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ORIGINAL ARTICLE

Ileal pouch-anal anastomosis 20 years later: is it still a good surgical option for patients with ulcerative colitis?

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Abstract
Purpose Short-term results after ileo-pouch anal anastomosis (IPAA) are well established; data are conflicting in long-standing patients. We retrospectively evaluated long-term complications and functional results after follow-up longer than 20 years.
Methods Two hundred five patients with follow-up longer than 20 years have been identified out of 1112 IPAA performed in our institution; of these, 20 cases were lost at follow-up or decline to take part at the study. We evaluated long-term complications and failure rate also according to changes in histological diagnosis. Changes in functional results and quality of life (QoL) were analyzed at 5 and 20 years after IPAA.
Results Pouch failure rate was 10.8 % (35 % due to misdiagnosed Crohn). Incidences of fistulas, anastomotic stenosis, chronic pouchitis, and pre-pouch ileitis were 17.3, 12.9, 28.6, and 7.6 %, respectively. Most of the patients reported good functional outcomes. Day-time evacuations at 5 and after 20 years were 4.3 and 4.8 (p = n.s.) while during night-time were 0.8 and 1.2 ($p < 0.05$). Urgency was 6 and 9.4 % (p = n.s.), respectively; need of antimotility drugs was 16 and 35 % ($p < 0.001$). Dietary limitations and work restrictions were similar over time. Only sexuality got worse during follow-up. Satisfaction for surgery was always high and it did not change over time.
Conclusion IPAA is still an excellent surgical option for UC with a low rate of pouch failure even after more than 20 years. Despite a slight worsening of functional results over time, the QoL remained high and most patients expressed satisfaction with the procedure and were willing to recommend it to others.

Keywords Restorative proctocolectomy · Ulcerative colitis · Pouch · Fistulas · Pouchitis · Crohn

Long-term outcomes and functional results after IPAA

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Introduction

Restorative proctocolectomy with ileal pouch-anal anastomosis (IPAA) was introduced in 1978 by Parks and Nicholls [1] and over the past 30 years it has become the standard surgical treatment for patients with ulcerative colitis (UC) refractory to medical therapy or in presence of dysplasia and cancer [2]. This surgical procedure allows a complete removal of the diseased colonic mucosa, thereby preserving gastrointestinal continuity, transanal defecation and continence, while avoiding permanent ileostomy in most patients. The method is effective and safe, with low mortality rates; complications mostly occur in the first months after surgery and can frequently be treated without consequences for the pouch's function and patients' quality of life (QoL). [3].

Several studies report a late pouch failure in less than 10 % of patients [4] mainly due to unrecognized Crohn's disease (CD) that leads to pelvic sepsis and formation of fistulas with the final result being poor functional outcomes, requiring a pouch excision or a fecal diversion with a loop ileostomy [5, 6].

Most studies have analyzed short-term functional results and QoL for patients who have undergone restorative proctocolectomy with a preoperative histopathological diagnosis of UC. Obtained data have reported a satisfactory QoL with good short-term postoperative outcomes in most of the

patients treated with surgery [7, 8] and in many cases QoL and health status increased after IPAA and reached levels comparable with those of the healthy reference population [9].

Despite a considerable amount of data available on short-term outcomes of restorative proctocolectomy, the number of studies specifically addressing long-term postoperative results of IPAA is limited. Moreover, the few data reported in the literature are often conflicting: some authors assert that long-term postoperative results are maintained over time [7, 10], while other studies describe a worsening of the functional results over years [11, 12].

Our study attempts to define long-term outcomes after IPAA using a detailed review of a large cohort of patients from a single high-volume institution. The primary aim of the study is to evaluate the rate of pouch failure and pouch-related complications in patients with a postoperative history longer than 20 years. The secondary end point is the analysis of changes over time in functional outcomes and QoL comparing results reported by the same patients at different points in their follow-up.

Materials and methods

One thousand one hundred twelve consecutive patients underwent IPAA between 1985 and 2014 at the Department of Surgery of the University of Bologna. We retrospectively analyzed 205 patients with a preoperative diagnosis of UC operated between 1985 and 1995. Out of these, complete data have been collected and analyzed for 185 patients while 20 patients were excluded. Among the latter were patients lost at follow-up or patients who declined to take part at the study and refused to give complete information on pouch's fate, long-term complications or to fill the study questionnaire.

