determined by correlating the recipient's serum reactivity against the T and B lymphocyte and monocyte populations as well as the use of HLA-specific monoclonal blocking antibodies. Thus, a procedure is now available for better prediction of graft survival in the recipient. The usefulness of this new procedure is particularly important in patients with high levels of sensitization. Investigators have noted that finding a serologically compatible kidney for these individuals is very difficult (15). Since the modified flow cytometric procedure can make the distinction between deleterious and irrelevant antibodies, some potential recipients may still be considered for transplantation with an available kidney despite a positive B cell crossmatch result. In conjunction with the CDC assay, we intend to use this modified flow cytometric crossmatch technique to study antibodies reactive with donor leukocytes in order to improve the success rate of renal transplantation.

In summary, we have described a modified flow cytometric crossmatch technique that utilizes donor peripheral blood leukocytes. The use of leukocytes provides a wider spectrum of antigens and has the potential to distinguish between antibodies that are detrimental and those that have no effect on graft survival. The procedure can also be performed in a shorter period of time than lymphocytotoxicity and previous flow cytometry crossmatch procedures. Three cases were described in which the modified crossmatch procedure was useful in characterizing the antibody responsible for the positive B cell CDC crossmatch. The application of this procedure in renal transplantation allows for the use of extended phases of crossmatch testing, thus enhancing the probability of graft survival. At the same time, some potential allograft recipients are not excluded from consideration for transplantation solely on the basis of a positive crossmatch result.

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LATE COMPLICATIONS WITH GALLBLADDER CONDUIT BILIARY RECONSTRUCTION AFTER LIVER TRANSPLANTATION

The preferred techniques for biliary tract reconstruction with liver transplantation are duct-to-duct anastomosis over a T-tube stent or anastomosis of the graft common duct to a defunctionalized Roux limb of jejunum (1-3). A more complex but occasionally useful procedure is the gallbladder conduit operation, which was recommended by Waddell and Grover (4) for use in liver transplantation and adapted by Calne (5) for this purpose.

In our own experience with almost 2000 liver transplantations, the Waddell-Calne option for biliary reconstruction has been exercised on only 10 occasions. In most of the 10 patients (Table 1), multiple previous operations had caused extensive scarring, and/or there had been the loss of a large portion of the small bowel, either from construction of multiple Roux limbs or because of extensive intestinal resections for other reasons. The use of the gallbladder conduit under these circumstances either obviated the need for extensive dissections, permitted the use of a short residual Roux limb, or allowed both advantages.

The biliary reconstructions were performed exactly as described by Calne (5). In essence, the donor common duct is anastomosed to the base of the donor gallbladder (Hartman's pouch) and the fundus of the gallbladder is anastomosed to...
TABLE 1. Complications of gallbladder conduit biliary reconstruction

<table>
<thead>
<tr>
<th>OT* No.</th>
<th>Age at transplantation</th>
<th>Date of transplantation</th>
<th>Multiple previous operations</th>
<th>Complication</th>
<th>Time to revision</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>235</td>
<td>45</td>
<td>8/8/82</td>
<td>Yes</td>
<td>No complication</td>
<td>No revision</td>
<td>Alive and well</td>
</tr>
<tr>
<td>250</td>
<td>3</td>
<td>8/22/82</td>
<td>Yes</td>
<td>Gallstone/cholangitis</td>
<td>5 Years</td>
<td>Alive and well</td>
</tr>
<tr>
<td>768*</td>
<td>22</td>
<td>10/5/88</td>
<td>Yes</td>
<td>No complication</td>
<td>No revision</td>
<td>Died 3 weeks postop.</td>
</tr>
<tr>
<td>1277</td>
<td>2</td>
<td>10/28/87</td>
<td>Yes</td>
<td>Gallstone/cholangitis</td>
<td>1 Years</td>
<td>Alive and well</td>
</tr>
<tr>
<td>1305</td>
<td>44</td>
<td>10/20/87</td>
<td>No</td>
<td>No complication</td>
<td>No revision</td>
<td>Alive and well</td>
</tr>
<tr>
<td>1321</td>
<td>20</td>
<td>12/8/87</td>
<td>Yes</td>
<td>No complication</td>
<td>No revision</td>
<td>Alive and well</td>
</tr>
<tr>
<td>1371</td>
<td>1½</td>
<td>1/17/88</td>
<td>Yes</td>
<td>No complication</td>
<td>No revision</td>
<td>Alive and well</td>
</tr>
<tr>
<td>1402</td>
<td>3</td>
<td>2/13/88</td>
<td>Yes</td>
<td>Sludge/cholangitis</td>
<td>6 Months</td>
<td>Alive and well</td>
</tr>
<tr>
<td>1601</td>
<td>54</td>
<td>7/6/88</td>
<td>Yes</td>
<td>Increased liver enzymes/gallstone</td>
<td>3.5 Months</td>
<td>Alive and well</td>
</tr>
<tr>
<td>1732</td>
<td>53</td>
<td>10/11/88</td>
<td>Yes</td>
<td>No complication</td>
<td>No revision</td>
<td>Died 9 weeks postop.</td>
</tr>
</tbody>
</table>

* OT, orthotopic transplantation.

