



## Outcome after ileal pouch-anal anastomosis in ulcerative colitis patients: experience during a 27-year period

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### Key words

continence, cuffitis, ileal-pouch anal anastomosis, surgery, ulcerative colitis.

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### Abstract

**Background:** No previous study describes the postoperative outcome and functional results after ileal pouch-anal anastomosis (IPAA), performed in ulcerative colitis by the same surgical team with the different anastomotic techniques adopted in a 27-year period.

**Methods:** Prospectively, consecutive 333 ulcerative colitis patients operated adopting different IPAA techniques during the open surgery period 1984–2011 were enrolled. IPAA was performed using single stapling (SS) technique in 38 patients, double stapling (DS) technique in 235 patients (TIA stapler 42 patients, Endo-GIA 131 patients, Contour 62 patients) and handsewn IPAA in 60 patients.

**Results:** Statistically different early and late complications were recorded among the different IPAA techniques. A lower frequency of daily and nocturnal defecations and a higher level of continence were observed in the DS-IPAA compared to handsewn IPAA. The distance between the anastomotic line and the anal verge was significantly lower in DS Endo-GIA or DS Contour groups than in the DS TIA and SS. In SS IPAA group, 31.6% developed cuffitis compared to 14.4% belonging to DS group, at a mean follow-up of 140.4 months.

**Conclusions:** Technical improvements changed the IPAA technique. Stapled IPAA is characterized by better functional outcome than handsewn IPAA. DS Endo-GIA and Contour IPAA are followed by lower risk of cuffitis.

### Introduction

Restorative proctocolectomy with ileal-pouch anal anastomosis (IPAA) is the gold standard procedure for the surgical treatment of ulcerative colitis (UC). In 1978, Parks and Nicholls firstly introduced the ileal pouch.<sup>1</sup> Although still associated with some unsatisfactory functional results, over time, the increased surgical experience in hand with refinements of the technical procedures has resulted in a significant reduction of its morbidity.<sup>2</sup>

However, sphincter injuries, inflammation of the ileal pouch (pouchitis), recurrence of inflammation at residual rectal mucosa level (cuffitis), anastomotic strictures, fistulas and perianal abscesses remain frequent complications after IPAA.<sup>3</sup> It would seem that, over time, technological improvements helped the surgeons to perform IPAA, but no previous study has clearly reported the real differences in postoperative outcome and the long-term functional results obtained with the different type of technical procedure adopted to perform IPAA. Our study aims to analyse postoperative outcome and functional results at a very long-term follow-up after IPAA, performed by the same surgical team during

a 27-year period of open surgery, with different ileo-anal anastomotic techniques, in patients with UC.

### Methods

Between January 1984 and September 2011, 333 consecutive UC patients, submitted to restorative proctocolectomy with IPAA at our Centre, were prospectively enrolled. Informed consent was obtained from the study participants, obtaining ethical approval from the local Experts Committee of Careggi Hospital.

Arbitrarily dividing this long-lasting enrolment period (27 years) into three equal parts, different anastomotic techniques were adopted: the handsewn IPAA anastomosis with mucosectomy of the upper anal canal performed during the abdominal time of the operation in order to reduce anal over-stretching by retractors<sup>4</sup> was adopted during the first period of the study or in presence of indications to completely remove anorectal mucosa (colorectal dysplasia or cancer); the single stapling (SS) technique with purse-string on the distal portion of the rectum was also adopted during our first period of enrolment; the double stapling

(DS) technique using a transverse intestinal anastomosis stapler (TIA; Tyco Healthcare, Norwalk, CT, USA) was adopted in an intermediate period, while the DS using the more recent Endo-GIA (Covidien, New Haven, CT, USA) and Contour (Ethicon Endo-Surgery, Cincinnati, OH, USA) devices in the last enrolment period. The distance of the anastomotic line from the anal verge was measured by a ruler at both posterior and anterior sites 3–6 months after IPAA in all patients.

Postoperative medical therapy with topic mesalazine and probiotics was prescribed in patients operated on with stapled anastomosis. The term cuffitis is applied when inflammatory alterations (hyperemia, fragility and bleeding) were confined to the mucosa between the anastomosis and the dentate line, pouchitis when inflammation affects the ileal pouch.<sup>5,6</sup>

The incidence of early (within 30 days) and late (more than 30 days) postoperative complications was evaluated. At follow-up, patients were submitted to periodic clinical and endoscopic assessments (every 6 months during the first 2 years after surgery, once per year subsequently) to evaluate functional results and late complications.

Functional outcome was recorded. Continence was evaluated by Kirwan's modified scale.<sup>7</sup> Anal manometry was performed at mean time of 1 year after IPAA.

The statistical significance was calculated using Student's *t*-test to compare the means and the  $\chi^2$  to compare the percentages.