The 20 patients excluded from the study were compared to the remaining 185 patients of the study population according to preoperative conditions, surgical technique used, and postoperative hospital stay. No significant differences were reported between these two groups of patients that could affect the results of the analysis in any way.

Patients' characteristics and surgical data are given in Table 1.

The primary aim of the study was to analyze pouch failure rate, both according to changes in histological diagnosis and onset of long-term pouch-related complications. For this purpose, complete data on preoperative conditions, histopathological diagnosis, surgical technique used, and early postoperative complications were collected using hospital records. During the 20-year follow-up, all patients were followed annually in an outpatient clinic after restorative proctocolectomy and periodically submitted to clinical examination and endoscopy. Data on the presence of pouch complications such as chronic remittent pouchitis, anastomotic strictures, pouch-anal or pouch-vaginal fistulas and pre-pouch ileitis were obtained by reviewing retrospectively all hospital records produced over the years. Long-term complications were defined according to the criteria given in Table 2 [13, 14].

We considered a "pouch failure" to be the complete pouch removal with Brooke ileostomy or the fashioning of a loop-end ileostomy, that has been considered permanent, without pouch removal.

Changes in histological diagnosis were made according to clinical conditions of the patients and confirmed by a

Table 1 Characteristics and surgical data of the 185 patients with follow-up longer than 20 years

Age at diagnosis (years)	26.5 (range 13–55)
Age at IPAA (years)	32.8 (range 7–65)
Mean follow-up after IPAA (years)	24.1 (range 20–30)
Sex	
Female, *n* (%)	61 (33 %)
Male, *n* (%)	124 (67 %)
Type of surgery	
IPAA 1-Stage	15 (8.1 %)
IPAA 2-Stages	42 (22.7 %)
IPAA 2-Stages modified	44 (23.8 %)
IPAA 3-Stages	84 (45.4 %)
Loop ileostomy at IPAA, *n* (%)	128 (69.2 %)
Type of pouch	
J, *n* (%)	180 (97.3 %)
S, *n* (%)	2 (1.01 %)
W, *n* (%)	1 (0.54 %)
H, *n* (%)	2 (1.01 %)
Type of anastomosis	
Stapled, *n* (%)	128 (69.1 %)
Handsewn, *n* (%)	57 (30.9 %)

Table 2 Definitions of long-term pouch related complications considered in the present study

Anastomotic stricture	The presence of a narrowing at the anastomosis on digital examination that required dilation in the outpatient clinic or operating room. Clinically significant anastomotic stricture is defined as those requiring dilation in the operating room in patients who developed symptoms of outlet obstruction.
Pouch-related fistula	An abnormal passage or sinus from the pouch to another surface or organ (e.g. pouch-anal and pouch-vaginal fistulas).
Chronic remittent pouchitis	Clinical condition defined as a Pouch Disease Activity Index score > 7 and no response to at least 4 weeks standard antibiotic treatment with at least 3 relapses per year.
Pre-pouch ileitis	Inflammation proximal to the pouch with or without associated stenosis with symptoms of outlet obstruction

pathologist with the examination of endoscopic biopsies or revision of the specimen of the proctocolectomy in patients with a still functioning or diverted IPAA and by the histopathological analysis of the pouch in cases of pouch removal.

As a secondary aim, we analyzed changes in functional results and QoL after restorative proctocolectomy. According to this aim, all patients who were alive and with a still functioning IPAA at the time of the study were asked to fill validated questionnaires. These data were retrospectively compared with those already obtained by the same patients 5 years after primary surgery, completing the same validated questionnaires.

Functional results were investigated using the Cleveland Clinic Pelvic Pouch Questionnaire; QoL was analyzed with Cleveland Global Quality of Life Instrument (CGQLI) [15, 16].

This retrospective study and the use of validated questionnaires for the evaluation of functional results were approved by the Institutional Review Board.

