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Prevalence, Causes and Management of Obstruction of Common Bile Duct: Review Article

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Gallstones cause biliary obstruction in about 5 out of 1000 people, whereas 10 to 15% of the adult population in the United States will have gallstones at some point in their lives. Gall stones, also known as cholelithiasis, are the precursor of choledocholithiasis, which occurs when gall stones pass through the cystic duct and lodge in the common hepatic ducts, causing an obstruction.

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Routine labs and some specialized labs are used in the diagnosis of biliary blockage. Severe complications can happen if left unchecked such as damaging the hepatic dysfunction, renal failure, nutritional deficiencies, bleeding problems, and infections. Treatment depends on the causing effect of bile duct obstruction. Sphincterotomy with lithotripsy, choledochotomy, choledochoduodenostomy, choledochojejunostomy, or cholecystectomy are the most used for large gall stones treatment. This review looks at the prevalence, etiology and management of the disease.

Keywords: Gallstones; biliary obstruction; choledocholithiasis; cholecystectomy.

1. INTRODUCTION

Cholestasis is a decrease in the flow of bile from the liver to the small intestine due to a blockage of the bile duct system. Cholestasis affects a large portion of the population worldwide with significant morbidity and mortality. The most common cause of biliary obstruction is the formation of gallstones that obstruct the common bile duct, which manifests as pain, nausea/vomiting, and jaundice [1].

Bile formed in the liver flows through the right and left hepatic ducts into the common hepatic duct. Then, the common hepatic duct joins with the cystic duct from the gallbladder to form the common bile duct. The common bile duct then joins the pancreatic duct through its journey through the head of the pancreas before opening into the duodenum via the papilla or main bulb. Most of the bile flows into the gallbladder through the cystic duct, where it is collected and temporarily stored, while the rest of the bile flows through the common bile duct into the duodenum via the sphincter of Oddi. The flow of bile in the duodenum is regulated by the release of the hormone cholecystokinin (CCK) from the duodenum, which controls the release of stored bile from the gallbladder and relaxes the sphincter of Oddi [1].

The occurrence of stones in the common bile duct is known as choledocholithiasis. The presence of common bile duct stones is thought to be prevalent in 1-15 percent of cholelithiasis patients. Endoscopic retrograde cholangiopan-creatography (ERCP) or, in some situations, laparoscopic cholecystectomy with bile duct exploration are the current treatments for bile duct stones. When bile duct stones are present, ERCP is routinely followed by laparoscopic cholecystectomy in most US institutions [2].

Cholestatic liver disease is liver disease that is seen in daily clinical practice, liver illness and bile duct tumors are the most common causes of chronic cholestasis. Bile duct epithelial cell growth and periportal fibrosis are caused by postcanalicular biliary blockage. Only timely restoration of bile flow can stop fibrosis and reverse biliary hyperplasia, according to clinical and experimental research. The impact of bile duct obstruction on liver volume has yet to be thoroughly investigated [3].

2. EPIDEMIOLOGY

Gallstones lead to gallstone obstruction in about 5 out of 1,000 people, but 10-15% of the US adult population develops gallstones at some point in their lives. Cholelithiasis, also known as cholelithiasis, is a precursor to cholelithiasis that occurs when gallstones pass through the cystic duct and stay in the common bile duct, causing obstruction. At the time of diagnosis, 10-15% of patients with gallstones also have bile duct stones [1].

The formation of stones in the main bile duct is called common bile duct stone disease. The presence of bile duct stones is thought to be widespread in 115 percent of patients with cholelithiasis. Common bile duct stone disease was found in 4.6 to 18.8 percent of patients with cholecystectomy. Common bile duct stone disease is common in older patients with cholelithiasis. Female patients, pregnant women, the elderly, and patients with high serum cholesterol levels are more likely to develop cholelithiasis. Obese people with little exercise and those who have recently lost weight are more likely to develop cholesterol stones. Patients with cirrhosis, those on a complete parental diet, and those who have undergone ileectomy all develop black pigment stones. Primary bile duct stones that are colored brown are formed by nucleating agents such as bacteria [2].

Gallstones are more common in women than in men and increase the risk of common bile duct stone disease. This is most likely due to the fact

that estrogen increases hepatic cholesterol absorption, increasing bile excretion and cholestasis. Gallstones are the most common cause of biliary atresia in Hispanics, Scandinavian and Native Americans. The highest recorded incidence of cholelithiasis among Native Americans is 64% in women and 29% in men. Cholelithiasis is more common in Asian Americans and African Americans, with 13.9% of women and 5.3% of men suffering from the disease. Cholelithiasis is the lowest prevalence in sub-Saharan Africa, with an overall incidence of less than 5%. The overall prevalence of cholelithiasis in North White Americans is 16.6% for women and 8.6% for men, respectively [1].

