The Continent Ileostomy

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The object of this article is to evaluate the results with the continent ileostomy and to define its place as a therapeutic alternative after proctocolectomy. In the past, the method has been affected by a high incidence of complications, but technical developments, simplifications, and improvements in surgical techniques have reduced the incidence of early complications from 20–25% to less than 10%, and that of late complications from 45–54% to 10–22%. The mortality rate in several recently published series of 1,142 patients was 0–1% (mean 0.2%), none of the deaths being directly pouch related. Fifteen to 20% of patients develop ileitis, which is usually successfully treated with antibiotics. Eighty-nine to 97% of the patients never require external ileostomy appliances, indicating perfect continence. No serious adverse effects have been found after 19 years’ experience with the method, but a few patients have developed subnormal values of vitamin B12. More than 90% of patients who have previously had a conventional ileostomy claim improvement in social life and sports activities and 68–85% found that the quality of their sexual life had improved. There is no doubt that a well-functioning continent ileostomy offers the patients a quality of life superior to that with a conventional ileostomy. Despite the increasing popularity of the pelvic reservoir and ileoanal anastomosis, the continent ileostomy remains a therapeutic alternative for proctocolectomized patients undergoing conversional procedures and for patients in whom ileoanal anastomosis with pelvic reservoirs are contraindicated or impossible to construct.

The conventional Brooke ileostomy has established itself as a safe and relatively simple method, giving the patient the possibility to enjoy perfect physical health and to live a near-normal life after proctocolectomy. For some patients, however, the conventional ileostomy may create problems that detrimentally influence their quality of life. Constantly having to wear a bag filled with liquid intestinal discharge may lead to significant psychological, social, and sexual problems [1, 2]. Furthermore, local problems such as prolapse, retraction, stenosis, fistula formation, and peristomal hernias necessitate surgical revision in 10–20% of patients, and as many as 25–50% may periodically or continuously experience troublesome skin irritation [3–6]. When Kock introduced the continent ileostomy in 1969 [7], the main objective was to improve the quality of life for these patients, the basic principle being to create a low-pressure reservoir for storage of feces, and a biological closing mechanism eliminating the need for external appliances. Since the introduction of the method, several thousand operations have been performed around the world. It is the object of this article to summarize and evaluate the overall results and to define the place of the continent ileostomy in today’s therapeutic arsenal.

Surgical Techniques

The low-pressure intestinal reservoir with an intussuscepted nipple valve providing continence is illustrated in Fig. 1. The nipple valve has a natural tendency to slip thereby causing intubation difficulties and incontinence [8–10]. Because of this, the surgical technique for constructing the nipple valve has been modified several times [11, 12]. Kock has recently published the techniques and results of his 2 latest modifications used during the period 1982–1984 [13] and 1984–1986 [14]. In these techniques, peritoneum and fat are removed from both sides of the mesentery of the segment to be used for the valve, and a 1–2-cm long opening made along the bowel wall (Fig. 2A). The 5-cm nipple valve is secured with 4 rows of staples using the TA55 stapler (Fig. 2B) and anchored to the wall of the reservoir (Fig. 2C). The reason for using the TA55 instead of the GIA (gastrointestinal anastomosis) stapler is that the former is less hemostatic, leaving a better blood supply to the nipple valve. After closure of the reservoir, an opening is made in the abdominal wall through the rectal muscle and the reservoir is sutured to the abdominal wall. The outlet is pulled through the opening and mucocutaneous sutures are applied (preferably with 4-0 monofil nylon for the least tissue reaction). The opening in the abdominal wall should be about 1½–2 finger breadths so as not to strangulate the blood supply to the outlet. It is a good practice to place an ileostomy catheter in the reservoir outlet while suturing the reservoir to the abdominal wall. The stoma itself should be everted 3–4 mm to avoid retraction and skin stricturing. The important staples are those at the base of the nipple valve. Skinner et al. [15] have, therefore, suggested removal of 10 staples near the hinge of the TA55 unit, i.e., the staples involving the tip of the nipple, in order to secure blood supply and avoid necrosis of the tip.