Statistical analysis

All collected data were recorded on a specific database. Numbers in text and tables are given as means and percentages. Student's two-sided *t* tests were used for comparison of continuous variables. Categorial variables used to define differences between groups were compared using Yates-corrected chi-square. Data analysis was done on the basis of intention of the study and carried out with SPSS version 17.0. A value of $p < 0.05$ was considered statistically significant.

Results

Pouch failure and pouch-related complications

During the study period, 205 patients were submitted to restorative proctocolectomy. Complete data were available for 185 patients with a follow-up longer than 20 years (male = 124 female = 61). Histological diagnosis of ulcerative colitis was confirmed at follow-up in 172 patients (93 %) while a delayed diagnosis of Crohn's disease was reported in 13 patients (7 %).

A pouch failure was reported in 20 cases (10.8 %), which occurred at a median of 11.3 years (range 3–25 years) after restorative proctocolectomy; the remaining 165 patients have a still functioning IPAA. Of these, 15 patients required excision of their ileal pouch with permanent ileostomy and 5 required a diverting ileostomy, which was never reversed. Indications for pouch excision included complex pouch-anal or pouch-vaginal fistulas associated to chronic pelvic sepsis, while a diverting ileostomy without pouch removal was performed for complex pouch-anal or pouch-vaginal fistulas without chronic sepsis and for extended PPI with long stenosis and entero-enteric fistulas. The pouch retention rate over time is reported in Fig. 1.

The histopatological examination of patients with pouch failure showed a misdiagnosed CD in 7 cases while 13 patients had a confirmed diagnosis of UC. The rates of pouch failure in CD and UC patients were 53.8 and 7.5 %, respectively ($p < 0.001$).

Survival rates over time of restorative proctocolectomy according to histological subtypes are reported in Fig. 2.

Among all patients enrolled in the study, the cumulative incidence of perianal fistulas (pouch-anal or pouch-vaginal) was 17.3 % (32 patients).

Twenty-three patients (12.4 %) presented pouch-anal fistulas alone during the follow-up after a mean time of 9.3 (range 3–21 years) years, while 9 patients (14.7 % of 61 females) presented a pouch-vaginal fistula with or without associated pouch-anal fistulas after a mean time of 7.6 years (range 6–14 years).

No differences in the onset of perianal fistulas were observed according to the type of pouch-anal anastomosis (13.2 % of pouch-anal fistulas and 6.2 % of pouch-vaginal fistulas for stapled IPAA vs 10.5 and 1.7 % respectively for hand-sewn IPAA, p = ns).

Patients with pouch-anal fistula alone were treated with surgical drainage and seton placement associated with systemic or local treatment with biological drugs [17, 18].

All patients with pouch-vaginal fistulas were submitted to surgical drainage of the rectovaginal septum and closure of the vaginal opening of the fistulas in order to convert pouch-vaginal to pouch-anal fistula and subsequently submitted to graciloplasty in 4 cases. Long-term outcomes of patients with pouch-anal and pouch vaginal fistulas are given in Table 3.

Finally, among patients with a still functioning IPAA, the rates of pouch-anal and pouch vaginal fistulas were 4.8 % (8/165) and 1.6 % (1/61), respectively.

The pouch's retention rate in pouch-anal fistulas was significantly higher than in pouch-vaginal fistulas (82.6 vs 33.3 %, $p < 0.05$).

Twenty-four patients (12.9 %) presented anastomotic stenosis after a mean time of 11 years (range 1–24 years). Stenosis was reported in 16 cases (12.5 %) among patients with a stapled anastomosis while it was reported in 8 cases (14 %) in hand-sewn ones (p = ns). All patients with stenosis were treated with mechanical dilation under anesthesia in a day surgery operative room and subsequently maintained with self dilations using Hegar's dilators. Final outcomes in patients with anastomotic stenosis are reported in Table 3.

