Appendix as a Biliary Conduit for Choledochal Cysts in Children

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Abstract

Biliary conduits are constructed in operations for choledochal cysts. A wide variety of options are available for biliary tract reconstruction. We present our experience of treating six children with choledochal cysts by using the appendix as a biliary conduit. After mobilizing the appendix on its vascular pedicle, non-refluxing, tunneled anastomosis was made with the 2nd part of the duodenum and the appendix. The operative procedure was simple and less time-consuming. Postoperative evaluation was done with the help of HIDA scan and ultrasound examination. Postoperative cholangitis was conspicuously absent in the two years of follow-up. One child has been lost to follow-up. From our preliminary experience, the operation seems simple and satisfying. Though the long-term efficacy still remains to be proven, the appendix should prove durable as a functional conduit.

Key words
Choledochal cyst · appendix

Résumé


Mots-clés
Kyste du cholédoque · appendice

Resumen

En las operaciones por quiste del colédoco es necesario reconstruir la vía biliar para lo que hay varias opciones disponibles. Presentamos nuestra experiencia en el uso del apéndice como conducto biliar en 6 niños con quiste del colédoco. Tras movilizar el apéndice con su pedículo vascular se realizó una anastomosis tunelizada entre la segunda porción del duodeno y el apéndice. El procedimiento operatorio fue fácil y breve. La evaluación postoperatoria se hizo con ayuda de HIDA y estudio ecográfico. No hubo colangitis postoperatoria en los 2 años de seguimiento. Hemos perdido de vista uno de los niños. De esta experiencia preliminar deducimos que esta operación parece simple y satisfactoria aunque la eficacia a largo plazo no ha sido aún probada. El apéndice parece ser un conducto biliar funcional.

Palabras clave
Quiste del colédoco · apéndice

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Bibliography
Zusammenfassung


Schlussfolgerungen: Von unseren begrenzten Erfahrungen her kann die Operation mit Interposition einer Appendix zwischen Choledochus und unterem Duodenum bei Vorliegen einer Choledochuszyste empfohlen werden. Allerdings muss noch geprüft werden, ob die Appendix selbst als ein brauchbares, funktionelles und vor allem dauerhaftes Ersatzrohr geeignet ist.

Schlüsselwörter
Choledochuszyste · Appendix · Gallenableitung

Introduction

The use of intestinal segments to reconstruct the biliary system after surgery for biliary atresia or choledochal cyst is not new. Kasai et al. [9] first described hepaticoportoenterostomy, which involved the use of a Roux-en-Y jejunal loop. Later, many modifications were made to the technique by Kasai and others [4, 5, 10,11,17], but a major problem of these techniques has been ascending cholangitis. Ascending cholangitis has been noted in up to 50–90% of cases with a high incidence of morbidity [12]. The authors describe here their experience with the use of the appendix as a biliary conduit for biliary reconstruction following excision of choledochal cysts in six children. The operation is easier and it achieves an anatomic reconstruction that is close to normal.

Materials and Methods

Six patients between 4 and 9 months of age with choledochal cysts type I were studied from March 2000 to September 2001. Three patients presented with conjugated hyperbilirubinemia, while one presented with a perforated choledochal cyst with biliary peritonitis. Two were diagnosed incidentally on abdominal ultrasound.

In addition to clinical examination, hematological tests for a full blood count, renal function tests, liver function tests, and a coagulation profile were carried out. An ultrasound examination was done in all cases for the evaluation of the extra- and intrahepatic ducts. Magnetic resonance cholangiopancreatography was done preoperatively in all cases to rule out biliopancreatic duct anomalies.

The abdomen was opened through a supraumbilical right transverse incision. The right colon and hepatic flexure was mobilized to bring the cecum under the liver. The appendix was then detached, preserving the vascular pedicle. The stump was ligated and buried, using purse string sutures. The tip of the appendix was cut open so as to form a tube from the appendix. This was irrigated with a solution of providone iodine and saline. The cecal end of the appendix was anastomosed with the common hepatic duct with interrupted 5–0 dexon or vicryl sutures. The distal end of the appendix was anastomosed to the duodenum with interrupted 5–0 dexon or vicryl sutures after forming a tunnel between the mucosa and the muscularis. The seromuscular layers were closed over it using interrupted 5–0 dexon sutures (Figs. 1 and 2). A drain was placed in the sub-hepatic space. Postoperatively it has been our practice to give prophylactic antibiotics for a period of six weeks. We used a combination of trimethoprim and sulphamethoxazole (cotrimoxazole 12 mg/kg once daily in all our patients. Hematological and biochemical investigations were repeated two weeks after surgery and subsequently at six weeks during the first follow-up. An ultrasound was done at 3 months and supplemented with a Tc HIDA scan in three patients. Repeat ultrasound scans were done on a yearly basis for the first two years. Hematological and biochemical investigations were repeated every 6 months for the first two years. Follow-up was done every 6 months up to a period of two years, following which the children will be reviewed on a yearly basis (Table 1).

