ENDOTHERAPY OF BENIGN BILIARY LESIONS

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Abstract: *Benign biliary lesions, comprising CBD stones, bile leaks, stricture and parasitic infestations are common clinical problems. Most of these cases can be diagnosed based on clinical and imaging findings. Earlier, surgery was the main stay of treatment. But now endotherapy, consisting of ERCP, sphincterotomy, dilatation and stenting has become the treatment of choice. It is highly effective, safe and is widely available. CBD stones can be removed in over 95% of cases while bile leaks are managed successfully in 100% of cases by sphincterotomy and stenting. Postoperative biliary stricture requires aggressive approach with placement of multiple stents and frequent exchanges. Failed cases unsuitable for endotherapy can be managed by percutaneous or surgical methods.*

Key words : *CBD stones, Mirrizi's syndrome, bile leaks, biliary stricture, biliary ascariasis & biliary hydatosis.*

INTRODUCTION

Endoscopic retrograde cholangio-pancreaticography (ERCP) was introduced initially as a diagnostic modality for evaluation of peri ampullary, pancreatic and biliary pathologies. Soon, its therapeutic potential was realised and endoscopist started treating various biliary and pancreatic during ERCP. Also with the development of better diagnostic modalities like conventional ultrasound, CT scan, MRCP and endoscopic ultrasound, the role of diagnostic ERCP is diminishing.

INDICATION

Now a days, ERCP is primarily used for treating various benign and malignant pancreaticobiliary disorders. The common **benign** conditions which are treated endoscopically are

1) Choledocholithiasis, hepatolithiasis, Mirrizzi's syndrome and cystic duct stump stones
2) Bile leaks
3) Biliary strictures
4) Parasitic infestation like ascariasis, hydatid cysts

CBD STONES

Choledocholithiasis is seen in 15% of patients with gallstones[1]. The stones can be secondary, occurring in association with gallstones or primary without gallstones. The secondary CBD stones are more common and originate from gall bladder. Eighty percent of patients with CBD stones have gallstones and composition of CBD and gallstones is similar (cholesterol stones)[2]. Primary CBD stones are pigment stones, are more common in Asia and occur in association with liver flukes and round worm. The common presentations of CBD stones include recurrent biliary colics, cholangitis, pancreatitis, abnormal liver function tests and imaging without symptoms and occasionally presence of stones on imaging but no symptoms and normal LFTs. LFTs show cholestatic pattern. Ultrasound which is easily available, cheap and portable can pick up upto 50% of CBD stones[3]. CT scan can pick up stones which are radiopaque. MRCP is highly sensitive and specific in diagnosing CBD stones (over 90%)[4]. Endoscopic ultrasound is also very useful for diagnosing CBD stones and also sludge in CBD. ERCP is the **gold standard** for the diagnosis of CBD stones. The sensitivity and specificity of ERCP for detecting CBD stones is over 95%[5].

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Management

Before the advent of endoscopic treatment, surgery was the primary mode of management of these cases with some complimentary role of percutaneous approach. Now a days, endotherapy is the first line of management of CBD stones. It is highly successful and safe procedure, and is widely available. Surgery is reserved for failed endotherapy cases or where laparoscopic or open CBD exploration is planned during the cholecystectomy. Various techniques used for treatment of CBD stones either alone or in combination includes:

Endoscopic sphincterotomy, balloon dilation, stone extraction using baskets and extraction balloons, mechanical lithotripsy, ESWL, laser lithotripsy and biliary plastic stenting Endoscopic sphincterotomy involves cutting of papilla and CBD sphincter using wire guided papillotomy or occasionally needle knife, the length of papillotomy determined by the size of papilla, size of stones and the bile duct and presence of periampullary diverticulum. Primary **balloon dilation** uses CRE balloons to dilate the papilla to 8 to 10mm so as to facilitate removal of stones less than 1cm in size. It is especially done in cases of coagulopathy or distorted anatomy. It carries negligible risk of bleeding or perforation but higher risk of pancreatitis. Secondary balloon dilatation involves partial sphincterotomy followed by dilation upto 15mm and is used for removal of larger stones. Once sphincterotomy and/or balloon dilation has been done, stones are removed using soft wired Dormia baskets or balloons. The above techniques result in stone clearance in nearly 90% of the cases[6]. (Fig.1)

