

BILIARY MANOMETRIC PERFUSION TEST IN THE EVALUATION OF BENIGN BILIARY STRICTURE TREATMENT - A CASE REPORT

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Background: Benign biliary strictures treated radiologically by percutaneous dilatation treatment are usually evaluated by 'clinical test'. For objective evaluation of treatment success, measurement of the pressure inside the biliary tree has been proposed.

Aim: The aim of this article is to report our experience with the measurement of the pressure in the biliary tree after treatment, to present the biliary manometric perfusion test (BMPT) as an alternative method of treatment evaluation and to demonstrate why the perfusion test is a better method of evaluation.

Materials and Methods: A 65 year old lady with post operative biliary stricture and symptoms of jaundice was treated in our Department with percutaneous dilatation treatment and long-term drainage. The perfusion test (BMPT) was adopted for evaluating treatment success after the treatment for 9 months. An intrabiliary pressure less than 20 cms of water during perfusion test was considered success threshold.

Results: The test was carried out without any complications and the pressure inside the biliary tree was less than 20 cms of water during the test. Eventually the drain was removed. On follow-up at 6 months the patient developed no recurrence of jaundice and the quality of life improved clinically. Periodic liver function tests during follow-up were normal.

Conclusion: The perfusion test(BMPT) is promising efficacious alternative method for the evaluation of radiological treatment of benign biliary strictures. It helps us to decide the end points in treatment and also helps in identifying patients who might later develop strictures.

INTRODUCTION

Benign biliary strictures are usually treated surgically or endoscopically. When these strictures are not accessible by endoscope or when open repair is not possible, percutaneous dilatation treatment is indicated. Percutaneous treatment includes initial drainage and dilatation of stricture by balloon angioplasty catheters of different diameters. When treated percutaneously, the typical sequence for determining the treatment success and potential durability is the cholangiographic impression of the free flow of contrast medium across the treated stricture followed by the 'clinical test'. The clinical test involves leaving a small non functional 4 F safety catheter peripheral to the treated stenosis for a period of time (usually 7 to 10 days) and following with liver function tests. If the liver function tests are within the normal range and if the obstructive symptoms do not recur it suggests that the treated stricture will sustain prograde bile flow once the catheter is removed. Accordingly, the treatment is considered successful and the safety catheter is withdrawn. For the objective evaluation of the treatment success measurement of pressure inside the biliary tree (Biliary manometric perfusion test) has been proposed. The aim of this article

is to report our experience with the measurement of pressure in the biliary tree after treatment, to present biliary manometric perfusion test as an alternative method of treatment evaluation and to demonstrate why the perfusion test is a better method of evaluation.

MATERIALS AND METHODS

A 65 year old lady was presented to our department (Department of Radiology, University Hospital, Olomouc) with symptoms of jaundice and cholangitis. Her liver function tests were mildly elevated (LFT = Serum Bilirubin:8.0 µmol/L, Alanine transferase(ALT):0.63 IU/L, Aspartate transferase (AST):0.85 IU/L, Alkaline phosphatase(ALP):11.54 IU/L, Gamma glutamyl transferase(GMT): 2.56 IU/L). She had a previous history of laproscopic cholecystectomy 10 years before and later post operative biliary stricture 4 years earlier for which reconstructive hepatico jejunostomy was done. The ultrasound of the abdomen revealed dilated intrahepatic biliary ducts. When the patient was admitted to our hospital with cholangitis and jaundice, she was finally referred to our department for percutaneous transhepatic drain-