* Retransplantation—first transplantation was 4/21/86.

A typical late complication is shown in Figure 2. The stricture occurred at the site of the anastomosis between the donor duct and the gallbladder. The stones were found in the donor duct, the gallbladder, or both places (Fig. 2). Reoperation was required in each instance with conversion to a choledochojejunostomy 0.3, 1, 3.5, and 5 years after the transplantation. The symptoms leading to operation were life-threatening in 3 patients with severe cholangitis. The fourth patient had silent obstructive jaundice. Reoperation was successful in all 4 cases.

FIGURE 1. Biliary reconstruction with a gallbladder conduit. The T-tube passes through the proximal and distal anastomosis and out through the gallbladder wall to the skin.

FIGURE 2. Transhepatic cholangiogram 5 years after transplantation and biliary reconstruction with gallbladder conduit.
By 1974, the devastating effect of biliary tract complications after liver transplantation had been recognized and the need for improved techniques was obvious (6). The options settled upon in our program were either choledochojejunostomy or choledochocholedochostomy with a T-tube stent (1–3). The alternative technique of reconstruction with a donor gallbladder conduit has the advantages of providing a double passage of bile from the new liver via the common duct and cystic duct, as well as easy access for postoperative irrigation through a carefully placed T-tube. In addition, dangerous dissections and loss of additional jejunal length can be avoided in patients with multiple previous operations. With this method, the rate of complications in the Cambridge program was substantially reduced (7).

However, it has not been appreciated that sludge and stone formation would be a common late complication, particularly in pediatric recipients. In our small series of only 10 patients, reoperation became necessary as early as 3.5 months after transplantation, and as late as 5 years. The potential hazards as well as the inconvenience inherent in this method of biliary tract reconstruction should preclude its use except for those specific indications already mentioned.

In summary, the Waddell-Calne method of biliary tract reconstruction using a gallbladder conduit was associated with a 50% incidence of late biliary tract sludge or stone formation, with obstruction and frequent cholangitis. This procedure should not be used for the biliary tract reconstruction of liver transplantation except under extremely specific and very rare circumstances.

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SATORU TODO
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NONTROPICAL PYOMYOSITIS IN A RENAL ALLOGRAFT RECIPIENT

Pyomyositis (pyomyositis tropicans) is an abscess-forming bacterial infection of skeletal muscle. This illness usually occurs in tropical climates, where it is well recognized, but is infrequently diagnosed in nontropical climates. It is, however, being recognized with increasing frequency in the United States. Although trauma, parasitic and viral infections, nutritional and other metabolic factors have been implicated, the exact pathophysiologic mechanisms leading to bacterial infection of skeletal muscle are unknown. Staphylococcus aureus is almost always the offending organism but the disease can be caused by virulent streptococci and other species. The disease occurs most often in males and in younger patients. Pyomyositis carries an important morbidity and mortality if not diagnosed properly and treated aggressively with antibiotics, as well as surgical intervention (1–8).

We present the first published case of nontropical pyomyositis occurring in a renal allograft recipient and comment on the presenting features, diagnosis, and therapy of the disease in this paper.

The patient is a 53-year-old white male with end-stage renal disease secondary to chronic glomerulonephritis. He underwent a cadaver donor renal transplant in 1978 which was lost to chronic rejection in 1985. He returned to dialysis at that time and underwent a second cadaver donor renal transplant in December 1987. Since that time he has enjoyed excellent allograft function (baseline serum creatinine 1.4–1.7 mg/dl). His maintenance immunosuppressive medications were prednisone 10 mg/day and cyclosporine A 250 mg/day (3.2 mg/kg/day). His past medical history is also significant for chronic hepatitis B infection with probable cirrhosis, hypertension, gouty arthritis, and lower extremity venous thrombosis. There is no history of previous dermatologic problems or intravenous drug abuse. He has never traveled outside the continental United States.

On July 1, 1988 he developed pain in the right elbow which became progressively worse, especially at night, and he presented for evaluation in Transplant Clinic on July 5. There was no history of trauma to the arm or any other difficulty. At that time he was afebrile. Examination of the right arm revealed no history of previous dermatologic problems or intravenous drug abuse.

The presenting features, diagnosis, and therapy of the disease in this paper.