3. ETIOLOGY

There are two types of biliary obstruction: intrahepatic and extrahepatic. Intrahepatic biliary blockage is known as cholestasis, and it is not covered in length here because it is beyond the scope of this discussion. Intrahepatic cholestasis can be caused by a variety of disorders, including viral hepatitis, alcoholism, drug-induced liver injury (antibiotics, acetaminophen, anti-epileptics, anti-arrhythmics), primary biliary cholangitis, primary sclerosing cholangitis, and infiltrative diseases (sarcoidosis, tumors, abscess, and cysts) [1].

Choledocholithiasis which is the main cause of common bile duct obstructions has been discovered in 4.6 percent to 18.8 percent of cholecystectomy patients. Choledocholithiasis is more common in cholelithiasis patients as they get older. Cholelithiasis is more common in women, pregnant women, the elderly, and people who have high serum lipid levels. Cholesterol stones are typically found in obese patients with low physical activity or patients that have recently intentionally lost weight. Cirrhosis patients, patients receiving total parental nutrition, and those who have had ileal resection all have black pigment stones. Nucleating factors, such as bacteria, are the source of the brown pigment primary common bile duct stones [2].

Cholangiocarcinoma and malignant bile duct obstruction are also causes bile obstruction. Cholangiocarcinoma (CC) is an epithelial cancer that starts in the biliary tree and has cholangiocyte differentiation markers. It has a lot of genomic variability, which explains why it has such a high treatment resistance. Although CC is uncommon, it is associated with a significant death rate because it is frequently identified at an advanced stage that is not susceptible to curative surgery. CC is still a rare disease, despite the fact that its frequency is constantly growing. Large databases of malignant obstructive jaundice, primarily owing to pancreatic head cancer, frequently contain information about endoscopic therapy alternatives. The stated outcomes and advantages of endoscopic treatment techniques may have been affected as a result of this [4].

The occlusion of the common bile duct (CBD) by a foreign body, followed by lithogenesis at that level, is rare and has only been mentioned in the literature a few times. Parasites, fish bones, T tube or other rubber object fragments, shrapnel, metal clips, migrating stents, surgical gauze, and non-absorbable suture material have all been reported as a nucleus for the formation of stones or moulds in the bile duct. Previous examples of CBD impacted surgical gauze presented with obstructive jaundice and radiologically inconclusive examinations, simulating a common bile duct stone or malignant illness of the CBD. Endoscopic and surgical removal of these entities is required to avoid obstructive jaundice consequences such as cholangitis and biliary sepsis [5 -9].

4. EVALUATION

1. Tests on the Blood [1,10,11].

Routine labs and some specialized labs are used in the diagnosis of biliary blockage, including:

- a complete blood count (CBC)
- Comprehensive metabolic profile (CMP)
- Bilirubin fractionated
- Fractionation and alkaline phosphatase
- Gamma-glutamyltransferase
- Serology for viral hepatitis
- Anti-mitochondrial antibody concentrations
- Antinuclear antibody
- Coagulation research
- Markers of cancer (CA19-9, CEA, AFP)

2. Urine Examination
3. Stool Bilirubin Urine Test

- To rule out GI malignancy, occult blood is used.

4. Endoscopic and radiologic studies - Both non-invasive and invasive radiologic tests can be used to determine the cause of biliary blockage.

- Because of its low cost, non-invasive nature, and widespread availability,

abdominal ultrasonography with Doppler can be used as a first radiological test. Ultrasound is a useful tool for detecting gall stones, extrahepatic bile duct dilations, and measuring the patency of blood arteries using doppler.

- An abdominal CT scan may be the next step, depending on the ultrasound results. This can be used to check for pancreatic head lesions, liver lesions, and other intra-abdominal conditions.
- The HIDA scan, a nuclear medicine scan, can detect cystic duct obstruction.
- MRCP (magnetic resonance cholangiopancreatography) is a highly sensitive test for detecting further intrahepatic and extrahepatic bile duct abnormalities such as cholangiocarcinoma, strictures, and bile duct stones.
- Based on the results of noninvasive testing, endoscopic procedures such as EUS (endoscopic ultrasound) with needle aspiration and ERCP with cytology and biopsies can be suggested. In cases of biliary blockage caused by gall stones, ERCP can be both diagnostic and therapeutic.
- PTCA (percutaneous transhepatic cholangiogram) based on interventional radiology can be used to acquire biopsies and evaluate for strictures. [1,12,13].

5. MANAGEMENT

A. CBD Stricture [1]

1. Benign:

- Balloon dilatation with endoscopic sphincterotomy
- Endoscopic stenting followed by stent removal/replacement after 4–6 weeks If and when surgery is required, a biliary-enteric bypass is performed.

