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improvement, only 1 per cent of patients required a colostomy
at the 1 year follow-up. However, at the 3 year follow-up, 3 per
cent of patients required a permanent stoma.

**INTRODUCTION**

Colorectal cancer is the second most common cause of cancer
death for both men and women, in Singapore. Surgery remains the best hope for curing colorectal cancer. Provided that the cancer is early and adequately removed with clear margins, the chances of long term survival are promising. Patients with adequately resected Dukes stage A colorectal cancer have an average 5 year survival of approximately 90 per cent. Less fortunate patients eventually succumb. The cause of death in such instances, where related to the cancer is due to recurrences. Recurrences may be multiple and systemic, due to the aggressive biological nature of the tumour. Little can be done surgically to improve prognosis under such circumstances. On the other hand, most local recurrences after rectal cancer surgery come from residual tumour remaining at the radial resection margins of the pelvis. These would grow and perhaps even invade back into the bowel lumen. Whether such residual tumour remains would therefore be dependent upon the surgical technique. It is therefore not surprising that the recurrence rates of various surgeons may vary from 3 to 30 per cent. For instance, it has been shown that after adequate total mesorectal clearance, the recurrence rate can be as low as 3 per cent. However, adopting proper cancer clearing techniques, the Department of Colorectal Surgery, Singapore General Hospital has been able to obtain recurrence rates of 5.7 per cent in 721 patients who underwent curative surgery and were followed up with a strict routine protocol. However, adequate bowel and lymphatic clearance margins necessitate removal of substantial segments of the rectum and colon. The effect of such intervention upon subsequent bowel function can be a significant problem.

**BOWEL FUNCTION AFTER COLO & RECTAL RESECTION**

The incidence of bowel function problems after colorectal cancer surgery may well be under-recognised and thus, underestimated. Patients grateful for the cure of their malignancies may be hesitant to complain about their bowel function, accepting this as part and parcel of their procedure. Surgeons may often be more concerned about detecting early recurrences at follow-up, rather than to acknowledge and treat these functional problems. Yet bowel dysfunction can be extremely debilitating to patients. These functional problems may be frequency of stools, faecal incontinence or constipation problems.

The factors which may influence bowel function after surgical resection include the extent and type of resection, time since operation, anastomotic leakage, recurrences and adjuvant chemo-radiotherapy. A recent survey of long term bowel function (> 1 year) showed that most patients have less than 3 bowel motions a day after colonic resections and their normal lifestyles were therefore not affected. However, after anterior resections, 37.8 per cent of patients can end up having 3 or more daily bowel movements. In fact, 39.7 per cent of anterior resection patients had their lifestyle adversely affected by increased stool frequency and faecal incontinence. Time after surgery also affects bowel function.

The majority of stool frequency problems tend to improve and stabilise after 1 year. However, infection and fibrosis resulting from anastomatic leaks may cause deterioration of bowel function. Cancer recurrences and strictures will also adversely affect bowel function. Adjuvant chemo and radiotherapy will also predispose to such functional problems.

Of the various types of segmental bowel resections, anterior resection is most likely to result in poor bowel function. Nonetheless, because it preserves coloanal continuity, anterior resection is the preferred over abdominoperineal resection (with permanent stoma) for treating rectal cancers whenever possible. There is no compromise to safety and chance of cure, when compared to the option of abdominoperineal resection. The reported mortality of 7 to 8 per cent is comparable with the 2.2 to 5 per cent after abdominoperineal resection. Improvements in surgical technique have reduced the anastomotic leak rate to around 2 percent. The major mortality results form cardiopulmonary risks and complications, which is equivalent in both procedures. Furthermore, local recurrence rates following anterior resection (7 to 14.7 per cent) were found to be similar to that of abdominoperineal resection (12 to 18.8 per cent).

**FACTORS AFFECTING BOWEL FUNCTION AFTER ANTERIOR RESECTION**

In order to understand bowel dysfunction, various physiological studies have been performed after anterior resections. Anorectal manometry studies show a drop in resting anal pressures after anterior resection. In dog experiments, this pressure drop occurs after dissection of the rectum from the pelvis. Thus injury to the nerves was implicated. On the other hand, careful anoscopy and dissection showed no sensory impairment after low anterior resections. Furthermore, studies performed during operations in patients showed that this pressure drop occurred only during the transanal introduction of intra-luminal stapling devices.

A recent randomised controlled trial comparing colorectal anastomosis by transanal introduced staplers with biofragmentable anastomotic ring, confirmed significantly better preservation of anal pressures with the latter. In addition, endonal ultrasound studies have shown evidence of internal anal sphincter fragmentation after stapled anterior resection. Thus, the major factor would be direct anal sphincter injuries, and it is advocated that anal dilatation be minimised during introduction of the stapling gun.

However, a likely more important finding is that impairment of bowel function is inversely related to the level of anastomosis above the anal verge. In particular, bowel function was significantly more impaired with anal sphincters within 4.5 cm of the anal verge. The amount of rectum resected relates to the eventual reservoir function of the neorectum, consisting of proximal colon anastomosed to the rectal stump. Being less compliant than the original rectum, stools are less efficiently stored. This is consistent with the ileal pouch after ileoanal anastomosis. Anorectal manometry studies have shown small rectal reservoir capacity may conceivably be the cause of impaired anal function after anterior resection.

Thus, it can be postulated that the decreased stool frequency was the result of reversed peristaltic activity in the J pouch limits. Further studies into the physiology of colonic pouches are needed and this would help in the refining of surgical technique.