Several additional measures have been advocated by different authors in order to stabilize the nipple valve. At the Mayo Clinic [12], through-and-through silk sutures, and longitudinal and transverse scarification of the serosa of the nipple valve are used in addition to stapling. In our experience, through-and-through sutures in the nipple valve created internal

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fistulas, so they have been abandoned. Kock et al. [11] used a fascia transplant or a Marlex® mesh at the base of the nipple valve in order to prevent slipping. It was found, in some cases, that the fascia transplant atrophied completely and disappeared without leaving a scar. With the Marlex® mesh, the problem was infection and breakthrough into the reservoir followed by chronic fistulation. Cohen has advocated the use of Prolene® since it is softer and creates fewer problems [16].

Postoperative continuous drainage of the reservoir for at least 2 weeks and intermittent drainage for another 2 weeks are important so that strain is not put on the nipple valve construction too early. This measure was stressed by Gelernt [17] and has quite clearly contributed to improved results.

Defunctioning the reservoir by a proximal loop ileostomy for 6–8 weeks has been reported to reduce the immediate postoperative complications, and may contribute to improved stabilization of the nipple valve [18]. This imposes, however, an additional operation on the patient.

**Early and Late Complications**

In the series reported in the literature, the majority of the patients provided with a continent ileostomy have had ulcerative colitis. A small number of patients with familial polyposis and multiple carcinomas are also included, and sometimes patients with Crohn’s disease have been accepted for this operation.

The operative mortality rate in 925 patients reported from 11 different centers during the years 1974 to 1981 varied between 0 and 8.3% (mean 1.2%) [19]. In more recent series, the reported mortality rate in 1,142 patients was 0–1% (mean 0.2%), none of the deaths being pouch related (Table 1) [13, 20–25].

The most frequent nonfatal postoperative complication requiring surgical intervention has been small bowel obstruction. The most serious postoperative complication is peritonitis due to suture insufficiency. The frequency of postoperative complications requiring relaparotomy, like mortality, has decreased during the years in those centers in which the greatest experience with the method has been gathered. In the series from Göteborg [13], the frequency of postoperative complications requiring reoperation decreased from 22.8% during the period 1967–1974 to 8.4% during the period 1975–1984. In the latest series presented from the Mayo Clinic [20], the frequency of immediate postoperative complications requiring relaparotomy was slightly less than 10%. A marked decrease in the frequency and severity of postoperative complications, with increased experience and improved technique, has also been reported from other centers [20–22].

Late complications occurring at various time intervals after the operation include slipping of the nipple valve, formation of fistulas, prolapse of the nipple valve, stricture of the stoma (skin stricture), and inflammatory changes (ileitis) in the reservoir. Most late complications are related to the construction of the nipple valve, and the most frequent of them all has been slipping of the nipple valve. In the early series from Göteborg, the frequency of revisional surgery was nearly 55%, but has subsequently decreased to less than 10% at present [14, 26]. The same trend has been found in other centers occupied with the method now reporting a frequency of revisional surgery between 8 and 22% [20, 21, 24, 25]. The reduction in late complications is obviously related to increased experience and improved surgical technique. In fact, Kock et al. claim that their latest modification has eliminated the most frequent late complication, namely, slipping of the nipple valve [14].

In Table 2 the relation between late complications and technique of nipple valve construction is presented as it has occurred in the series from Göteborg.

Slipping of the nipple valve, i.e., reduction of the intussuscepted nipple valve, presents as intubation difficulties and leakage. In most instances this complication occurred within 1–2 years after construction of the reservoir [8, 12]. Through-and-through sutures for stabilization of the nipple valve was the first method used, and was applied in 93 patients. Slipping of the nipple valve occurred in 44% of the patients, and internal fistulas bypassing the nipple valve and causing leakage in 9.7%. No prolapse was found in this group. Thus, 53.8% of the patients were subjected to revisional surgery. The method was then changed. The serosa of the mesentery to the nipple valve was excised and the mesentery divided in such a way that

![Fig. 1. The continent ileostomy reservoir in situ. The outlet is constructed with a skin flush stoma and a nipple valve to maintain continence.](image-url)