Patients with larger stones, impacted stones, small papilla or presence of periampullary diverticulum or undilated lower CBD may require crushing of stones. Mechanical lithotripter is the most commonly used device for stone fragmentation and their removal. It involves catching of the stone in the basket followed by crushing against a metallic sheath. (Fig.2) Various mechanical lithotripters used are from Olympus, Trapezoid basket from

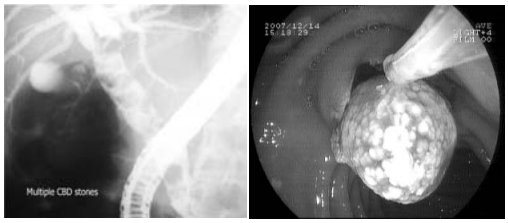

Fig.1: ERCP with EPT and CBD stones removal

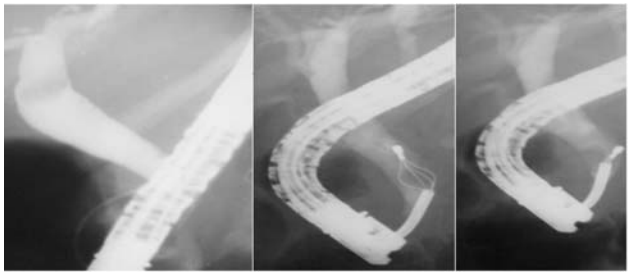

Fig.2: Mechanical Lithotripsy for removal of large CBD stones

Boston scientific, Sohendera and Mediglobe. This procedure is successful in 90% of attempted cases[7].

In centres where **ESWL** facility is available, stones can be crushed under ultrasound or fluoroscopic guidance. This may be preceded by placement of nasobiliary drain or stent or immediately followed by ERCP and removal of fragmented particles. This results in clearance of 70% of difficult stones[8]. Stones resistant to these measures can be crushed using laser delivered endoscopically. In patients where stone removal is not possible or unsuccessful, 10F **biliary stents** can be placed either as a temporary measures or definitive in medically unfit, elderly patients.

MIRRIZZI'S SYNDROME

The condition is seen in 1% of patients undergoing cholecystectomy. It results from impacted stone in neck of gall bladder causing biliary obstruction - type1 (Fig.3) or cholecystocholedochal fistula (type 2). Such patients can be managed by biliary stenting followed by surgery[9].

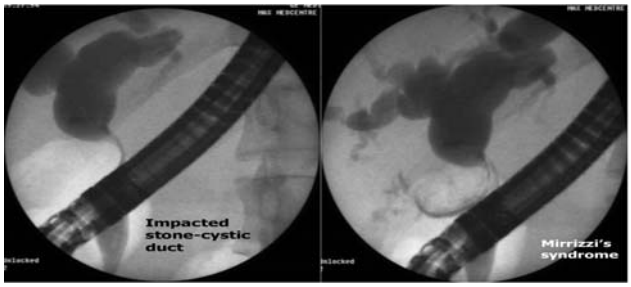

Fig.3: Stone impacted in cystic duct compressing the CBD – Mirrizzi's syndrome

CYSTIC DUCT STUMP STONES

This is very uncommon problem where stones may be left in the stump following cholecystectomy. They are more common after laparoscopic cholecystectomy especially when long stump is left behind and the fundus first technique is used. It may be asymptomatic or present with biliary colics and obstructive jaundice. The management options include ERCP with stone removal using *mechanical lithotripters, stump resection laparoscopically or open surgery, ESWL* and *oral dissolution therapy*. (Fig.4).

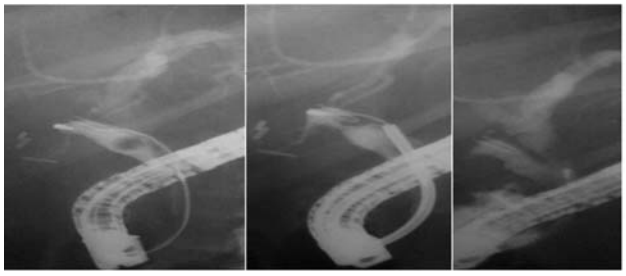

Fig.4: Removal of cystic duct stump stone.

HEPATOLITHIASIS

The condition is seen in patients with liver flukes, ascariasis, primary sclerosing cholangitis and anastomotic strictures. Patient present with recurrent pain and fever and uncommonly jaundice. Treatment is difficult, requires antibiotics, stricture dilatation and stone removal using wire guided balloons and baskets.