## Results

Within the 333 patients, 192 were males and 141 females. The mean age was 37.6 years (range 14–75), mean follow-up was 140.4 months (Table 1). Sixty patients had handsewn IPAA. In the

other 273 cases, a stapled ileoanal anastomosis with circular end to end anastomosis (CEEA) had been performed: 38 patients were operated with a SS technique and 42 with a DS technique using the TIA stapler, 131 with a DS using the Endo-GIA stapler and 62 patients with a DS using the Contour device.

Sometimes S-pouch was adopted in handsewn IPAA to avoid anastomotic traction. Temporary diverting ileostomy was employed in all patients with handsewn anastomosis and frequently in those with stapled anastomosis (Table 1).

There were no perioperative deaths. Early complications were observed in 14.1% of all patients and late complications in 24%. Anastomotic dehiscence was significantly less frequent after handsewn anastomosis, while SS and DS-TIA were related to higher rate of late complications (Table 2). The incidence of cuffitis in SS technique was significantly higher than in DS procedures (Table 2). The topical use of mesalazine and steroid drugs was sufficient to improve or completely relieve the symptoms in nearly all patients. However, 20 cases required systemic corticosteroid therapy (eight cases in SS and 12 in DS groups) and three patients of SS group had persistent cuffitis for which re-do-IPAA with anal mucosectomy was necessary.

The number of bowel actions over 24 h and the number of nocturnal bowel motions were lower in patients with DS anastomoses than in handsewn anastomoses (Table 3). Patients with handsewn anastomosis showed less satisfying functional result and perfect continence was present only in 30 patients (50%) (Table 3). In this group, nocturnal soiling was prevalent not more than twice per week and anti-diarrheal drugs were prescribed for half of them; in addition, urgency to defecate was present in a significantly higher

**Table 1** Characteristics of UC patients undergone IPAA

	Total	Handsewn	SS-purse string	DS-TIA	DS-EndoGIA	DS-Contour
Number	333	60	38	42	131	62
Age: mean (range)	37.6 (14–75)	36.5 (16–59)	39.6 (25–64)	37.2 (22–68)	36.7 (18–63)	38.4 (14–75)
Male/female	192/141	35/25	22/16	26/16	71/60	38/24
Type of pouch						
J pouch	283	21	31	40	131	60
S pouch	50	39	7	2	0	2
Protective ileostomy, <i>n</i> (%)	221 (66)	57 (95)	19 (50)	27 (64)	72 (55)	46 (74)
Mean follow-up (range), months	140.4 (26–321)	183.8 (42–321)	180.4 (128–311)	152.6 (126–220)	114.4 (28–190)	82.1 (26–90)

DS, double stapling; IPAA, ileal pouch-anal anastomosis; SS, single stapling; UC, ulcerative colitis.

**Table 2** Early (within 30 days from surgery) and late (after 30 days) postoperative complications

	Total ( <i>n</i> = 333)	Handsewn ( <i>n</i> = 60)	SS-purse string ( <i>n</i> = 38)	DS-TIA ( <i>n</i> = 42)	DS-Endo-GIA ( <i>n</i> = 131)	DS-Contour ( <i>n</i> = 62)
Early intestinal obstruction, <i>n</i> (%)	7 (2.1)	3 (5)	0	1 (2.4)	2 (1.5)	1 (1.6)
Abdominal haematoma, <i>n</i> (%)	1 (0.3)	0	1 (2.6)	0	0	0
Wound infection, <i>n</i> (%)	12 (3.6)	3 (5)	1 (2.6)	2 (4.8)	5 (3.8)	1 (1.6)
Anastomotic dehiscence, <i>n</i> (%)	20 (6)	1 (1.7)	3 (8)*	1 (2.4)	7 (5.3)*	8 (6.1)*
Total EARLY complications, <i>n</i> (%)	47 (14.1)	7 (11.7)	5 (13.2)	5 (11.9)	17 (12.9)*	13 (20.9)*
Late intestinal obstruction, <i>n</i> (%)	15 (4.5)	5 (8.3)	2 (5.3)	3 (7.1)	5 (3.8)	0
Anastomotic strictures, <i>n</i> (%)	15 (4.5)	6 (10)	0	1 (2.4)	7 (5.3)	1 (1.6)
Perianal fistula, <i>n</i> (%)	15 (4.5)	3 (5)	3 (8)	2 (4.8)	6 (4.6)	1 (1.6)
Cuffitis, <i>n</i> (%)	46 (13.8)	0	12 (31.6)	11 (26.2)	15 (11.5) <sup>#</sup>	8 (12.9) <sup>#</sup>
Pouch removal, <i>n</i> (%)	7 (2.1)	1 (1.7)	0	1 (2.4)	5 (3.8)	0
Total LATE complications, <i>n</i> (%)	80 (24)	15 (25) <sup>#</sup>	17 (44.7)	15 (35.7)	28 (21.4) <sup>#</sup>	5 (8) <sup>#</sup>

\**P* < 0.05 versus handsewn anastomosis; <sup>#</sup>*P* < 0.05 versus SS-purse string anastomosis. DS, double stapling; SS, single stapling.

