Transduodenal Sphincteroplasty – Still an Effective Biliary Drainage Procedure in The Laparoscopic Era

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ABSTRACT

Background: With the advent of interventional endoscopic procedures and with growing experience with laparoscopic surgery, the indications for open biliary procedures have become limited. Aims & Objectives: This prospective study reviews the changing trends in the indications of transduodenal sphincteroplasty and presents the short-term and long-term outcomes of this procedure in the present minimally invasive surgical era. Methods: Transduodenal sphincteroplasty was performed for various benign obstructive biliary pathologies. Various parameters recorded were the demographic data, indications for surgery, early and late complications and long-term outcome of the procedure. The changing trend in the current indications of the procedure was reviewed. Results: Results of transduodenal sphincteroplasty on 49 consecutive patients over 9 years period are presented. Mean age was 48.4 years with male to female ratio of 1:3.4. Twenty-six (53.0%) patients presented with obstructive jaundice and 36.7% had cholangitis. Common indications of surgery included multiple common duct calculi (44.8%), impacted ampullary stones (36.6%) and ampullary stenosis (10.2%). Overall hospital morbidity was 12.2% with zero mortality. After a mean follow up of 9.3 years, 95.9 % patients had “good” or “fair” and 4.1 % reported “poor” results. Conclusion: Most of the biliary pathologies may be dealt with laparoscopic and endoscopic procedures; open drainage procedures may still be indicated in selected patients. Transduodenal sphincteroplasty remains an effective biliary drainage procedure with acceptable morbidity and mortality. The procedure should be regarded as an essential in the general surgical knowledge and training.

Key words: Transduodenal sphincteroplasty, Indications, Outcome

INTRODUCTION

Ever since the introduction of endoscopic sphincterotomy and advanced laparoscopic biliary procedures, the indications of open exploration of common bile duct, and more so, the biliary drainage procedures have become limited. Endoscopic management is useful but requires the expertise of a medical gastroenterologist and may not be available at many centers. In addition the procedure carries an early complication rate of around 10% with a procedure-related mortality of 0.4-1%. Laparoscopic procedures need considerable experience and sophisticated and expensive technologies. Moreover even the basic laparoscopic facility is not yet available at every center. Transduodenal sphincteroplasty has been a safe and effective biliary drainage procedure when performed correctly and for carefully chosen indications. Even with all the endoscopic and laparoscopic advances, the procedures may still be indicated in selected cases.

Shaikh Zayed Postgraduate Medical Institute (SZPGMI) is a tertiary referral center in Lahore, Pakistan. Laparoscopic surgery was started in the institute in 1990, but laparoscopic common bile duct (CBD) exploration has not yet been introduced. The center has a well-equipped Gastroenterology Unit involved in various diagnostic and therapeutic endoscopic procedures. This prospective study reviews the results of 49 consecutive cases of transduodenal
sphincteroplasty performed for various indications over a 9 years period. The objective was to review the indications and outcome of the procedure in the present era of endoscopic and laparoscopic management of various biliary pathologies.

PATIENTS AND METHODS:

From January 1992 through December 2000, a total of 14018 patients were admitted to the Department of General Surgery, SZPGMI, Lahore. Out of these, 2523 patients (17.9%) were admitted for various benign biliary diseases and 2327 patients (16.6%) underwent some biliary surgery, including 2253 (96.8%) cholecystectomies. CBD exploration was performed in 335 (14.4%) cases and Transduodenal Sphincteroplasty (TS) was carried out in 53 (15.8%) of these patients. Four patients were lost to follow up. The results on rest 49 (14.6%) patients are further presented.