BILE LEAKS

Bile leaks occur due to disruption of the wall of bile ducts. These may occur either due to surgery like cholecystectomy and liver transplantation, invasive procedures on liver like liver biopsy, radiofrequency ablation, transhepatic intrahepatic porto-venous shunts and penetrating and blunt trauma. The leaks are more common after *laparoscopic cholecystectomy* (.5 to .8%)[10, 11] than open cholecystectomy. They are seen in up to 26% patients after cadaveric liver transplant[12]. The leaks are mostly seen from cystic duct stumps or accessory duct injuries following cholecystectomy and from T- tube site or anastomotic sites in patients undergoing liver transplant. The leaks may be minor and heal spontaneously in a day or two. But majority of the patients are symptomatic. They may present with persistent or increasing bile output from the abdominal drains or with abdominal pain, fever and distension. *Clinically* patients may be febrile, toxic, jaundiced and have distended and tender abdomen with sluggish bowel sounds. Investigations reveal neutrophilic leucocytosis, deranged liver function tests and localised collection or free fluid in abdomen on imaging. The leak can be diagnosed on nuclear scan but this is less sensitive and may not identify the exact site. Direct cholangiography[13], either endoscopic or percutaneous, is the investigation of choice. It confirms the presence, site and degree of leak and also the underlying cause for the leak like stone or stricture.

MANAGEMENT

It requires team approach, consisting of therapeutic endoscopist, interventional radiologist and surgeon. Most of these cases can be managed by ERCP. The *endoscopic techniques* include *endoscopic sphincterotomy*, *biliary stenting* with or without

sphincterotomy and nasobiliary drainage. The basic principle of all these procedures is to eliminate pressure gradient between bile duct and duodenum allowing preferential flow of bile into the duodenum[14]. *Endoscopic sphincterotomy* alone is successful in 85% of cases[15]. It may take longer time for healing. *Biliary stenting* with or without sphincterotomy appears to be the preferred technique with success rate ranging from 84 to 100% in various series [16, 17](Fig.5). The stent used may be long bridging the leak or small just eliminating the pressure gradient. A larger diameter stent, preferably 10F is used for stenting. The stents are usually removed after 4 to 8 weeks. Placement of *nasobiliary drain* is as effective as biliary plastic stenting and has the advantage of irrigation and repeat cholangiography. It can be removed after 7 to 10 days. Disadvantages of nasobiliary drain include local irritation, cosmetically unacceptable and accidental dislodgement. Newer techniques being attempted in such cases include local injection of botulism toxin in the papillary sphincter, sealing of leak by use of glue and in animal models use of biodegradable stents thereby avoiding repeat procedure for stent removal. In cases of failed endotherapy or difficult anatomy, percutaneous approach can be used for the leaks. This is also used for aspirating or draining bilomas. It is less successful in undilated biliary system. Surgery is reserved for failed endoscopic/ percutaneous approaches and complicated injuries.

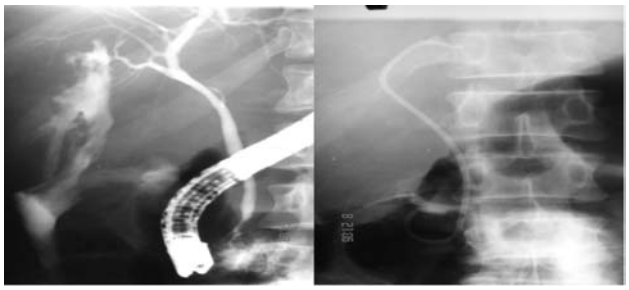

Fig.5: Post operative bile leak managed with biliary stenting

BILIARY STRICTURES

Bile duct strictures can be caused by bile duct injuries during surgery or trauma, chronic pancreatitis, primary sclerosing cholangitis, portal biliopathy and other uncommon causes. Most of the cases result following open or laparoscopic cholecystectomy (.2 to .5%)[18] and cadaveric liver transplant (2 to 16%)[19]. The factors responsible for stricture formation following cholecystectomy include partial or complete clipping or ligation of the bile duct, thermal and ischemic injury. In cases following liver transplant, the stricture can occur at duct to duct anastomosis due to ischemic injury (especially in cases where no T- tube is placed) or at choledocho or hepaticojejunostomy site or can be ischemic affecting donor bile ducts. In contrast to bile leaks, patients with biliary strictures usually present late after months to years of injury. They may manifest with only deranged liver function tests, fever with jaundice and itching or full blown secondary biliary cirrhosis. The diagnosis can be suspected based on clinical picture, deranged liver function tests supported by dilated intrahepatic biliary system and bile ducts. MRCP with MRI plays an important role in demonstrating the level and length of stricture, proximal and distal ducts, status of liver, including evidence of cirrhosis. It also helps in deciding the preferred invasive modality for diagnosis and treatment. Biliary strictures in chronic pancreatitis can be seen in 10% of the cases which may be asymptomatic or present with features of obstructive jaundice and cholangitis. The stricture may be short and terminal but is more commonly in lower part, tight and may be sigmoid in shape.