**Table 3** Functional results of IPAA in patients undergone different types of IPAA

	Total (n = 333)	Handsewn (n = 60)	SS-purse string (n = 38)	DS-TIA (n = 42)	DS-EndoGIA (n = 131)	DS-Contour (n = 62)
Defecation number/24 h mean ± SD (range)	4.9 ± 2.3 (2–10)	5.7 ± 3.8 (2–10)	5.8 ± 2.6 (3–8)	4.6 ± 1.4 (3–6)	4.4 ± 2.1 (2–6)	4.7 ± 1.6 (3–6)
Nocturnal defecation number mean ± SD (range)	0.6 ± 0.7 (0–3)	1.5 ± 0.8 (0–3)	1 ± 0.9 (0–2)	0.4 ± 0.5* (0–1)	0.3 ± 0.6* (0–1)	0.3 ± 0.7* (0–1)
Perfect continence (%)	77.2	50	78.9*	83.3*	82.4*	87.1*
Constant soiling (%)						
Diurnal	0	0	0	0	0	0
Nocturnal	1.8	5	0	0	0	4.8
Occasional soiling (%)						
Diurnal	6	6.7	7.9	7.1	5.3	4.8
Nocturnal	7.8	21.7	13.2	9.5	9.2*	8.1*
Urgency	9.3	26.7	10.5	9.5*	3.1*	4.8*
Loss of discrimination flatus/faeces	7.5	35	10.5*	0*	0*	0*

\**P* < 0.05 versus handsewn anastomosis. DS, double stapling; IPAA, ileal pouch-anal anastomosis; SS, single stapling.

**Table 4** Manometric values after the different IPAA techniques

	Total (n = 333)	Handsewn (n = 60)	SS-purse string (n = 38)	DS-TIA (n = 42)	DS-EndoGIA (n = 131)	DS-Contour (n = 62)
MBP (mmHg) mean ± SD	57 ± 18.4	57 ± 18	48 ± 7	57 ± 16	58 ± 21	60 ± 22
Tone at 2 cm (mmHg) mean ± SD	51.7 ± 18.5	40 ± 14	39 ± 7	50 ± 13*	55 ± 25*	65 ± 20*
MVC						
Strength (mmHg) mean ± SD	86.8 ± 25.5	82 ± 38	83 ± 45	92 ± 20	88 ± 21	88 ± 15
Duration (s) mean ± SD	71.8 ± 30.2	68 ± 40	65 ± 6	81 ± 33	71 ± 31	75 ± 32
AIR (%)	86.8	58.3	71.1	95.2*	97.7*	95.1*

\**P* < 0.05 versus handsewn anastomosis. AIR, anal inhibitory reflex; DS, double stapling; IPAA, ileal pouch-anal anastomosis; MBP, maximum basal pressure; MVC, maximum voluntary contraction; SS, single stapling.

**Table 5** Distance between anterior and posterior anastomotic line and external anal verge according to the different procedure to perform the IPAA

Distance of IPAA from anal verge (cm)	Distance of IPAA from anal verge (cm)					
	Total (n = 333)	Handsewn (n = 60)	SS-purse string (n = 38)	DS-TIA (n = 42)	DS-EndoGIA (n = 131)	DS-Contour (n = 62)
Anterior mean ± SD	3.2 ± 0.3	2.2 ± 0.2*	4.4 ± 0.5	4.0 ± 0.3	3.2 ± 0.4	3.1 ± 0.2
Posterior mean ± SD	2.9 ± 0.5	2.1 ± 0.3*	4.1 ± 0.3	3.8 ± 0.5	2.5 ± 0.7	3.3 ± 0.3

\**P* < 0.05 versus the other stapled procedures. Values are expressed as mean (±SD). DS, double stapling; IPAA, ileal pouch-anal anastomosis; SS, single stapling.

percentage than in the other groups. The manometric evaluation showed a basal sphincter tone lower than that observed in patients who had undergone DS anastomosis (Table 4). The distance between anastomotic line and anal verge according to the different procedure to perform the IPAA is reported in Table 5.

## Discussion

Our study analyzes the results of open surgery IPAA performed to treat UC during a 27-year period. It confirms the good functional outcome of IPAA even at a very long-term follow-up. We observed that the number of nocturnal defecations is significantly lower in patients with DS-IPAA compared to those with handsewn anastomosis, which may be explained by the fact that the continence grade is higher in stapled versus handsewn IPAA. The patients with handsewn anastomosis have lower values of basal anal sphincter tone on manometric examination.