age and dilatation treatment in view of the surgery done earlier. Endoscopic treatment was not tried because of the previous hepaticojejunostomy anastomosis. We performed the percutaneous puncture of biliary tree from a right sided approach under local anaesthesia and gained access to the biliary system after which cholangiography was done. The cholangiography revealed a very tight stenosis at the hepatic duct junction with dilatation of intrahepatic ducts. Manometry has been tried to demonstrate the correlation of poor bile duct caliber and intraductal pressures and is discussed in the literature¹. It is not routine to measure the pressure inside the biliary tree during the transhepatic drainage. However we wanted to establish the correlation of increased intraductal pressure in the biliary tree in the presence of biliary stricture in our patient. Therefore before advancing the guide wire through the stenosis into the intestinal loop we measured the pressure inside the biliary tree at the level of stenosis. We placed one small catheter just above the stenosis and connected it to the manometer. It was more than 24 cm of water. A guide wire was then advanced through the stenosis into the intestinal loop and a 7F drain was left through the stenosis for enabling external-internal drainage (Fig. 1). After 3 days, balloon dilatation of the stricture using a 8 mm balloon with a pressure of 10 atmospheres for 3 minutes was done (Fig. 2) and a 12 F drain was left in situ for 3 months for stricture remodeling. Cholangiography was repeated after 3 months and this revealed persistence of stenosis. Therefore another balloon dilatation using a 10 mm balloon with a pressure of 10 atmospheres for 3 minutes was done and a 14 F drain was left in situ for external-internal drainage and long term stricture remodeling (Fig. 3). After 3 months cholangiography was done which revealed decompressed intrahepatic bile ducts but in view of mildly elevated liver function tests, we changed the drain and another 14 F drain was left in situ for 3 months more for long-term drainage. Subsequently after a total period of 9 months of dilatation and long term drainage, cholangiography was repeated which revealed free-flow of contrast through the stenosis to the intestinal loop. Even though we had the evidence of unimpeded flow of contrast material through the treated stenosis during cholangiography, we decided to perform manometry to ensure the functional status of the treated stricture. We evaluated the treatment efficacy and success of the treatment using the biliary manometric perfusion test (BMPT) instead of the standard clinical test. We followed the specifically reported technique of manometric perfusion test by Savader et al.^{2,4}. The pre-existing internal external biliary catheter was exchanged for a 10 F sheath which was left peripheral to the treated stenosis (Fig. 4) and was connected by tubing and a three way stop cock to a manometer and a standard angiography injector. With the stop cock off the angiographic injector and on to the manometer, the baseline intrahepatic pressure was measured and recorded. It was less than 10 cm of water. The injector was loaded with contrast material diluted to 50 % by normal saline. Then the biliary tree was perfused through the side arm valve of the sheath with this diluted

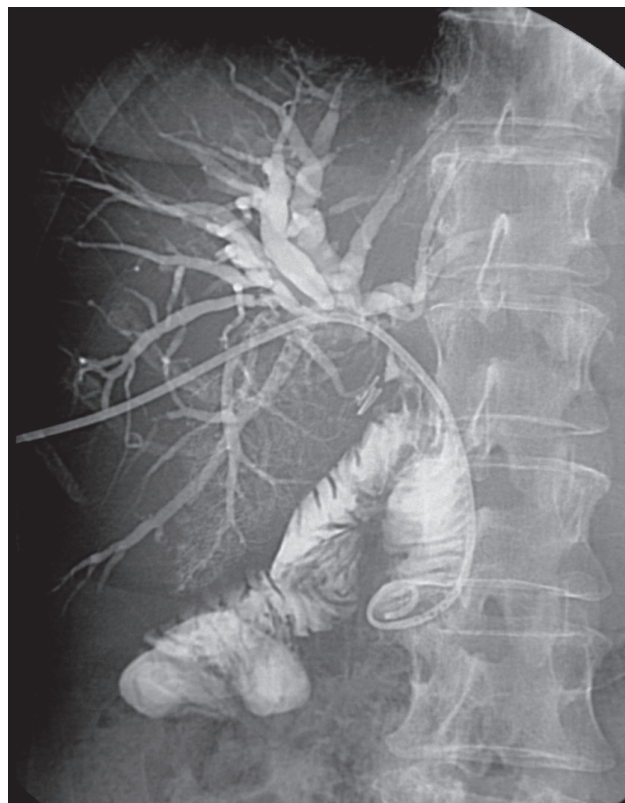


Fig. 1. Initial percutaneous drainage after which a 7 F catheter was left in situ showing dilated intrahepatic ducts and tight stenosis at the hepatic duct junction.

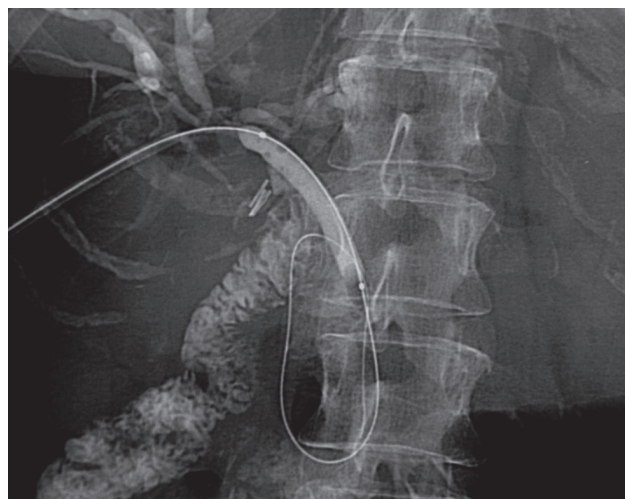


Fig. 2. Balloon dilatation of the stricture using a 8 mm balloon.

