INT SURG 1998;83:58-59

The Biofragmentable Anastomosis Ring in Elective Colon Resections

M. VALLE, F. BIANCARI*, A. CAVIGLIA, V. D'ANDREA*, P. F. BASELICE

Methods. **Sixty-eight patients underwent elective colon resection and intraperitoneal anastomosis with the biofragmentable anastomosis ring (BAR).**

Results. **Anastomotic dehiscence occurred in 3 patients (4.4%). Two of them had an end-to-end ileocolostomy using a 31 mm BAR. The anastomosis failure was due to ischaemic lesion of the small bowel close to the ileocolostomy, probably caused by a mismatch between the size of small bowel and that of the BAR. Another patient experienced anastomosis dehiscence probably due to a faecal impaction into the BAR. Forty-eight patients (70.5%) experienced troublesome constipation and evacuated after the sixth postoperative day. A bowel obstruction proximal to the BAR was documented in 4 cases who have been treated conservatively.**

Conclusions. **The low rate of major complications justify the use of the BAR in elective colon surgery, but the surgeon must be aware of tedious postoperative obstructive episodes frequently encountered in this series.**

KEY WORDS: Biofragmentable anastomosis ring - Valtrac - Sutureless intestinal anastomosis - Colon carcinoma - Colon resection - Elective surgery.

The appealing concept of sutureless intestinal anastomosis brought researchers and clinicians,[1-4] during the last two decades, to reconsider the ideas of 19th century pioneering surgeons who invented mechanical devices to allow approximation and healing of the cut ends of bowel.[5,6] Among several devices, the biofragmentable anastomosis ring (BAR) introduced in 1985 by Hardy *et al.*,[3] after the success of the first efforts, gained a certain popularity and diffusion.[7] Although originally designed for colon resections, the BAR proved its usefulness also in small bowel anastomosis [8,9] and it has been successfully used in laparoscopic colon surgery [10] as well as in emergency intestinal resections.[11,12] Here, we report a critical retrospective study based upon our experience with 68 patients undergoing elective colon surgery.

Reprint requests: F. Biancari, Via delle Vigne 64a, 00148 Rome, Italy.

From the Department of General Surgery "Flaiani I" S. Camillo Hospital, Rome, Italy
**3rd Department of Surgery University "La Sapienza", Rome, Italy*

Materials and Methods

The charts of 68 patients who underwent elective colon resection and anastomosis with the BAR (Valtrac, Davis & Geck) in the Division of General Surgery "Flaiani I", S. Camillo Hospital, between January 1993 and December 1996, were retrospectively evaluated. Patients whose anastomosis was carried out below the upper third of the rectum were excluded from this study. There were 40 men and 28 women with a mean age of 66 years (range 41-90). In all cases, colon cancer was the indication for surgery. No patient had neoadjuvant or perioperative chemo- and/or radiotherapy. Preoperative bowel preparations consisted of mechanical cleansing on the day prior to operation and antibiotic administration (vancomycin 2 g/day plus piperacillin 6 g/day, or aztreonam 2 g/day plus metronidazole 1 g/day) since three days prior to operation. Eight patients had right hemicolectomy, 6 had left hemicolectomy, 30 had anterior resection, 8 had transverse colon resection, and 16 had secondary anastomosis after Hartmann procedure. Sixteen BARs with a diameter of 28 mm and 1.5 mm gap, 16 BARs with a diameter of 28 mm and 2.0 mm gap, and 36 BARs with a diameter of 31 mm and 2.0 mm gap were used. No proximal ileostomy or colostomy was used. All anastomoses were located intraperitoneally and a silicone rubber tube was left in the abdomen in all cases. Piperacillin 6 g/day, clindamycin phosphate 1.2 g/day, and tobramycin 200 mg/day were routinely administrated in the postoperative period. In absence of any signs of sepsis, antibiotics were discontinued on the third postoperative day. Dietary intake was begun, whenever not contraindicated, on the third-fourth postoperative day with clear liquids. Regular diet was resumed after a further 2-3 days. On the tenth-twelfth postoperative day, a plain abdominal X-ray was routinely taken. Contrast computed tomography scan of the abdomen was performed in those patients with suspicion of anastomosis failure or postoperative bowel obstruction. The mean follow-up period was 4 months (range 2-6).

Results

No major medical complication or postoperative death occurred in

this series. An anastomotic dehiscence occurred in 3 patients (4.4%) causing peritonitis. Two of them underwent right hemicolectomy and an end-to-end ileocolostomy using a BAR with a diameter of 31 mm and 2.0 mm gap was carried out in both patients. The anastomosis failure was due to ischaemic lesion of the small bowel close to the ileocolostomy. Another patient undergoing anterior resection and having poor preoperative colon cleansing, experienced anastomosis dehiscence probably due to a faecal impaction into the 31 mm BAR with 1.5 mm gap. These patients successfully underwent re-operation and hand-sewn suture reanastomosis. No other major surgical complication was encountered.

The mean time for bowel movement was 3 days (range 2-4). Forty-eight patients (70.5%) experienced troublesome constipation and evacuated after the sixth postoperative day. A bowel obstruction proximal to the BAR was confirmed by contrast computed tomographic scan in 4 cases who have been treated conservatively with the aid of cathartics.

