed from the smooth muscular layers of the neighbouring duodenum. However, Boyden (1957) showed that the sphincter develops much later in foetal life than does the duodenal muscle and that its genesis is via progressive differentiation of the primitive mesoderm surrounding the intradermal portion of the biliary duct (Boyden, 1957).

The distal part of the common bile duct in man pierces the duodenal muscle and runs a variable distance in the submucosa before turning towards the lumen to open onto the papilla of Vater. The course through the duodenal wall is therefore S-shaped. The site of the papilla varies, the distance from the pylorus ranges from 44 to 142 mm (Thomas, 1981).

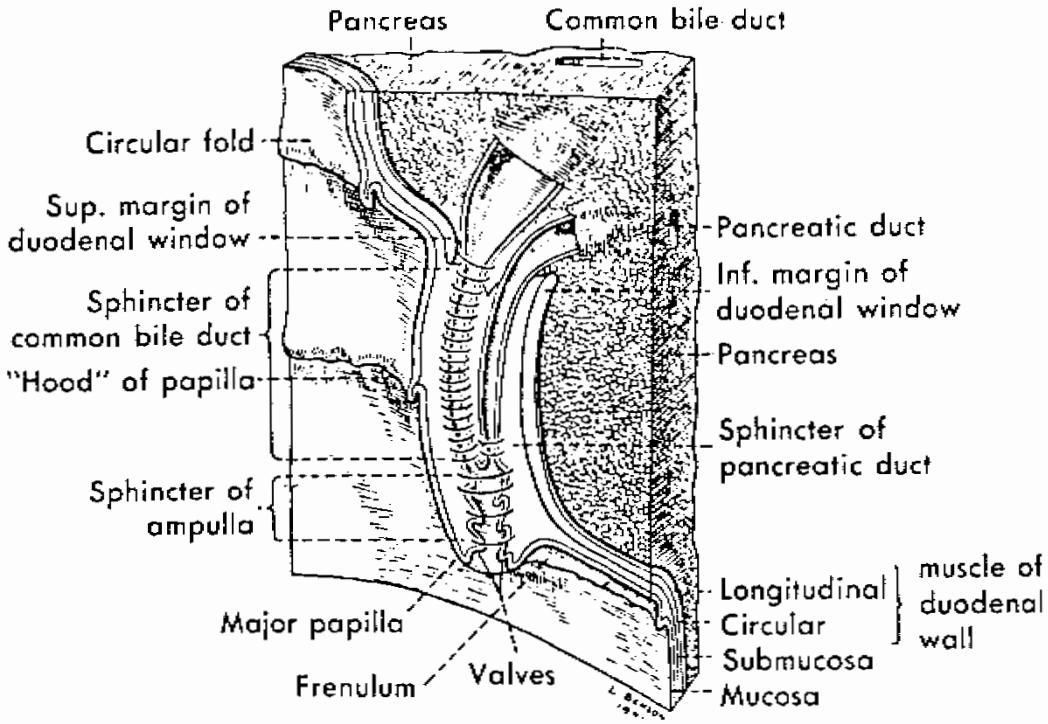

FIGURE (1)
The muscular apparatus at the terminal end of the common bile duct (Linder, 1988).

The length of the intramural course of the bile duct varies from 6 to 30 mm. Therefore, the length of the incision made cannot be used as a criterion for the adequacy of a sphincteroplasty. A 20 mm incision would be excessive in a patient whose ducts have only a 6 mm course, and entirely inadequate in a subject with an oblique 30 mm intramural length (Figure 2), so that the adequate incision for sphincteroplasty depends on the length of sphincter (Austin, 1987).

The sphincter of Oddi can be divided into the choledochal sphincter, the pancreatic sphincter, the sphincter ampulla and the sphincter papillae. The choledochal sphincter is the most prominent extending for a distance of 2-3 mm outside duodenal wall. It has been further divided into a pars superior and a pars inferior. The sphincter ampullae is well developed in only one in six individuals, as is the sphincter papillae. The pancreatic sphincter surrounds the terminal portion of the pancreatic duct before it joins the common bile duct. Associated with choledochal sphincter are bundles of extrinsic duodenal muscle. These auxiliary bands have been divided into three types:

(1) Reinforcing fibers that strengthen the margins of the window;
(2) Connecting fibers that hold the ducts to the intestine;
(3) Longitudinal fibers that shorten and erect the papilla.