contrast at the following incremental rates: 2 ml/min for 5 min, 4 ml/min for 5 min, 8 ml/min for 5 min, 15 ml/min for 3 min, and 20 ml/min for 2 min. The continued adequacy of sheath infusion position was reviewed fluoroscopically during each infusion. At the end of each perfusion the stopcock was taken off the angiographic injector and onto the manometer and the pressure in the

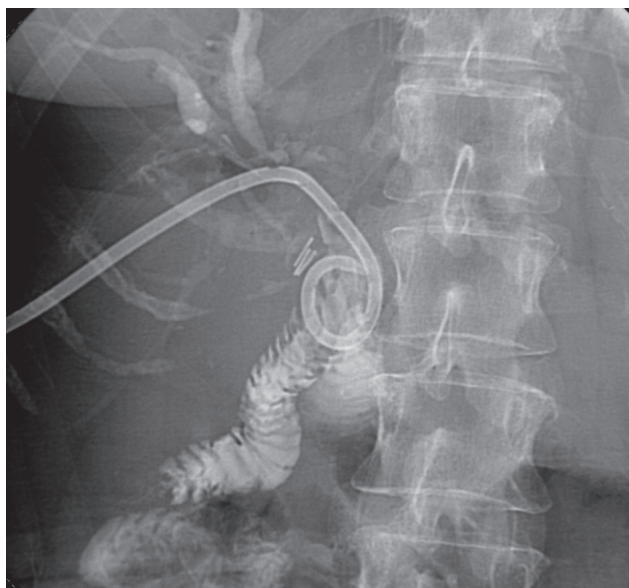


Fig. 3. Long term biliary drainage using a 14 F catheter.



Fig. 4. A 10 F sheath left peripheral to the treated stenosis during manometric perfusion test showing free flow of contrast medium through the treated stenosis.

biliary tree was measured and recorded. The advancement to the next infusion proceeded if the absolute intraductal pressure at the end of each perfusion was less than 20 cms of water and no complications or side effects (chills, rigors or pain) occurred².

RESULTS

The pressure values after each infusion during the perfusion test were 11, 9, 12, 14 & 17 cms of water respectively. The patient experienced no nausea, vomiting,

chills or right upper quadrant pain at any stage of the perfusions. Since she had no pressure more than 20 cms of water in any of the perfusions the drain was removed and the patient was discharged. There were no complications of biliary manometry (fever, chills, pain or sepsis). On follow-up at 6 months the patient developed no recurrence of symptoms of jaundice and the quality of life improved clinically. Periodic liver function tests during follow-up were within the normal range.

DISCUSSION

Benign biliary strictures can have traumatic, postoperative, infectious, inflammatory and other causes. Postoperative strictures are the most frequent⁵⁻⁷. Even though the strictures are benign, long standing benign biliary strictures can lead to recurrent episodes of ascending cholangitis, liver abscesses, biliary cirrhosis and portal hypertension.

The biliary strictures are usually treated surgically or endoscopically. When these strictures are not accessible by the endoscope or the stenosis itself is the result of surgical treatment, radiological percutaneous dilatation treatment is indicated. The percutaneous treatment includes initial drainage and dilatation of the stricture with balloon angioplasty catheters of different diameters⁸.

When treated percutaneously the typical sequence for determining the treatment success and potential durability is the cholangiographic impression of the free flow of contrast medium across the stricture followed by 'clinical test'. The clinical test involves leaving a small non functional 4 F safety catheter peripheral to the treated stenosis for a period of time (usually 7 to 10 days) and followed by liver function tests. If the liver function tests are within the normal range and if the obstructive symptoms do not recur during clinical test it suggests that the treated stricture will sustain prograde bile flow once the catheter is removed. Accordingly the treatment is considered successful and the safety catheter is withdrawn. When we do the evaluation of treatment by the clinical test in our department, we pass the safety non-functional catheter without side holes through the treated stenosis into the duodenal loop and leave it there during the clinical test. This accounts for the fear of dislocation and dislodgement of catheter during the period of clinical test. Theoretically leaving the catheter through the treated stenosis can affect the diameter of the treated part and this in turn can influence bile flow. However, we believe that even when the catheter is left through the stenosis and treated bile ducts sustain free unimpeded flow of bile which is reflected by the normal liver function tests during the clinical test, we can be more sure about the success of treatment. We can also accurately predict that the treated bile ducts will sustain uninterrupted flow once the safety catheter is removed.