Management

Before the popularity of endoscopic and percutaneous treatments, surgery was the mainstay of treatment in post operative biliary strictures (POBS), consisting of either choledochoduodenostomy or hepaticojejunostomy. The short and long term results of surgery are reasonably good (70 to 90%), but the associated morbidity (18 to 51%) and mortality (4 to 13%) are high. Also, 12 to 45% of patients may have recurrent symptoms. *Endoscopic* and *percutaneous approaches* are good alternative to surgery, the choice depending on the level of stricture, local expertise available and failure of one technique. *Endoscopic treatment* is the preferred modality in most cases. It involves direct cholangiography making note of the length, tightness and course of stricture, status of proximal ductal system, calibre of distal CBD, and taking brush cytology or biopsy in suspicious cases. It is usually followed by biliary sphincterotomy and dilation of the stricture either using balloon dilators or graduated catheters and then placement of large diameter plastic biliary stents across the stricture. The standard protocol is to place two or three 10F stents, then change every three months for one year. This approach provides good results in 74 to 90% of patients but the recurrence rate is high[20, 21].

Fig.6: Post operative bile duct strictures

In order to improve the initial long term results and reduce recurrence[22], Costamagna group reported a more aggressive approach for POBS. They placed increasing number of stents, at each stent exchange so as to obliterate the stricture. The mean duration of the treatment was 12 months and mean number of stents placed were 3.1. The success rate was 90% with none of the patient developing recurrent stricture after 4 years of follow up. The *complications* with endoscopic treatment include sphincterotomy related, cholangitis and perforation at stricture site. In patients with failed endotherapy, inaccessible papilla or lack of available expertise and hilar stricture type III and IV, percutaneous approach can be attempted. In expert hands, the results are similar to endotherapy. But it may be contraindicated in patients with ascites, coagulopathy and be difficult in undilated biliary system. This can also be used for rendezvous technique.
The management of biliary strictures in post transplant cases was initially surgical, consisting of hepaticojejunostomy. But this has

high morbidity and mortality. Then, percutaneous approaches were attempted giving good results. But now endotherapy is the treatment of choice with percutaneous and surgical options reserved for failed cases. Endotherapy consists of gradual dilation followed by plastic biliary stenting, increasing the number of stents at each session (Fig.6). This has resulted in success rate of 90% compared to previous less aggressive approach which gives success rate of 50 to 94%. Biliary strictures in chronic pancreatitis can be managed on short term by plastic stenting especially in patients with cholangitis. But surgery seems to be the definitive therapy in symptomatic cases. There are few studies of use of self expandable metallic stents in benign strictures. As they are non removable (uncovered biliary stents), they should only be used in cases not fit for surgery or repeated endoscopic procedures (preferably covered stents).

BILIARY ASCARIASIS AND HYDATID CYSTS

Biliary ascariasis is common problem in areas where roundworm infestation is endemic. It may cause recurrent biliary colics, jaundice, pancreatitis, cholecystitis and stone formation. The treatment consists of *endoscopic removal* using forceps or balloon avoiding sphincterotomy followed by deworming with pyrantel palmoate or albendazole (Fig.7)[23].

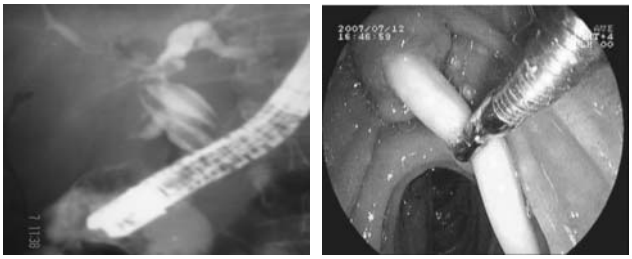

Fig.7: Endoscopic removal of Roundworm from CBD

Hydatid cyst of the liver, usually presenting as mass lesion or pain, can occasionally rupture into biliary tree causing pain and jaundice. *ERCP with sphincterotomy* can help in removing the membranes and cysts[24].

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