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*Leading article*

# Determinants of ileoanal pouch function

Restorative proctocolectomy – with the construction of an ileal reservoir and pouch-anal anastomosis – is now widely accepted as a definitive surgical procedure in ulcerative colitis.[1] Increasing operative experience and modifications in surgical technique have lowered operative morbidity and improved functional outcome. But what constitutes good pouch function and what accounts for the variable functional outcomes still reported?

The definition of ileoanal pouch function is entirely subjective, being determined by four characteristics: spontaneity of defecation, ability to defer defecation, continence, and stool frequency. In almost every case patients can now expect a stool frequency of about four to six per 24 hours, complete continence, and spontaneous defecation, with the ability to defer defecation for more than 15 minutes.[2,3] Yet clinical results still vary considerably and are regarded as poor in about 10% of pouch patients.[4]

Many studies have been undertaken in an attempt to explain the variations in reported pouch function. These have included measurements of pouch capacity and compliance,[4–14] static and ambulatory manometry,[4,5,7,8,12,13,15–23] defecating pouchography, and scintigraphy.[4,8,9,24,25] Other variables that have been related to subsequent pouch function are pouch mucosal ultrastructure,[8] pouch and proximal enteric bacterial flora,[8,26] the postoperative clinical course,[14,20,27,28] and many aspects of surgical technique.[8,11,13,15,16,22,29–31]

Most of these studies, however, were carried out in heterogeneous groups of patients and few have used comparable surgical techniques, duration of follow up, or means of pouch assessment.[31,32] Not surprisingly, therefore, their results have often been contradictory or inconclusive.

Many of the variables examined are now thought to be of little consequence, but some consistent trends have emerged.

## Spontaneity of defecation

Failure of spontaneous defecation and the resultant need to intubate the pouch affected as many as 50% of early S pouches constructed with a long efferent limb.[19] This is now well recognised and shortening of the efferent limb of the S pouch or its complete avoidance with the J and W pouch designs has virtually eliminated this problem.[8,9,10,33,34]

## Ability to defer defecation

Most ileoanal pouch patients are able to defer defecation for at least 15 minutes.[2,3] Disabling urgency after restorative proctocolectomy is unusual and the causative factors have not been thoroughly studied. Nasmyth *et al* were able to link inability to defer pouch evacuation to impairment of external anal sphincter function,[8] although Scott *et al* could not confirm this.[5] Experience with the intact anorectum, however, suggests that urgency and external anal sphincter dysfunction are closely associated.[35] Many publications now indicate that damage to the external anal sphincter during pouch construction is rarely significant.[4,7,8,12,15–19,21] Postoperative urgency may more closely reflect poor preoperative sphincter function than intraoperative trauma. Care with case selection, especially in parous women, remains vital.[31]

## Continence

The abnormality that has most consistently been linked to poor postoperative continence is reduction in the resting anal canal pressure, which directly reflects impaired internal anal sphincter function.[5,7,8,15,16,18] Stool consistency[20] and the efficiency of pouch evacuation[8] also influence continence, but to considerably less degrees.

Poor internal anal sphincter function is frequent after pouch construction by whatever technique. Prolonged anal retraction during endoanal mucosectomy is especially damaging,[15,16,22,36] but even fully stapled techniques without anal retraction lower the resting pressure, possibly due to direct trauma to the sphincter mechanism.[21] Yet despite the objective evidence of internal anal sphincter dysfunction, subjective continence in the early postoperative phase is generally satisfactory,[4,19,21] indicating considerable functional sphincter reserve. Moreover, both continence and resting pressure have been shown to improve with time, gradually returning to preoperative levels.[12,17]

Importantly, postoperative incontinence often results from poor case selection rather than operative injury. Patients with reduced functional sphincter reserve owing to previous sphincter injury and advanced age are those most likely to be rendered incontinent by restorative proctocolectomy.[6,7,17,31]

## Stool frequency

To date, the most important factor influencing stool frequency is the pouch capacity – larger volume pouches have consistently, though not universally, been associated with lower stool frequency.[6,8,9,12,37] Predictably, perhaps, the more capacious triplicated and quadruplicated pouch designs have provided the lowest stool frequencies reported.[3,6,8,38] What is

more, there is a tendency for pouch capacity to increase with time and with it for stool frequency to fall.[12 32]

The mechanism by which pouch capacity influences stool frequency is less clear. The reservoir function of the ileoanal pouch is probably of less importance than has generally been held true. Some authors have recorded comparable neorectal capacity after straight ileoanal anastomosis with that after pouch construction.[10 34] And scintigraphic studies of ileoanal pouch patients have shown that the 'reservoir' comprises, in large part, ileum immediately proximal to the pouch.[25]

Undoubtedly the critical physiological action of the pouch is its modification of terminal ileal motility – the interruption of normal ileal peristalsis at the ileal-pouch junction, and the delay in onset of 'propulsive' wave activity within the pouch.[23 34 39] Yet pouch capacity remains important. Larger pouches are also more compliant,[8 13 33] another property that has been linked to lower stool frequency.[5 8] Furthermore, their motility profiles are less active.[9] In particular, the 'threshold volume' – the volume of pouch content at which propulsive wave activity associated with the desire to defecate appears – is appreciably higher in larger capacity pouches.[9] How variations in pouch capacity influence pouch compliance and motility remains unexplained.

Another important factor influencing stool frequency is the total daily stool volume.[9] Higher stool volumes, which are most closely related to dietary intake, are associated with appreciably more frequent bowel actions after pouch construction. Yet another factor associated with increased stool frequency is incomplete pouch emptying.[4 9 10] Although one scintigraphic study has shown that the ileoanal pouch empties as rapidly and efficiently as the healthy rectum,[25] other reports have shown that pouch emptying is appreciably less (73–84%) efficient than normal rectal emptying.[4 8] The causes of poor pouch emptying have not been thoroughly studied, but outlet obstruction is considered to be a major influence.[19 25]

## Overall function

Two other factors that have been shown to adversely influence overall pouch function are postoperative sepsis[14 20 27] and pouchitis.[28 40] Postoperative sepsis is thought to produce a smaller, less compliant pouch,[20] but this has not been confirmed objectively.[14] Pouchitis results in both increased frequency and increased urgency. Although its occurrence has only been conclusively documented in patients with pre-existing ulcerative colitis,[28] the presence of pouchitis should be considered in all patients with poor pouch function.

## Conclusions

The response of patients to pouches is highly individual; even patients with morphologically and physiologically identical pouches may report differences in pouch function. Clearly, not all of the variables that influence ileoanal pouch function can be accounted for, let alone measured. Clarification of the determinants of pouch function will require investigation of larger and more homogeneous groups of pouch patients than has been undertaken to date. Precise documentation of the motility profile of the ileo-pouch-anal unit, which represents the final common pathway determining pouch function, seems to be the most direct means available of better understanding pouch function and of guiding surgical technique. For the present at least, construction of a large capacity pouch in a patient with sound preoperative anal sphincters offers the best chance of good functional outcome.

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