Preoperative evaluation comprised a detailed history and physical examination. Various hematological and biochemical investigations included complete blood count, estimation of BUN, creatinine, electrolytes and serum amylase levels. Liver function tests, hepatitis screening and coagulation profile were performed in all cases. Imaging studies included plain X-rays of the chest and abdomen. An abdominal ultrasound was obtained in all cases and remained the mainstay of diagnosis and subsequent management. Preoperative Endoscopic Retrograde Cholangiopancreatography (ERCP), available in the last 5 years of the study, was requested in 22 (44.8%) patients. Main indications of ERCP had been; inconclusive abdominal ultrasound with dilated common duct along with multiple gall stones, an abrupt termination of common duct on ultrasonography (suggestive of stricture or impacted stone), recurrent attacks of pancreatitis and in postcholecystectomy cases with persistent biliary symptoms and inconclusive ultrasonography. Peroperative cholangiography was used selectively in patients where operative findings were not consistent with preoperative diagnosis. A T-tube cholangiogram was obtained in all postoperative cases where cholecystectomy was combined with CBD exploration. Adequate hydration, correction of electrolytes and coagulation profile and optimization of renal function were regarded as important preoperative measures. All patients were put on therapeutic doses of cefoperazone in the perioperative period. Antibiotics were changed appropriate to subsequent cultures whenever needed. Right subcostal or paramedian incision was employed in all cases. Cholecystectomy was carried out first where symptomatic gall stones were associated findings. A supraduodenal choledochootomy was performed in all cases for exploration and as an aid in localizing the papilla. The ampulla was identified and assessed employing a 3 mm Bakes dilator. Papillary stenosis was defined as inability to pass a 3 mm Bakes dilator. The duodenum was completely mobilized. An oblique duodenotomy incision was made over the papilla. A small grooved dilator was passed from the bile duct into the duodenum. This helped in protecting the pancreatic duct orifice in addition to identifying the intramural course of the bile duct. The sphincteroplasty was then performed for a distance of 2-2.5 cm in an anterolateral (10 or 11 o’clock) position. The mucosa of the duodenum and bile duct were subsequently approximated with 4-0 polygalactin 910 (Vicaryl, Ethicon®, U.K.) placed at 3 mm intervals. Particular attention was paid for meticulous suturing of the two mucosae at the apex of the incision to prevent leak. The duodenum was repaired in single layer employing 2-0 polygalactin 910 (Vicaryl, Ethicon®, U.K.). The operative area was drained and a T-tube was retained in all cases.

Postoperative morbidity and mortality were recorded. All patients had serum amylase checked on the first and third postoperative days and then only if indicated. Postoperative hyperamylasemia was defined as a rise in serum amylase level up to 500 U/L, without significant clinical findings. Postoperative pancreatitis was diagnosed when severe abdominal pain was associated with fever, increased fluid requirement, shock, hyperamylasemia and elevation of liver enzymes. The T-tube was removed in 7-9 days after obtaining a postoperative cholangiogram. All patients were followed every month for the first 6 months, every 3 months for the next 6 months and every 6 months thereafter. Subjective assessment of relief was made by symptomatic improvement. All patients had liver function tests checked on every follow up visit. A plain X-ray abdomen was obtained in all cases on second follow up visit to demonstrate pneumobilia.
Detailed investigations were requested only if patients had persistent or recurrent biliary symptoms or in cases with deranged liver function tests. Results were considered “good” if the patient had no further symptoms, required no further surgery for persistent biliary complaints and returned to usual activities. Results were labeled as “fair” in case of incomplete symptomatic relief or transient recurrent symptoms requiring no further biliary surgery. Persistent biliary symptoms, frequent or recurrent attacks of pain or pancreatitis necessitating further surgery or procedure related death after discharge from the hospital was categorized under “poor” results.

RESULTS

Out of the 49 patients included in the study, 11 (22.4%) were male and 38 (77.6%) were female; male to female ratio being 1:3.4. The age ranged from 26 to 69 years (mean 48.4 years). Seventeen (34.6%) patients were above 50 years of age. Upper abdominal pain was the commonest presentation observed in 89.7% (44) cases, followed by flatulent dyspepsia 61.2% (30) and obstructive jaundice 53% (26) patients. Altered coagulation profile necessitating correction was observed in 14 cases (28.5%). Eighteen patients (36.7%) presented with features of cholangitis, whereas 4 others (8.1%) had acute pancreatitis at presentation. Seven patients (14.2%) had previous cholecystectomy with 5 (10.2%) having CBD exploration. Nine patients (18.3%) were diabetic and 1 (2.04%) had renal impairment at presentation.