Chronic remittent pouchitis was reported in 53 patients (28.6 %) during the follow-up; histological revision and biopsies in the follow-up confirmed the preoperative diagnosis of UC in 46 cases while a delayed diagnosis of CD was reported in 7. Thus, the incidence of chronic remittent pouchitis over time was 26.7 % in UC and 53.8 % in CD ($p = 0.05$). Out of

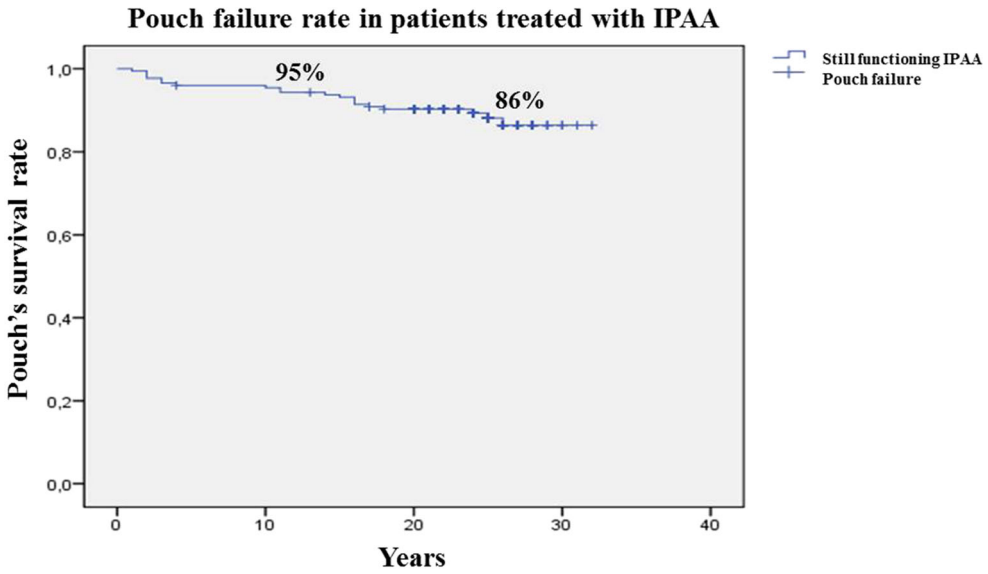

Fig. 1 The pouch retention rate over time

the 7 patients with chronic pouchitis and CD, a complete pouch removal was required in 4 cases and 2 more with confirmed UC reported a pouch failure. Nevertheless, in all these cases, the pouch failure was never due to pouchitis alone but to associated septic complications (Table 3). Finally, pre-pouch ileitis occurred in 14 patients (7.6 %) during the follow-up; histological revision and biopsies in the follow-up confirmed the preoperative diagnosis of UC in 8 cases while a delayed diagnosis of CD was reported in 6. Therefore, the incidence pre-pouch ileitis over time was 4.6 % in UC and 46.1 % in CD ($p < 0.001$). We also analyzed the association between pre-pouch ileitis and pouchitis; we observed that all patients with pre-pouch ileitis were found to have concomitant pouchitis. Obversely, among the 54 patients with chronic remittent pouchitis, a condition of associated pre-pouch ileitis was described in 26.4 % of cases.

In the UC group, 4 patients were treated successfully with medical therapy, while 3 patients required a salvage surgery with resection of the stenotic pre-pouch ileal loop and only 1 patient needed a diverting ileostomy. In pre-pouch ileitis associated with a delayed diagnosis of CD, 2 cases were treated with medical therapy, 2 patients required a salvage surgery and 2 pouch failures were observed due to complex entero-enteric fistulas (Table 3).

The pouch retention rate in pre-pouch ileitis according to histological diagnosis was 87.5 and 66.6 % in UC and CD groups, respectively (p = ns).

Functional results and QoL

For the analysis of the secondary aim, we excluded the 20 patients who were lost at follow-up or who declined to take part in the study; out of the remaining 185 patients we ruled out the 20 cases of pouch failure and 16 more patients who had died at the time of the last follow-up. These left 149 patients with a still functioning IPAA, who were analyzed