Routine plain abdominal X-ray taken on the tenth-twelfth postoperative day showed the intact BAR in place in all cases. The median length of in-hospital stay was 15 days (range 10-30 days). During the follow-up period, none of the patients was either aware of passing BAR fragments or experienced obstructive symptoms.

Discussion and Conclusions

Good results with the use of the BAR have been diffusely reported by the most enthusiastic proponents, but literature often fails to describe the minor and major problems with which abdominal surgeons potentially can be faced with in using this device.

Although previous studies reported the sporadic long-term occurrence of obstructive symptoms,[13 14] none has clearly stressed the clinical importance of a possible occurrence of bowel obstruction in the immediate postoperative period after the use of the BAR. Gullichsen,[15] in his experimental work, reported three animals with obstruction at the BAR anastomosis and proximal dilatation of the bowel, and noticed accumulation and adherence of bowel content to the ring. Bubrick *et al.*[16] reported the occurrence of this complication at a slightly higher rate than in the group of patients undergoing suture and staple anastomosis, and early postoperative small bowel obstruction was encountered in 15% of patients from the series by Luukkonen *et al.*[14]

The high rate of postoperative constipation and delay in evacuation, even if managed conservatively, had negative impact in the immediate postoperative outcome of our patients. It seems likely that this phenomenon could be due to the relatively higher rate of distal colon resections performed in our series. In fact, this complication did not occur after ileocolostomy where the BAR had to be faced with more liquid bowel content. On the other hand, ileocolostomies suffered from two ischaemic failures probably due to a mismatch between the size of the small bowel and that of the BAR used. Therefore, we have learned that it is mandatory to use at least a 31 mm BAR in distal colon resections, whereas it is safer to use a smaller ring in performing ileocolostomies to avoid any ischaemic small bowel lesion and a subsequent anastomosis failure.

It is also imperative to perform a careful preoperative intestinal preparation in order to avoid any early impaction of solid bowel content into the BAR which could be a potential cause for postoperative discomfort or anastomosis dehiscence as observed in one of our patients.

In conclusion, the low rate of major complications justify the use of the BAR in elective colon surgery, but the surgeon must be aware of tedious postoperative obstructive episodes frequently encountered in this series.

References

1. Eigler FW, Gross E. Mechanical compression anastomosis (AKA-2) of the colon and rectum. Results of a prospective clinical study. Chirurgie 1986;57:230-235.
2. Rosati R, Rebuffat C, Pezzuoli G. A new mechanical device for circular compression anastomosis. Preliminary results of animal and clinical experimentation. Ann Surg 1988;207:245-252.
3. Hardy TG Jr, Pace WG, Maney JW, Katz AR, Kaganov AL. A biofragmentable ring for sutureless bowel anastomosis: an experimental study. Dis Colon Rectum 1985;28:484-490.
4. Jansen A, Brummelkamp WH, Davies GA, Klopper PJ, Keeman JN. Clinical applications of magnetic rings in colorectal anastomosis. Surg Gynecol Obstet 1981;153:537-545.
5. Fraser I. An historical perspective on mechanical aids for intestinal anastomosis. Surg Gynecol Obstet 1982;155:566-574.
6. Murphy JB. Cholecysto-intestinal, gastro-intestinal, entero-intestinal anastomosis, and approximation without sutures (Original research). Med Rec N Y 1892;42:665-676.
7. Havia T. Gastrointestinal viscerosynthesis with biofragmentable anastomosis ring. Ann Chir Gynaecol 1992;81:271-275.
8. Gullichsen R, Ovaska J, Rantala A, Havia T. Small bowel anastomosis with the biofragmentable anastomosis ring and manual suture: a prospective, randomized study. World J Surg 1992;16:1006-1009.
9. Gullichsen R, Havia T, Ovaska J, Rantala A. Cholecystoenteral anastomosis with the biofragmentable ring and manual suture - a prospective, randomized study. Ann Chir Gynaecol 1992;81:354-356.
10. Polglase AL, Skinner SA, Johnson WR. Laparoscopic assisted right hemicolectomy with Valtrac BAR (biofragmentable anastomotic ring) ileotransverse anastomosis. Aust NZ J Surg 1993;63:481-484.
11. Massi G, Di Castro A, Brocato R, Adami EA, Biancari F. Biofragmentable anastomosis ring in emergency surgery. Ann Chir Gynaecol (in press).
12. Fansler RE, Mero K, Steinberg SM, McSwain NE, Flint LM, Ferrara JJ. Utility of the biofragmentable anastomotic ring in traumatic small bowel injury. Am Surg 1994;60:379-383.
13. Gullichsen R, Ovaska J, Havia T, Yrjänä J, Ekfors T. What happens to the Valtrac anastomosis of the colon? A follow-up study. Dis Colon Rectum 1993;36:362-365.
14. Luukkonen P, Järvinen HJ, Haapiainen R. Early experience with biofragmentable anastomosis ring in colon surgery. Acta Chir Scand 1990;156:795-799.
15. Gullichsen R. The biofragmentable ring in intestinal surgery. Eur J Surg 1993;s 569:7-31.
16. Bubrick MP, Corman ML, Cahill CJ, Hardy TG Jr, Nance FC, Shatney CH, the BAR Investigational Group. Prospective, randomized trial of the biofragmentable anastomosis ring. Am J Surg 1991;161:136-143.