Mean hemoglobin was 10.3 g/dL (range, 8.4-14.6) and mean total white cell count was 10.8x10^9 (range, 5.9-23.4). Deranged liver function tests were observed in 29 (59.1%) cases. Mean total bilirubin was 63.2 Umol/L (range, 5.3-167 Umol/L). The alkaline phosphatase in the non-icteric patients ranged from 98 U/L to 714 U/L (mean, 523.3 U/L) and in the icteric patients from 198 U/L to 1219 U/L (mean, 857.9 U/L). Increased levels of alkaline phosphatase were observed in 83.6% (41) of all cases. Seven patients (14.2%) had raised serum amylase (mean 945 U/L). Abdominal ultrasound obtained in all cases revealed gall bladder stones in 38 (77.5%) patients whereas 4 (8.16%) had no gall stones and 7 (14.2%) already had cholecystectomy in the past. The common bile duct was reported as dilated (1.2-2.6 cm) in 38 (77.5%) cases and CBD stones were verified in 29 (59.1%) patients. No demonstrable abnormality of biliary ducts was reported in 3 (6.1%) cases on ultrasonography. ERCP was performed in 22 (44.8%) cases. The procedure confirmed dilated CBD (>1cm) with multiple common duct calculi in 8 (36.3%) patients and solitary stone larger than 2 cm in size in another 5 cases. Three (13.6%) patients were reported to have an impacted calculus with ampullary stenosis. Short stricture (1 cm) in the lower end of the common duct in 2 (9.09%) patients and ampullary stenosis with a periampullary diverticulum in 1 (4.5%) were other findings on ERCP. The procedure failed in 3 (13.6%) patients. Three patients had a T-tube retained after previous biliary surgery. The T-tube cholangiogram revealed residual stones in 2 cases and a short distal stricture in one patient. Table 1 summarizes the indications for surgery and operative findings in 49 cases. The mean common duct size was 1.7 cm (range, 1.2-2.7 cm). Five (10.2%) patients had operative evidence of acute pancreatitis and 3 (6.1%) had acute cholecystitis. The operative findings in 7 patients with previous biliary surgery included: residual stones (2 cases – 4.08%, ERCP not available in 1 case and

Table 1: Indications of Operation & Operative Findings

<table>
<thead>
<tr>
<th>Indications and findings</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple common duct stones</td>
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<td>44.89</td>
</tr>
<tr>
<td>Ampullary stone</td>
<td>18</td>
<td>36.7</td>
</tr>
<tr>
<td>Isolated</td>
<td>14</td>
<td>28.5</td>
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<tr>
<td>Associated ampullary stenosis</td>
<td>04</td>
<td>08.1</td>
</tr>
<tr>
<td>Ampullary stenosis (isolated)</td>
<td>05</td>
<td>10.2</td>
</tr>
<tr>
<td>Short distal stricture (up to 1 cm)</td>
<td>03</td>
<td>6.1</td>
</tr>
<tr>
<td>Periampullary diverticulum with ampullary stenosis</td>
<td>01</td>
<td>02.0</td>
</tr>
<tr>
<td>Associated findings</td>
<td></td>
<td></td>
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<tr>
<td>Pancreatitis</td>
<td>05</td>
<td>10.2</td>
</tr>
<tr>
<td>Acute cholecystitis</td>
<td>03</td>
<td>06.1</td>
</tr>
<tr>
<td>Findings in 7 patients with previous biliary surgery*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual stones</td>
<td>02</td>
<td>04.08</td>
</tr>
<tr>
<td>Missed stones</td>
<td>01</td>
<td>02.0</td>
</tr>
<tr>
<td>Recurrent stones</td>
<td>02</td>
<td>04.08</td>
</tr>
<tr>
<td>Impacted ampullary calculus</td>
<td>01</td>
<td>02.0</td>
</tr>
<tr>
<td>Short distal common duct stricture (up to 1 cm)</td>
<td>01</td>
<td>02.0</td>
</tr>
</tbody>
</table>

*Percentages calculated against total number of patients (49)
deemed not amenable in other case due to stone size > 2cm on ultrasound), missed stones (1 case - 2.9%,
ERCP failed), recurrent stones (2 cases - 4.08%,
ERCP not requested), ampullary stenosis with an
impacted calculus (1 case - 2%, ERCP failed) and a
short distal common duct stricture (1 case - 2%, ERCP
deemed not helpful). The histopathology was reported
as chronic calculus cholecystitis in 35 (71.4%),
chronic acalculus cholecystitis in 4 (8.16%), and acute
cholecystitis in 3 (6.12%) cases. Histopathology of the
ampulla obtained in all cases of stenosis and short
striction revealed chronic non-specific inflammation.