One of the difficulties in the use of benign biliary stricture dilatation is determining treatment end points, that is, success warranting catheter removal with expectations of acceptable subsequent patency, treatment failure

warranting surgical revision, or treatment continuation by means of indwelling catheter intubation and potential subsequent dilatation⁹. It is very important to evaluate treatment because the long-term success of the treatment depends on the functional status of the anastomosis. The altered functional status of treated bile ducts can lead to possible slow progression of late biliary cirrhosis even in the absence of elevated liver bilirubin levels (anicteric cholestasis) during follow up.

The functional status of any distal anastomotic conduit is determined by physiological variables like flow, volume and pressure¹. The same physiologic variables decide the functional status of the treated stenosis in the biliary tree. The current evaluation method which is the clinical test, evaluates this functional status indirectly using liver function tests. The pressure inside the biliary tree is directly proportional to the degree of obstruction. This is clearly reflected in the increased pressure (greater than 24 cm of water) in the biliary tree in our patient before the dilatation treatment. The functional status of a bile duct is determined by its ability to sustain prograde flow and pressure. Similar to Urologic Whittaker perfusion studies, manometry has been tried to demonstrate correlation of poor duct caliber and intraductal pressures¹. It is presumed that if the pressure inside the biliary system is less than 20 cms of water, functional status is adequate and the bile ducts sustain free flow.

Accordingly manometric perfusion test has been tried in order to evaluate the adequacy of the percutaneous treatment of biliary strictures after balloon dilatation^{2,3}. Most of the anastomotic strictures are fibrotic and elastic recoil after balloon dilatation is anticipated⁹. The functional measures of the treatment success further ensures the appearance of cholangiographic improvement after dilatation treatment. If the pressure inside the biliary tree is less than 20 cms of water after each perfusion, it can be presumed that the treatment is successful. The manometric perfusion test is a direct measurement of patency of the treated stricture unlike clinical test which evaluates the patency indirectly. Direct measurement of the functional parameters is more reliable for the evaluation of treatment success and helps in deciding the treatment end point. The low pressures during the manometry indicates that once the treatment is finished, the treated bile ducts will sustain free-flow of bile and further chance of slow progression to slow late biliary cirrhosis is excluded. Therefore the manometric perfusion test is definitely a better method of evaluation and is gaining popularity for its inherent advantage in evaluating treatment.

The methodology of the perfusion test was as described above and we followed the specifically reported technique by Savader et al.^{2,4}. There are very few studies that measure biliary pressure to evaluate treatment. The reasons for this are that patients develop biliary strictures as late as 20 years after an apparently successful intervention¹⁰, that long term follow up and documentation are difficult. The few available studies on the perfusion test (Savader et al.) clearly shows that manometric perfusion test has the same efficacy as the clinical trial for predicting

the long term patency of the strictures treated by dilatation treatment. They recommended the manometric test as simple, cost effective with quick results. The manometric perfusion test is a single session test giving immediate results unlike the clinical trial which takes minimum of 7 days. The efficacy of perfusion test lies not only in its advantage to predict the post treatment patency but also in its ability to identify the potential treatment failures thereby reducing the number of patients who might later develop strictures after the treatment is completed². With respect to utilization of both patient and physician time and resources, the perfusion test offers the patient an opportunity to discontinue biliary intubation 2 or 3 weeks earlier than with the clinical trial. Further biliary intubation with small catheter carries a risk of encrustation with bile salts, obstruction, interim catheter dislodgement and cholangitis⁹. The manometric perfusion test is cost effective because patients can save money for safety catheter and other biochemical tests before catheter extraction which includes liver function tests. The evaluation of functional status of treated biliary tree by manometric test helps to detect biliary drainage failure and slow progression to biliary cirrhosis which may even be manifested by non elevated liver function tests during follow up.

CONCLUSION

Our experience with the manometric perfusion test is good and promising. It is simple, cost effective and gives immediate results. It gives the patient the opportunity for discontinuing biliary intubation earlier than that of clinical test. It is definitely a better method of evaluation as it is a direct evaluation of the functional status and it helps us to identify the patients who might later develop strictures. It helps us to ensure the cholangiographic impression of unimpeded flow and helps us to decide the treatment end point. In future, the manometric test can completely replace the clinical test for the treatment evaluation of biliary strictures. We are continuing our study and research.

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