Colonic anastomosis using the biofragmentable anastomotic ring and manual suture: a prospective, randomized study

One hundred and fifty consecutive patients undergoing colonic surgery were randomized into two groups: 71 underwent hand-suture with a two-layer anastomosis of resorbable suture material (3/0 Dexon) and 79 were fitted with the biofragmentable anastomotic ring (Valtrac – BAR).

Five patients, two treated using the BAR and three by suturing, developed anastomotic leakage which required a Hartmann-type reoperation. This was successful in four; one patient in the suture group died after reoperation. One patient who underwent suture had an early anastomotic stricture with fatal sequelae. Three other patients (one in the BAR group and two in the suture group) died after operation from other causes. Thus the mortality rate was 6 per cent in the suture group and 1 per cent in the BAR group. During follow-up, one patient in each group underwent reoperation for anastomotic stricture. Recovery of the gastrointestinal tract was similar in the two groups regarding duration of nasogastric drainage, intravenous fluid therapy and ileus. There was no difference between the groups in duration of hospital stay. The BAR seems to be a safe and reliable alternative to conventional suture anastomosis in colonic surgery.

The biofragmentable anastomotic ring (Valtrac – BAR; Davis and Geck, Wayne, New Jersey, USA) was introduced in 1985 by Hardy et al. It is a double-segmented ring composed of polyglycolic acid (Dexon; Davis and Geck) and barium sulphate, originally designed for colonic anastomosis. In about 3 weeks the ring breaks up within the bowel lumen and the fragments are passed in the faeces, leaving no foreign material in the tissues. The aim of this randomized study was to compare the efficacy of the BAR anastomosis with conventional two-layer suture anastomosis in colonic surgery.

Patients and methods

All patients undergoing open colonic surgery between 1 June 1988 and 28 February 1991 were considered for inclusion in the study. Patients were randomized at laparotomy if a procedure requiring a colonic anastomosis was deemed necessary. Only if the bowel lumen was too narrow for insertion of the smallest BAR (outer diameter 28 mm) was the patient excluded from the study.

Seventy-nine patients were allotted to the BAR group and 71 to receive manual sutures (Table 1). The mean age was 61 years. Peri- and postoperative fluid therapy and drainage was discontinued when the volume was <500 ml/day. The number of days of intravenous fluid therapy, the time taken to return to an oral diet, and the time to appearance of bowel movements were also recorded.

The postoperative course was followed by recording the number of days of nasogastric drainage; drainage was discontinued when the volume was <500 ml/day. The number of days of intravenous fluid therapy, the time taken to return to an oral diet, and the time to appearance of bowel movements were also recorded.

All complications were noted. After discharge from hospital patients were followed up as outpatients; mean follow-up was 11 (range 1–33) months. Operations were performed by five surgeons, three of whom were qualified abdominal surgeons and two senior registrars.

Statistical analysis was carried out using the $\chi^2$ test, with $P < 0.05$ taken as significant.

Table 1 Study population allotted to colonic anastomosis by biofragmentable anastomotic ring or conventional suture

<table>
<thead>
<tr>
<th>Reason for operation</th>
<th>BAR</th>
<th>Suture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignancy</td>
<td>72</td>
<td>35</td>
</tr>
<tr>
<td>Other</td>
<td>78</td>
<td>44</td>
</tr>
</tbody>
</table>

Values in parentheses are percentages. BAR, biofragmentable anastomotic ring

Results

In all, 133 colocolic and 17 ileocolic or ileorectal anastomoses were performed (Table 2). A colorectal anastomosis below the peritoneal reflection was performed in 16 patients, of whom eight fell into each treatment group. The operation was performed electively in 136 patients and as an emergency in 14.

Surgical complications are listed in Table 3. The five patients with anastomotic leakage were treated with a Hartmann's procedure. Four patients survived this reoperation; one patient receiving sutures, who had been operated on for carcinoma of the splenic flexure, died. One of the sutured patients was readmitted and operated on for obstruction 2 weeks after a right hemicolectomy for carcinoma. An anastomotic stricture, probably of ischaemic origin, was found and the patient subsequently died. Three further patients died after operation, one with the BAR and two in the suture group, although in none of these was the cause of death related to the anastomosis. The mortality rate for patients treated with the BAR was 1 per cent (one of 79), and 6 per cent (four of 71) for those in the suture group. Two patients treated with the BAR and one
with a sutured anastomosis had intraluminal bleeding leading to rectal haemorrhage during the first few days after operation. These patients were treated conservatively and made uneventful recoveries.

During follow-up three patients developed anastomotic stenosis. Two had been treated using the BAR; one of these patients, who had undergone sigmoid resection, had frequent, painful defaecation, and the stools were tape-like. At sigmoidoscopy 10 weeks after operation the anastomosis appeared oedematous and narrowed. The symptoms gradually subsided and no intervention was needed. The other patient with a BAR anastomosis developed partial intestinal obstruction about 3 months after left hemicolectomy for diverticulosis. A barium enema demonstrated the strictured anastomotic area resulted in an uneventful recovery. One patient with a sutured anastomosis developed an anastomotic stenosis with obstruction and was reoperated on 3 months after a colonic resection for villous adenoma.

Table 4 shows the recovery of the gastrointestinal tract. Need for nasogastric intubation, duration of intravenous fluid therapy, first productive bowel movements and tolerance of oral feeding were similar in both groups. The duration of the hospital stay after operation was also similar (Table 5).

Discussion
The BAR differs from its predecessor, Murphy's button, and some of the later compression anastomotic devices in that it does not cause necrosis in the inverted bowel ends after ring closure. Its biofragmentability is a unique feature. The BAR has some obvious advantages over other methods of construction of colonic anastomoses. It is easy to use and the procedure may be performed swiftly; it produces a standardized and safe anastomosis. Experimental work has shown the BAR anastomosis to be similar in macroscopic and histological appearance to that of hand-sewn and stapled anastomoses at 40 days after operation.

The overall incidence of anastomotic leakage in the present series was 3·3 per cent, comparable to that of other studies of colonic anastomosis. The occurrence of anastomotic stricture was acceptably low at 2·7 per cent. The present observations are in accordance with those of a recent multicentre study by Bubrick et al., but differ from the results of Luukkonen et al., who observed more anastomosis-related complications in the BAR group. All present leakages were significant and required reoperation.

In the early period after surgery a mechanical anastomatic device may cause obstruction in the bowel lumen, as has been demonstrated experimentally. However, in the present series there was no significant difference between the groups in the recovery of the gastrointestinal tract. The risk of obstruction with the BAR seems no greater than that experienced after conventional anastomotic techniques.

These observations suggest that the BAR is a safe and reliable alternative to conventional sutured anastomosis. The device is currently in routine use for colonic surgery in this clinic.
Colonic anastomosis with the biofragmentable ring: R. Gullichsen et al.

References


Paper accepted 10 January 1991