Experience with surgical implantation of catheters for continuous ambulatory peritoneal dialysis

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Summary
In 68 patients undergoing Continuous Ambulatory Peritoneal Dialysis (CAPD) a total of 77 CAPD catheters were surgically implanted providing a total CAPD experience of 980 patient months. The early postoperative complications of catheter displacement and blockage have not occurred since the routine employment of flanged Oreopoulos catheters and omentectomy. Peritonitis remains the major cause of later morbidity although 72 per cent of the patients in this series remain on CAPD between one and 31 months after catheter placement.

We contend that open surgical implantation of Oreopoulos catheters together with omentectomy contributes to reducing the incidence of mechanical complications in patients undergoing CAPD.

Introduction
Continuous ambulatory peritoneal dialysis (CAPD) is an increasingly popular form of treatment for patients with end-stage renal failure. Its advantages include increased patient freedom, biochemical stability and the fact that CAPD is an anabolic process compared with the catabolic events associated with haemodialysis (2, 3).

The overwhelming disadvantage of CAPD is peritonitis which may be attributable to poor bag-changing technique on the part of the patient or due to the introduction of organisms by the nursing and medical staff. This in turn is related to the amount of clinical manipulation to which the catheter may be subjected.

In many centres CAPD catheters are inserted under local anaesthesia using a trocar but this has a considerable incidence of both vascular and intestinal complications (4, 5). Other centres (6), have adopted a policy of open surgical implantation of the catheter in an attempt to diminish the incidence of such complications.

If open surgical implantation becomes the technique of choice it seems likely that increasingly more surgeons will be requested to undertake catheter insertion. We therefore felt it of interest to review our own series of CAPD catheter insertions in an attempt to identify where the surgeon may contribute towards diminishing the incidence of CAPD complications.

Patients and methods
From January 1981 to January 1984 77 CAPD catheters were surgically implanted into 68 patients with end-stage renal failure. There were 25 females and 43 males whose ages ranged from fifteen months to 67 years. Six patients had previously undergone intraperitoneal abdominal surgery, mostly through lower abdominal wounds.

Under general anaesthesia a lower midline incision five to eight centimetres long was performed. In 63 of the 68 patients the greater omentum was removed from the transverse mesocolon and either a Tenckhoff (Fig. 1a) or Oreopoulos (Fig. 1b) catheter was inserted with the tip lying in the rectovesical or recto-uterine pouch (Fig. 2). The peritoneum was then closed tightly around the catheter so as to place the first Dacron cuff in a pouch between the peritoneum and linea alba at the upper end of the wound. The linea alba was then closed tightly over this cuff and around the catheter using interrupted and continuous polyglycolic acid sutures. A tunnelling device constructed from the trocar of an Argyle chest drain was inserted through a small stab incision in the skin at a point 8-10 cm to the left of the upper end of the midline wound and passed in such a fashion as to emerge from the subcutaneous tissues at the upper end of the incision. The tip of the trocar was inserted into the end of the catheter and withdrawn, thus leading the catheter through a

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Implantation of catheters for ambulatory peritoneal dialysis

The first 16 catheters inserted were standard Tenckhoff catheters of which 3 displaced from the pelvis producing difficulties with ingress and egress of fluid. Subsequently, with the introduction of Oreopoulos catheters only two of 61 have experienced difficulties with flow.

Injection Thirty-one of the sixty-eight patients (45.6%) have suffered no peritonitis. There have been 87 episodes of peritonitis over a period of 900 patient months – one episode per 11.3 patient months. Four patients developed late fungal peritonitis. The first patient did not have the catheter removed and died. The remaining three patients had the catheter removed surgically with full peritoneal lavage and drainage and they survived to return to CAPD at a later date. All twelve patients who developed bacterial peritonitis had their catheters removed and six were able to resume CAPD. The overall causes of catheter removal are summarised in Table I.