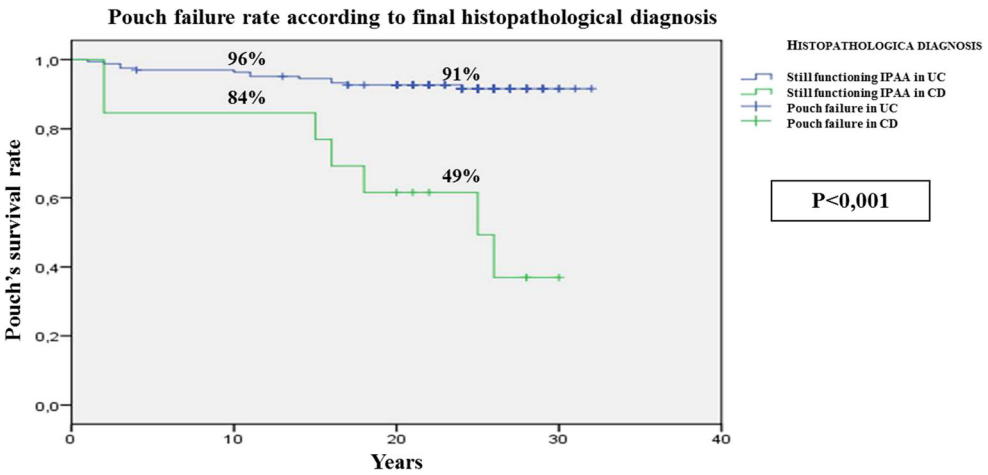

Fig. 2 Survival rates over time of restorative proctocolectomy according to histological subtypes

Table 3 Pouch-related complications in the 185 patients submitted to IPAA with a follow-up longer than 20 years

23 pts. with pouch-anal fistula 12.4 %	• 11 pts. healed after surgical drainage and biological therapy (47.8 %)
	• 8 pts. with a chronic drained fistulas with good clinical outcomes (34.8 %)
	• 4 pts. needed an ileostomy due to recurrent disease (17.4 %)
9 pts. with pouch-vaginal fistula 14.7 % of female patients	• 2 pts. healed after graciloplasty (22.2 %)
	• 1 pts. with a chronic drained fistulas with good clinical outcomes (11.1 %)
	• 6 pts. needed an ileostomy due to recurrent disease (66.6 %)
24 pts. with anastomotic stenosis 12.9 %	• 18 pts. healed with mechanical dilations using Hegar's dilators (75 %)
	•2 pts. still in treatment with periodical dilations (8.4 %)
	• 1 pt. had a salvage surgery with redo-anastomosis (4.2 %)
	• 3 pts. needed an ileostomy due to associated perianal fistulas or pre-pouch ileitis (12.5 %)
53 pts. with chronic pouchitis 28.6 %	• 47 pts. with chronic pouchitis (88.7 %)
	• 6 pts. reported a pouch failure due to associated septic complications (11.3 %)
14 pts. with pre-pouch ileitis 7.6 %	• 6 pts. ha a delayed diagnosis of CD and 8 pts. had their initial diagnosis of UC confirmed
	• 6 pts. have been treated with medical therapy (42.8 %)
	• 5 pts. have been submitted to resection of the stenotic ileal loop above the pouch (35.8 %)
	• 3 pts. had a pouch failure due to associate entero-enteric fistulas (21.4 %)

on functional results and QoL (Tables 4 and 5). Long-term functional outcomes, 20 or more years since primary surgery, were collected for each patient, who completed the study questionnaire during outpatient visits or telephone interviews, and retrospectively compared with data previously collected.

The median number of bowel movements during daytime in best and worst day was similar after 5 and 20 years since IPAA (p = ns). In contrast, a slight deterioration in night-time bowel movements was observed over time. The use of antimotility drugs at least twice a week changed significantly after restorative proctocolectomy, increasing at 5 and 20 years.

No significant differences in terms of urgency were observed.

Incontinence was analyzed by noting the presence of at least two episodes in a week of seepage and soling, and reporting an increased incidence of major and minor incontinence over time.

The need of protective pads during daytime did not change; conversely its use during night-time increased over the years.