Overall postoperative morbidity was 12.2% (6
patients). Wound infection was the commonest
complication (10.2%) followed by chest infection
(8.16%). Three (6.12%) patients had significant early
postoperative hyperamylasemia (>300 U/L), returning
to normal within 4 to 6 days. Two (4.08%) patients
developed transient duodenal leak, managed with
continued conservative management. One (2.04%)
patient developed acute pancreatitis, as an
exacerbation of preoperative pancreatitis. There was
no hospital mortality.

Follow up was available for a mean period of
9.3 years (range, 4 - 13 years). Results were rated as
“good” in 42 (85.7%), “fair” in 5 (10.2%) and “poor”
in 2 (4.1%) patients. No patient developed recurrent
stones or ampullary stenosis during the follow up
period. Out of 2 patients with “poor” result, one had
ampullary stenosis with impacted calculus associated
with recurrent pancreatitis and the other had a short
distal common duct stricture at initial exploration.
Extensive investigations, including ERCP and HIDA
scan, could not reveal any pathology necessitating
reexploration in both patients.

**DISCUSSION**

Indications of transduodenal sphincteroplasty
have become limited in the present endoscopic and
laparoscopic era. Endoscopic treatment is effective,
but the procedure has an overall morbidity of 10% and
mortality of 2.3%.2,3 In a recent meta-analysis
performed on seven prospective randomized
controlled studies comparing the endoscopic
sphincterotomy to surgery in the management of
common duct stones, Hay observed that endoscopic
procedure should not be the first treatment.4 Concerns
have also been expressed for the long-term results of
endoscopic sphincterotomy. Late complications have
been reported in 5.8-24% cases.5 These include stone
recurrence or papillary stenosis reported mostly within
10 years of endoscopic treatment. The failure or
inability to perform the treatment has been reported in
another 5% to 10% of patients.6 Laparoscopic
exploration of the common bile duct is becoming more
popular but is associated with substantial variation in
results signifying that different patient populations
have been studied. Laparoscopic exploration of the
bile duct has been reported as safe and effective when
used for all patients. The procedure has been
recommended to replace the endoscopic
sphincterotomy for young and fit patients.7 Various
other novel approaches for endoscopic clearance of the
common duct include; electro hydraulic lithotripsy
followed by ERCP in high risk elderly patients8,
endoscopic papillary balloon dilatation (EPBD)9, and a
combined laparoendoscopic approach.10 Though
transduodenal sphincteroplasty is infrequently
performed these days, the procedure may still be
indicated in selected or difficult cases. This study
highlights the overall decreasing trend for
transduodenal sphincteroplasty in the present
endoscopic and laparoscopic era of biliary surgery.
The female preponderance (3.4:1) is similar to other
studies.11,12,13 The mean age of 48.4 years correlates
well with 44-56 years reported in earlier studies.11,12,14
whereas 34.6% patients were above 50 years of age.
Upper abdominal pain (91%) was the commonest
presentation. Obstructive jaundice was observed in
58.2% and pancreatitis in 8.1% cases in this study.
Antrum and Hall in their study of 101 patients reported
abdominal pain in 95%, obstructive jaundice in 62.4%
and pancreatitis in 9.9% cases.15 Cholangitis was the
presenting feature in 40.3% patients in this study. This
finding is similar to that of 40.4% reported in a series
of 109 patients by Anderson and colleagues.16
Common duct stones (83.6%) (multiple or impacted)
remained the commonest indication for
sphincteroplasty. This is well within the figures of
76% to 85.5% reported in the literature.11,13,16 The
incidence of missed stones (2.04%) and residual stones
(4.08%) in the present study correlates well with that
of 1-5% described in other studies.17,18 Patients with
ampullary stenosis (5 isolated, 4 associated with stone
and 1 associated with periampullary diverticulum)
Transduodenal Sphincteroplasty