2. Malignant

- Stenting and endoscopic drainage
- Internal and exterior drainage with percutaneous drainage with PTC
- In unresectable situations, a palliative biliary-enteric bypass is performed.
- In resectable illness, resection of the tumour with biliary-enteric anastomosis is performed.

B. Parasites

1. Medication

- Albendazole
- Mebendazole
- Pyrantel pamoate

2. Surgical/endoscopic:

- ERCP with sphincterotomy and basket extraction.
- Cholecystectomy, CBD exploration, and T-tube implantation are all options for gallbladder invasion.

C. Choledochal Cysts

- ERCP and cytology are used to check for cancer.
- If necessary, excision and a hepaticoje junostomy may be performed.

Choledocholithiasis is treated by removing the obstructing stones via endoscopic means. Under general anaesthesia, an ERCP can be performed with the patient in a prone, left lateral, or supine position, though prone is the most common. After that, the endoscopist will insert a duodenoscope into the second half of the duodenum and insert a catheter and guidewire into the common bile duct. After that, a sphincterotome is used to cauterise the papilla and enlarge the ampulla of Vater with a sphincterotome. This manoeuvre frequently results in the stones being released. To grasp the stones and remove them if necessary, a variety of snares and baskets can be used. The common bile duct can also be swept with a balloon catheter to remove any stones. In the common bile duct, the endoscopist can also place a stent, which will serve two purposes. First, any remaining stones will be softened, and potentially easier to remove with a second ERCP. Second, the stent allows bile drainage, thereby preventing obstructive jaundice. If the stones are large, stuck, or there are many stones in the biliary tree, surgical removal is required. Stones that cannot be removed by endoscopic methods require laparoscopic or open exploration of the common bile duct. It is also recommended to perform elective cholecystectomy during the same admission to prevent common bile duct stones from occurring in the future [2,14-16].

Patients with jaundice had a higher risk of postoperative problems, thus preoperative biliary drainage was added to improve the postoperative outcome. Preoperative biliary drainage was shown to minimize morbidity and mortality after surgery in several experimental trials and retrospective case series. Nonetheless, two meta-analyses of randomised trials and a systematic review of descriptive series found that patients who had preoperative biliary drainage had a greater overall complication rate than those who were referred straight to surgery. The use of a plastic biliary stent followed by postponed surgery in patients who were fit for surgery for malignant common bile duct (CBD) obstruction was linked with a greater morbidity rate than surgery within one week. This was explained in part by problems related to the biliary drainage surgery. Preoperative biliary drainage has been introduced into the work-up of carcinoma of the pancreatic head or distal CBD in many institutions. In 2010, van der Gaag et al. conducted a large multicenter randomised trial in which 202 patients were randomly assigned to receive either preoperative biliary drainage followed by surgery within 4-6 weeks of diagnosis or surgery alone within 1 week of diagnosis. Serious problems occurred in 39% of those who had urgent surgery and 74% of those who had biliary drainage. In patients who had preoperative drainage, neither mortality nor length of stay were reduced. Furthermore, the presence of a stent within the biliary tree may impair diagnostic imaging's capacity to forecast tumour resectability and the surgeon's ability to establish the proximal tumour extent during intervention [4,17-33].

Perforation of the extrahepatic biliary tree during childhood is a rare occurrence. The aetiology of bile duct perforation is unknown, but a stone or bile sludge clogging the distal common bile duct has been linked to one-quarter of recorded instances. A DISIDA (99m technetium diisopropyl iminodiacetic acid) scan indicated perforation of the biliary tree in a 4-week-old girl with jaundice. In a case report [33]. A distal common bile duct obstruction with proximal perforation was discovered during exploratory surgery. Because of duct irritation, no attempt was made to remove the obstructive lesion. The obstruction of the common bile duct lasted until week 5 after surgery, when cholangiography demonstrated unobstructed passage of contrast into the duodenum through a normal-sized common bile duct with no filling defect. Exploration of the common bile duct to remove a distal obstruction could be dangerous in the case of acute inflammation associated with biliary tree rupture. review of the literature suggest that if the obstructing stone or sludge is managed expectantly, it may pass naturally [34].

6. CONCLUSION

Common Bile duct obstruction is common disease and unfortunately it can to severe complications if left unchecked such as damaging the such as hepatic dysfunction, renal failure, nutritional deficiencies, bleeding problems, and infections. There's plenty of reasons that can cause the obstruction, such as forming of gall stones, duct stricture, or even the present of foreign bodies and parasites. Treatment of these case depends on the causing effect with sphincterotomy with lithotripsy, choledochotomy, choledochoduodenostomy, choledochojejunostomy, or cholecystectomy are the most used for large gall stones, we hope for the development of more effective methods in the future.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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