Contraction of the pars superior forces bile back up into the common bile duct and that contraction of the pars inferior expels bile into the duodenum

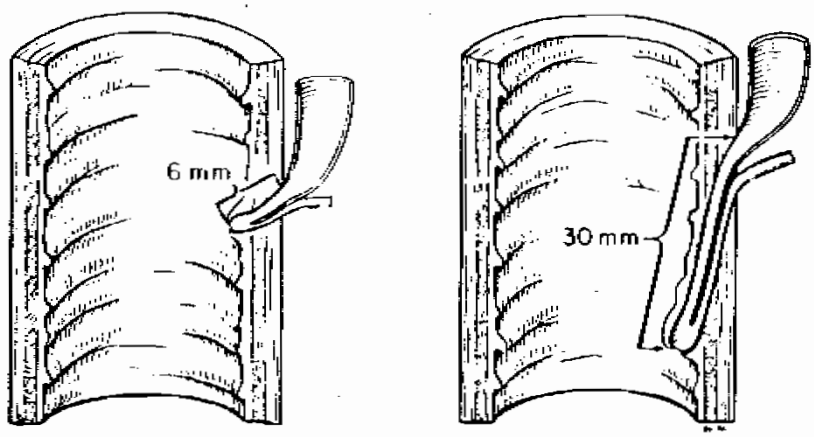

FIGURE (2)
The length of the incision required to destroy the sphincters varies among individuals (Austin, 1987).

(Thomas, 1981).

The mucosa of the human sphincter of Oddi segment is lined by columnar epithelium and contains numerous mucus secreting glands. The mucosa is thrown into longitudinal folds likened to mucosal valvules. These folds are least marked proximally and increase distally, becoming maximal in the common channel. the mucosal folds may occasionally be seen projecting through the orifice of the duodenal papilla (Tansey et al., 1975).

The submucosa contains dilated blood vessels which have been referred to as the "plexus papillary". The filling of this plexus may cause erection of the papilla (Thomas, 1981).

Functionally, the most important element in the choledochoduodenal junction is the sphincter choledochus, which lines the submucosal segment of the bile duct for a distance of more than 5 millimeters. Tonic contraction of this muscle is responsible for the filling of the gall bladder in the intervals between meals. Its relaxation under appropriate stimuli permits the discharge of bile into the intestine (Boyden, 1957).

Surrounding the end of the papilla is a terminal musculature consisting of a sphincter ampulla or of a sphincter papilla depending upon whether the ducts open into the ampulla of Vater or separately. Contraction of the former may result in

reflux of bile into the pancreatic duct. Contraction of the latter would impede the outflow of juices in both ducts. The auxiliary fibers, acting in conjunction with musculus proprius may erect the papilla and assist in the discharge of bile (Keddi, 1974).

Factors influencing the choledochal sphincter:

1- Hormones:

Cholecystokinin (CCK) has dual effects on biliary muscle, contracting the gall bladder and relaxes the sphincter. Cholecystokinin mediates its response on the gall bladder and sphincter of Oddi by affecting tissue level of cyclic AMP. The action of this hormone on the sphincter is not affected by atropine, propranolol, or phenoxybenzamine (Lin, 1975).

The effect of the other gastrointestinal hormones on the choledochoduodenal junction is less well documented, but gastrin and its analogues relax the sphincter. Secretin potentiates the action of cholecystokinin. Glucagon has been found to relax the sphincter (Becker et al., 1982).

2- Nerves:

Acetylcholine causes contraction of both gall bladder and the sphincter of Oddi. Contraction of the Oddi sphincter occurs with stimulation of the vagus nerves. alpha-adrenergic receptors mediating contraction and beta-adrenergic receptors