Results

All children did well in the postoperative period. There was no evidence of cirrhosis in any of the patients. One child was lost to follow-up after two weeks. All hematological and biochemical investigations were normal at the two-week check-up. Jaundice had resolved in all three children who had initially presented with hyperbilirubinemia. A Tc HIDA scan was done in three patients operated for choledochal cyst excision with interposition of the appendix three months after surgery which showed a normal length and caliber of the duct with free flow of the contrast into the duodenum and no evidence of reflux. Follow-up HIDA scans could not be carried out in all patients because of economic restraints, but the lack of clinical evidence of cholangitis or jaundice eliminated the possibility of reflux or strictures and ensured a free flow of bile. Repeat ultrasound scans done on a yearly basis showed no dilatation of the intrahepatic biliary tree or changes of portal vasculature.

We had no febrile episodes to suggest cholangitis in the two years of follow-up of our patients. Currently all five patients in follow-up are free of jaundice.
Discussion

An ideal biliary conduit is one that should allow a free flow of bile from the liver to the duodenum, without allowing reflux of any intestinal contents back into the biliary tree. Though the jejunal loop is well known and effective, it has its own drawbacks.

Cholangitis is one of the main problems that the surgeons have to face in these patients. As many as 50% of patients who have been operated for Biliary Atresia, and about 46% of patients operated for biliary reconstruction after resection of choledochal cysts have episodes of cholangitis. This high incidence has prompted various modifications of the jejunal grafts to prevent reflux, e.g. using interposition grafts, intussuscepted ileocolic interposition graft [1,4,10], jejunal nipple valve [3,10,15], mucosal flap valve [16], and sphincter of Oddi valve [13], but in spite of all these modifications the incidence of cholangitis remains significant. Jejunal loop has its own disadvantages, i.e. the use of a wide loop that may necessitate tailoring, strictures at the site of anastomosis, and loss of a long jejunal loop out of the intestinal circuit.

The use of the appendix, on the other hand, is well suited as a biliary conduit. The procurement of the appendix is simple and direct. The conical base and the tapering tip are well suited for biliary replacement. The small caliber, well-vascularized tube can be anastomosed to the duodenum using a nonrefluxing tunnel. The bile is directed into the duodenum, which is a physiological area for the intestinal and biliary contents to be mixed.

We used prophylactic antibiotics for up to six weeks after surgery. O’Neill [14] suggests that the chances of postoperative cholangitis diminish six weeks after surgery. Decreased incidence of postoperative cholangitis as suggested by Gupta et al. [8] when the appendix was used as a biliary conduit was possibly due to the role played by the presence of lymphoid follicles in the wall of the appendix.

Grosfeld et al. [7] first reported the use of an appendiceal graft for biliary reconstruction in mongrel dogs. Greenholz et al. [1] performed an ancillary appendiceal conduit to provide biliary drainage of an independent bile duct. Crombleholme et al. has used this technique successfully in patients with biliary atresia and choledochal cyst [2]. The appendix has also been used as a ureteral conduit and long-term patency and function has been documented for as long as 11 years postoperatively [18]. Our initial experiences with the use of the appendix as a biliary conduit have shown promising results.

Table 1 Patient details

<table>
<thead>
<tr>
<th>Patient no.</th>
<th>Age in months</th>
<th>Sex</th>
<th>Presentation</th>
<th>Postoperative course</th>
<th>LFT at 6 weeks post op.</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>Male</td>
<td>Incidental</td>
<td>Uneventful</td>
<td>Normal</td>
<td>HIDA – Normal</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>Male</td>
<td>Biliary peritonitis</td>
<td>Fever for two days</td>
<td>Normal</td>
<td>HIDA – Normal</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>Male</td>
<td>Jaundice</td>
<td>Uneventful</td>
<td>Normal</td>
<td>USG – Normal</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Male</td>
<td>Jaundice</td>
<td>Uneventful</td>
<td>N/A</td>
<td>Lost to follow-up</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>Female</td>
<td>Jaundice</td>
<td>Uneventful</td>
<td>Normal</td>
<td>HIDA – Normal</td>
</tr>
<tr>
<td>6</td>
<td>71/2</td>
<td>Male</td>
<td>Incidental</td>
<td>Uneventful</td>
<td>Normal</td>
<td>USG – Normal</td>
</tr>
</tbody>
</table>

conduit in children with choledochal cyst seem to be promising and long-term follow-up of these children would be interesting.

References

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