**MANAGEMENT OF EXCESSIVE STOOL FREQUENCY**

The majority of patients complaining of excessive stool frequency and faecal incontinence may be managed expectantly. Most would improve after one year out from surgery.8 In the meantime, fibre supplements, anti-diarrhoeal agents and perineal pads may be prescribed. However, some patients will continue to be distressed by these disorders despite the measures above. Under such circumstances, biofeedback therapy may be an available option when little else is possible. Anorectal biofeedback is a technique which trains the mind to control body functions. It has been postulated to work by strengthening the anal sphincters, improving the anorectal sensation and the coordination of the mechanism of continence. Biofeedback has been shown to be effective in the management of anorectal disorders such as incontinence, severe constipation, solitary rectal ulcer syndrome and chronic perineal pain. Biofeedback equipment consists of a probe with a rectal balloon at its tip and a pressure transducer situated to measure the anal canal pressures. The anal pressures are displayed to the patient on a monitor. Thus, the patient is given feedback to monitor his progress as he trains in squeezing and relaxing his anal sphincter muscles against various volumes of rectal balloon distension.

A recent study was conducted on patients with stool frequency and faecal incontinence. This was after anterior resection in 7 patients and after total colectomy and ileorectal anastomosis in 6 patients. After biofeedback, there was significant improvement in the stool frequencies and continence status in both groups. After a mean follow-up of 10.6 sem 2.5 months, there were no complications and regressions. Hence, biofeedback promises...
Colonic pouch for rectal cancer surgery

Yik-Hong Ho
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INTRODUCTION

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Bowel function after colon & rectal resection

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Removal of the pelvic floor where it is not involved by tumour does not improve cancer clearance.

Factors affecting bowel function after anterior resection

In order to understand bowel dysfunction, various physiological studies have been performed after anterior resections. Anorectal manometry studies show a drop in resting anal pressures after anterior resection. In dog experiments, this pressure drop occurs after dissection of the rectum from the pelvis. Thus injury to the nerves was implicated. On the other hand, careful anorectal resting showed no sensory impairment after low anterior resections. Furthermore, studies performed during operations in patients showed that this pressure drop occurred only during the transanal introduction of intra-luminal stapling devices. A recent randomised controlled trial comparing colorectal anastomosis by transanal introduced staplers with biofragmentable anastomotic ring, confirmed significantly better preservation of anal pressures with the latter. In addition, endoanal ultrasound studies have shown evidence of internal anal sphincter fragmentation after stapled anterior resection. Thus, the major factor would be direct anal sphincter injuries, and it is advocated that anal dilatation be minimised during introduction of the stapling gun.

However, a likely more important finding is that impairment of bowel function is inversely related to the level of anastomosis above the anal verge. In particular, bowel function was significantly more likely impaired with anastomoses within 4.5 cm of the anal verge. The amount of rectum resected relates to the eventual reservoir function of the neorectum, consisting of proximal colon anastomosed to the rectal stump. Being less compliant than the original rectum, stools are less efficiently stored. In order to remove a low or mid rectal cancer with total mesorectal clearance, the anastomosis needs to be near or at the pelvic floor. These patients are then at an increased risk of poor bowel function, which may be aggravated by adjuvant post operative chemoradiotherapy.

Colonic pouch

Improvements in rectal reservoir capacity may conceivably improve bowel function. In order to increase the reservoir capacity of the neorectum, a colonic pouch could be constructed proximal to the colorectal anastomosis. This can result in reduced stool frequency but at the risk of defaecation problems. These defaecation problems may indeed be severe enough to require catheterisation in order to evacuate the colonic pouch. Such problems may be related to use of the sigmoid colon in pouch construction, excessively long residual rectal stump and the size of the pouches.

The standard colonic J pouch consists of limbs of 10-12 cm length. Smaller colonic pouches with 6-8 cm limbs have recently been reported to result in minimised stool frequency problems but without compromise in faecal evacuation. However, the rectal compliance and reservoir capacity (maximum tolerable rectal volume) were not significantly different from that of straight anastomoses after one year. Ambulatory anorectal physiologic studies have shown increased ano-rectal pressure gradients with small colonic pouches.

Radio-isotope studies have shown small colonic pouches to have better retention of liquids than of solids. It can be postulated that the decreased stool frequency was the result of reversed peristaltic activity in the J pouch limits. Further studies into the physiology of colonic pouches are needed and these would help in the refining of surgical technique.

Management of excessive stool frequency

The majority of patients complaining of excessive stool frequency and faecal incontinence may be managed expectantly. Most would improve after one year out from surgery. In the meantime, fibre supplements, anti-diarrhoeal agents and perineal pads may be prescribed. However, some patients will continue to be distressed by these disorders despite the measures above. Under such circumstances, biofeedback therapy may be an available option when little else is possible.

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to be a suitable option for a problem which is otherwise very difficult to manage.

Where the predominant factor for bowel dysfunction is anal sphincter damage, good improvement of function may be obtained with post anal repair.16

SUMMARY

Up to 38 per cent of patients can have stool frequency and faecal incontinence after anterior resection for rectal cancer. This risk of poor function is aggravated by a low colo-anal anastomosis. However, this may be ameliorated by the need for adequate cancer clearance which includes total mesorectal excision. Under such circumstances, the function is related much to the impaired compliance and reduced reservoir capacity of the neo-rectum. A 6-8 cm limb colonic J pouch may decrease the stool frequency problem without excessive evacuation complications. Where continence is impaired and does not respond to expectant and conservative treatment, anorectal biofeedback therapy is a promising option.

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