constituted 20.3% of the study patients. This figure is lower than 22% to 30% reported in some earlier reports.\(^{11,16,19}\) This observation reflects the changing trend in indications for transduodenal sphincteroplasty, as more and more patients with ampullary stenosis are now dealt with endoscopic procedures. ERCP can be regarded as the procedure of first choice in the management of obstructive jaundice resulting from benign biliary pathologies, like stones, ampullary stenosis and distal strictures. Large impacted stones, with or without associated ampullary stenosis, maintained an almost static trend as an indication of the procedure throughout the study period. The overall postoperative morbidity in the present study is 12.2%. Various studies have quoted the morbidity figures ranging from 2-28% (Table 2).\(^{11,15,16,22,25}\) Pancreatitis and cholangitis have been the most fearsome postoperative complications of transduodenal sphincteroplasty. Pancreatitis developed in only one patient (2%) in this study. The reported incidence of pancreatitis varies considerably but averages around 2%.\(^{15,23,24}\) The diagnosis is often difficult as transduodenal sphincteroplasty predisposes to a higher incidence of postoperative cholangitis. Only one patient (2%) in this study developed cholangitis. As this patient initially presented with cholangitis due to an impactedampullary stone, this is difficult to label that postoperative cholangitis was related to the procedure or merely a continuation of the same disease process. Peel and associates quoted a 5% incidence of early and 10% incidence of late cholangitis following transduodenal sphincteroplasty.\(^{25}\) Stefanini and colleagues reported 6 cases and Thomas et al observed 7 cases of postoperative cholangitis in their series of 542 and 1061 cases respectively.\(^{12,24}\) Cholangitis may be regarded as a consequence of biliary stasis rather than reflux.\(^{15}\) Madden and colleagues demonstrated this by an experimental anastomosis between the common bile duct and colon. They labeled this clinical entity as “descending cholangitis.” Duodenal leak is another feared complication of the procedure. In the present study there were 2 (4.08%) duodenal leaks, both closing spontaneously with conservative management. Strom and Stone reported an incidence of 1.6% and Finan et al described a 3% incidence for this complication.\(^{29,30}\) Jones and Smith experienced no duodenal leak in their study of 268 cases.\(^{31}\) These authors believed that opening and closing the duodenum in the same axis can prevent the duodenal leak or fistulization. As the medial border of the duodenum can not be mobilized, longitudinal incision with transverse closure results in tension and may contribute to dehiscence or narrowing of the lumen. Accordingly, the duodenum was repaired in the same axis in this study. Transduodenal sphincteroplasty has been described to carry an overall mortality rate of 1-13%.\(^{11,20,31,32}\) Various studies have identified old age, low albumen, high bilirubin, associated illness (renal impairment, diabetes), and presence of sepsis as significant contributory factors affecting mortality after transduodenal sphincteroplasty.\(^{11,20,30,32}\) No hospital mortality was observed in this study. This may partly be explained by a younger mean age of the patients (48.4 years), strict adherence to the operative principles, selection of the patients and a better perioperative care. With the better understanding of pathophysiological basis of the disease and improvement in the perioperative care including effective preoperative preparation, treatment of infection, minimal manipulation within the common

<table>
<thead>
<tr>
<th>Authors</th>
<th>Total Patients</th>
<th>Overall Morbidity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stefanini et al (1974)(^{11})</td>
<td>712</td>
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</tr>
<tr>
<td>Antrum &amp; Hall (1984)(^{15})</td>
<td>118</td>
<td>05.9</td>
</tr>
<tr>
<td>Anderson et al (1985)(^{16})</td>
<td>109</td>
<td>28.0</td>
</tr>
<tr>
<td>Chiong et al (1989)(^{21})</td>
<td>143</td>
<td>15.4</td>
</tr>
<tr>
<td>Ortega et al (1991)(^{20})</td>
<td>150</td>
<td>25.9</td>
</tr>
<tr>
<td>Ramirez et al (1993)(^{32})</td>
<td>135</td>
<td>05.1</td>
</tr>
<tr>
<td>Present study</td>
<td>49</td>
<td>12.2</td>
</tr>
</tbody>
</table>

hyperamylasemia is a common observation, occurring in up to one-third of the cases in the early postoperative period.\(^{25}\) The occurrence of this finding makes the diagnosis of postoperative pancreatitis difficult and other clinical presentations like severe abdominal pain, shock, etc should be included in reaching the diagnosis. Postoperative pancreatitis does occur after supraduodenal exploration of the common bile duct (5.7%) and endoscopic sphincterotomy (2.9%).\(^{26,27}\) Cholangitis remains a dreaded complication of the transduodenal common duct procedures. Despite endoscopic and barium meal demonstration of a reflux, there is no evidence that
bile duct, least trauma to the pancreas and careful identification and sparing of the pancreatic duct, the incidence of procedure-related morbidity and mortality can be reduced.