**TABLE I Summary of causes of catheter removal**

<table>
<thead>
<tr>
<th>Cause of loss</th>
<th>No</th>
<th>Subsequent progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massive tunnel leak</td>
<td>1</td>
<td>Catheter removed.</td>
</tr>
<tr>
<td>Catheter occlusion (omentum)</td>
<td>2</td>
<td>Catheters removed and immediately replaced</td>
</tr>
<tr>
<td>Catheter displacement</td>
<td>5</td>
<td>Catheters removed and immediately replaced</td>
</tr>
<tr>
<td>Successful transplantation</td>
<td>6</td>
<td>Catheters removed</td>
</tr>
<tr>
<td>Chronic tunnel infection</td>
<td>1</td>
<td>Catheter removed and immediately replaced</td>
</tr>
<tr>
<td>Peritonitis</td>
<td>15</td>
<td>6 replaced later after period on haemodialysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 transferred to permanent HD or transplanted</td>
</tr>
</tbody>
</table>

Hernias Three patients (4.4%) had inguinal hernias at the time of catheter insertion. Nine of the remaining 65 patients (13.8%) developed abdominal wall hernias. Five were male, two inguino-scrotal hernias in children, two unilateral inguinal hernias in adults and one paraumbilical in an adult. Four females developed incisional hernias, two of whom had concurrent peritonitis with catheter removal. The other two and all the men had elective repairs without interruption of CAPD.

**Discussion**

Because of the complications associated with “blind” catheter insertion (4,5) it seems likely that surgeons will be requested to perform CAPD catheter insertion more often. If a surgical technique is employed which carries with it a minimal risk of mechanical complications, then this in turn may result in fewer episodes of peritonitis. Our experience leads us to make the following recommendations. Firstly, use of the tunnelling technique which we describe results in an incidence of tunnel leakage of 8/77 (10.4%), of which only one patient, undergoing steroid therapy, required catheter removal. This contrasts with a reported incidence of tunnel leakage of 20% (7). Consequently, unlike Brown et al (8), we do not feel that CAPD needs to be delayed after catheter implantation.

Secondly, in our experience, the Tenckhoff catheter appears to become more readily displaced from the pelvis than the flanged Oreopoulos catheter with consequent loss of the syphoning principle of having the tip of the catheter in the pelvic sump. Since fewer manipulations of the catheter are therefore necessary we suggest that the Oreopoulos catheter is the one of choice. Comparison of Tenckhoff and Oreopoulos catheters revealed that, excluding those removed following successful transplantation, 57.2% of the former required removal within 12 months of insertion whereas only
16°, of Oreopoulos catheters were removed within the same time interval, again suggesting a technical advantage in the use of Oreopoulos catheters.

Thirdly, we would advocate omentectomy as a primary procedure in CAPD catheter insertion. Occlusion of the catheter by omentum is a well recognised complication of CAPD and two of our first five cases became occluded. None occluded after omentectomy was introduced.

All pre-existing abdominal wall hernias may be successfully repaired at the time of catheter insertion. Our incidence (13:2°n) of abdominal wall hernias arising after the implementation of CAPD compares favourably with that of Nelson et al. 17°n (9) and Rubin et al., 24°n (10). We feel that in the absence of peritonitis, hernia repair may be safely conducted without interrupting CAPD. However, as with a previous report (10), all our incisional hernias have occurred in females. This indicates that an alternative to the midline incision should be considered in women (11).

Our overall incidence of mechanical complications using the technique described was 27.3°n, compared with a figure of 50°n, reported by Brown et al. (8). Since the adoption of routine omentectomy and use of the Oreopoulos catheter we have not had to re-operate on any of our patients other than for hernias or intractable late peritonitis. We would recommend that this procedure should be undertaken as an open surgical operation under general anaesthesia.

The advantages are threefold: the Oreopoulos catheter is placed accurately, omentectomy may be performed and pre-existing hernias can be repaired. All these contribute to a decreased morbidity in CAPD for end-stage renal failure.

Notes on books

Diagnostic Ultrasound in Gastroenterology by L Bolondi, L Gandolphi and G Labó. 544 pages. illustrated. Piccin, Italy. £48.00
An extensively illustrated book which gives a comprehensive account of the applications of ultrasound in clinical gastroenterology. Over 900 ultrasound images are reproduced and explained. The quality of reproduction is high.

Designed to appeal to trainee surgeons it is hoped this book will be used by those preparing for their Fellowship examinations as well as by general surgeons working in areas remote from a cardiothoracic centre. It describes complications which may arise from both investigation and treatment. Prevention of complications is stressed throughout.

This is one in the series of Comprehensive Manuals of Surgical Specialties. This book describes the general principles and the surgical treatment of soft tissue sarcomas at various sites in adults, and special aspects in children. Adjuvant therapy and management of recurrent sarcomas are also discussed. The book is illustrated superbly, much of it in colour.

The first part of this book describes carbon dioxide laser surgery. The second part is devoted to its use in dermatology. Nearly all the pictures are excellent colour photographs.