The better continence rate of the stapled techniques is also reported by many uncontrolled studies.<sup>8–11</sup> A randomized controlled study showed that the percentage of nocturnal soiling is 45% with handsewn anastomosis and 12% with stapled anastomosis 1 month after ileostomy closure, but the results improve respectively to 27% and 9% after 1 year.<sup>12</sup>

Low basal anal sphincter tone is the main cause of faecal incontinence. Regardless of the different type of IPAA, after surgery, the basal anal sphincter tone is significantly decreased by 30% compared with the preoperative value.<sup>13</sup> This drop is constant even 1 year after surgery.<sup>14</sup> The cause may be due to sectioning of the sympathetic and parasympathetic pelvic nerve fibres that innervate the internal sphincter during proctectomy.<sup>12,15</sup> In literature, it is still debate whether handsewn IPAA leads to a drop in basal anal sphincter tone similar or greater than that stapled IPAA.<sup>16</sup> In our experience, the manometric results do not show significant differences among different IPAA techniques on the maximum basal

pressure, the length of the high pressure zone and the maximum voluntary contraction. However, the basal anal sphincter tone measured at 2 cm from the anal verge is significantly lower in the hand-sewn anastomoses than in DS-IPAA.

This could be due to many factors related to the handsewn anastomosis procedure: in our patients, we avoided prolonged anal dilatation since the mucosectomy of the upper anal canal was performed widely through the pelvis. When a strong anal dilatation is performed in the treatment of haemorrhoids or anal fissures, a significant and permanent reduction of pressure is observed,<sup>17</sup> but less traumatic procedures, for example maintaining a dilatation of the anus of 5 cm for 20 min by Parks's retractor, do not seem to cause permanent modification of the basal pressure.<sup>18</sup>

Another parameter showing difference between handsewn and stapled IPAA is anal inhibitory reflex (AIR). One year after the operation, AIR was present in all patients undergone DS-IPAA, but only in 58% of the patients undergone handsewn anastomosis: this difference is statistically significant. However, it is still controversial whether the presence of AIR is essential for continence or not.<sup>15,19</sup> AIR seems dependent on the rectum and the normal intramural nervous plexus.<sup>20</sup> However, it was observed that AIR tends to reappear some time after surgery: this seems to be due to the formation of new nervous fibres from ileal intramural plexuses that innervate the internal sphincter.<sup>21</sup>

On the contrary to handsewn IPAA, a variably long cuff of anorectal mucosa is left in stapled IPAA. This may result in persistence or recurrence of inflammation at that site, along with the risk of dysplasia and cancer.<sup>22</sup> Many studies seem to indicate that the risk for cancer in UC patients undergoing IPAA is low but not eliminated by proctocolectomy or mucosectomy.<sup>23–25</sup>

Another complication of the residual rectal mucosa is cuffitis which may present with bleeding and urgency. Lavery *et al.* studied 217 patients, 63 patients with anastomosis situated at less than 1 cm from the dentate line, and 154 patients where it was situated more than 1 cm proximally from the dentate line: by endoscopic examination, they found inflammation in 36% of cases (20% slight grade, 13% mild grade and only 2% severe grade). Moreover, on histological examination, the same authors discovered inflammation in 82% of the examined cases (41% slight grade, 35% moderate grade and 6% severe grade).<sup>26</sup> Gozzetti *et al.* found inflammation on histological examination in 69% of cases undergoing stapled IPAA. This study showed that a symptomatic inflammation of the anal canal is present in only 13.8% of patients, predominantly in SS and DS-TIA techniques.<sup>27</sup> Sugerma *et al.* observed the presence of symptoms due to cuffitis in three of 21 patients who had undergone DS-IPAA at an average distance of about 1.8 cm from the dentate line.<sup>28</sup> Our study shows an overall incidence of cuffitis of about 14%, significantly higher in SS technique than in DS procedures (31.6% versus 14.4%). This could be related to the different distance between the anastomosis and the dentate line, which is lower in patients with DS-EndoGIA or DS-Contour than in the other stapled procedures.

Limitation to our study could be that we did not include the patients operated after September 2011: this is to guarantee a homogeneously long follow-up, but also to exclude laparoscopic total proctocolectomy with IPAA: even if in laparoscopic surgery IPAA

performance follows the same principles adopting the same devices, we prefer not to include these patients to avoid statistical bias in evaluating their postoperative and functional results.

## Conclusion

Technical improvements during a 27-year period made IPAA safer and simpler. Early and late postoperative complications were similar between stapled and handsewn IPAA. DS Endo-GIA and DS Contour IPAA seem to be characterized by better functional outcome than the handsewn IPAA. The incidence of cuffitis after stapled IPAA could be minimized by performing the anastomosis as low as possible, a procedure that can be accomplished with the modern stapler devices.

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