As regards the outcome of the procedure in terms of symptomatic relief and prevention of recurrent disease, follow up was available for a mean period of 9.3 years. Results were regarded as “good” in 85.8%, “fair” in 10.2% and “poor” in 4.0% patients. These findings correlate well with the experience of other authors (Table 3). Patients with the poor results continued experiencing symptoms in the postoperative period. One patient had ampullary stenosis associated with impacted calculus and evidence of recurrent pancreatitis. Patients who initially present with recurrent pancreatitis have been reported to experience poor results by other authors as well. Another patient had a short stricture at the lower end of common duct. Overall 7 (14.2%) patients including those with “fair” and “poor” results were not satisfied with the procedure. The observation that “satisfactory” and “poor” results were reported in patients presenting initially with cholangitis (3 patients), ampullary stenosis with impacted calculus and associated pancreatitis (2 patients), short distal common duct stricture (1 out of 3 patients), and ampullary stenosis associated with periamillary diverticulum (1 patient), further strengthens the recommendation of Rutledge and Jones and Smith, who described all these conditions as associated with unsatisfactory results or as relative contraindications (distal stricture, periamillary diverticulum) for transduodenal sphincteroplasty. An alternate biliary drainage procedure, like choledochoduodenostomy or choledochojejunostomy, may be indicated in such benign biliary pathologies. As regards the long-term outcome in the present study, no patient developed recurrent stones, ampullary stenosis or malignancy during the follow up period. In an international survey of 8,843 patients, the incidence of retained common bile duct stones and papillary stenosis were reported as 1% and 0.7% respectively after transduodenal sphincteroplasty and represented long-term failures of the procedure. These results are, however, much better than stone recurrence rate of 5.8% and papillary stenosis of 24% described mostly within 10 years of endoscopic sphincterotomy. Some serious concern has also been expressed regarding the late development of bile duct cancer after surgical biliary drainage in some reports with long follow up. Mazzoni and colleagues in a study of 1003 patients with a mean follow up of 129.6 months reported late development of bile duct cancer in patients who have biliary-enteric drainage for benign diseases. The incidence of cholangiocarcinoma was reported to be 5.8% after transduodenal sphincteroplasty, 7.6% after choledochoduodenostomy and 1.9% after hepaticojejunostomy. These authors concluded that chronic inflammatory changes consequent to biliary-enteric drainage should be closely monitored for the late development of biliary tract malignancies. The follow up in the present study is not long enough to comment on this aspect of biliary drainage.

**CONCLUSION**

After an initial enthusiasm of endoscopic procedures and with more and more long-term results reporting associated significant morbidity and definite mortality, transduodenal sphincteroplasty can be regarded as an important surgical armamentarium for dealing with difficult and complicated benign biliary pathologies with comparable long lasting results. The procedure is safe and effective, if correctly performed and for carefully selected indications. The risk factors, which appear to be related to the morbidity and mortality, do not significantly differ from those following endoscopic sphincterotomy. Transduodenal sphincteroplasty remains an effective procedure for biliary drainage. The operation allows dependent drainage of the common duct, removal of impacted calculus, direct visualization of the ampulla of Vater and does not create a distal blind segment of the

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**Table 3: Comparison of Outcome after Transduodenal Sphincteroplasty**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Total patients</th>
<th>Good/ Fair (%)</th>
<th>Poor (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stefani et al (1974)</td>
<td>712</td>
<td>97.0</td>
<td>03.0</td>
</tr>
<tr>
<td>Rutledge (1976)</td>
<td>60</td>
<td>91.7</td>
<td>08.3</td>
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<td>138</td>
<td>86.5</td>
<td>13.5</td>
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<tr>
<td>Vogt &amp; Hermann (1981)</td>
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<td>94.1</td>
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<tr>
<td>Antrum &amp; Hall (1984)</td>
<td>118</td>
<td>93.5</td>
<td>06.5</td>
</tr>
<tr>
<td>Ramirez et al (1993)</td>
<td>135</td>
<td>72.9</td>
<td>27.1</td>
</tr>
<tr>
<td>Present study</td>
<td>49</td>
<td>95.9</td>
<td>4.1</td>
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</table>
common bile duct (sump syndrome). Transduodenal sphincteroplasty should be considered a fundamental part of the knowledge and training of a general surgeon even in the present endoscopic and laparoscopic era.

REFERENCES


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