Table 4 Functional results in 149 patients with a still functioning IPAA at time of surgery

Functional results	5 years after surgery	20 years after surgery	p
Mean stool frequency			
Best day	4.3 (range 1–10)	4.8 (range 2–20)	ns
Worst day	7.2 (range 3–20)	8.2 (range 2–20)	ns
Night	0.8 (range 0–4)	1.2 (range 0–6)	<0.01
Antimotility drugs %			
At least twice a week	16.1 %	34.9 %	<0.001
Urgency %	6 %	9.4 %	ns
Incontinence %			
Seepage twice a week	18.1 %	34.9 %	<0.01
Soiling twice a week	16.1 %	32.2 %	<0.001
Pad use %			
Matter of necessity	4 %	6.7 %	ns
Day-time	4 %	19.5 %	<0.0001
Night-time			
Perianal irritation %	28.2 %	30.2 %	ns
Bleeding	36.2 %	28.8 %	ns

ns not significant

Table 5 Quality of life in 149 patients with a still functioning IPAA at time of surgery

QoL			
Dietary without limitations %	96 %	94.6 %	ns
Work without restrictions %	86 %	82.6 %	ns
Social restrictions %	12.7 %	20.8 %	ns
Sexual disfunctions %	6 %	14.1 %	<0.05
Subjective paramethers (Score 1–10)			
Mean QoL	8.23 (range 4–10)	8.27 (range 4–10)	ns
Mean vitality	8.06 (range 3–10)	8.09 (range 3–10)	ns
Mean energy	7.62 (range 2–10)	7.94 (range 2–10)	ns
Mean happiness with surgery	8.90 (range 2–10)	8.93 (range 2–10)	ns
CGQLI (Fazio Score)	0.79	0.80	ns

ns not significant

Finally, the incidence of perianal irritation remained constant over time. All data on functional results are given in Table 4.

Despite a slight worsening of functional results over time, data on dietary limitations and work restrictions were similar at 5 and 20 years.

Only sexual function got worse during follow-up. After 20 years, a higher rate of sexual deterioration was reported in patients with chronic drained fistulas compared to patients without fistulizing disease (55.6 vs 11.4 %, respectively, $p < 0.001$). According to perianal disease, a decrease in sexual activities was described by 50 % of patients with a chronic pouch-anal fistula. Similarly, only females with vaginal fistula and still functioning IPAA were reluctant to have sex.

Evaluation of patients' subjective perception of their own QoL, energy and vitality did not show any changes since restorative proctocolectomy, with high scores reported throughout follow-up.

Therefore, no changes in CGQLI were observed.

According to these data, satisfaction with surgery was always high and did not change over time.

Data on QoL are summarized in Table 5.

Discussion

For many years, IPAA was considered the treatment of choice for patients with chronic, medically refractory UC. Data on short-term results after surgery are many and well established. However, few data on late pouch failure, pouch-related complication, quality of life and level of satisfaction after surgery are available in the literature, especially concerning patients with follow-up longer than 20 years. The present study describes the risk of pouch failure and the onset of long-term pouch-related complications and quality of life in a single centre institution. We obtained data on a large cohort of patients with a mean follow-up of 24 years (range 20–30 yrs) after restorative proctocolectomy, which is significantly longer than those reported in most of the studies already published. For these purposes, we used validated questionnaires such as the Cleveland Clinic Pelvic Pouch Questionnaire and the Cleveland Global Quality of Life Instrument [15, 16], which were considered to be reliable in many previous studies.

In our series, we reported an overall pouch failure rate of 10.8 % after a mean follow-up of 24 years. Factors associated with pouch failure were pelvic sepsis, pouch-anal and pouch-vaginal fistulas and CD, which is consistent with what other authors have already found [19–21]. The Kaplan Meier analysis showed that the pouch retention rate decreased gradually over time, without sudden changes until the end of our follow-up.

Data from the literature show a pouch failure rate between 5.3 and 6.4 % in two wide groups of patients with a follow-up shorter than 8 years [16, 22]. However, according to our results, this rate rises to 11 % in series with follow-up up to 20 years [11, 23, 24].

Moreover, we analyzed pouch failure rate in patients according to changes in final histopatological diagnosis. During follow-up, 93 % of patients had their initial diagnosis of UC confirmed while 7 % of patients reported a delayed diagnosis of CD: the pouch failure rate reported was 7.5 and 53.8 %, respectively. Similar data on the fate of pouch in patients with a delayed diagnosis of CD have been already reported in literature ranging between 29 and 56 % [24–26]. In the present study, the pouch retention rate in cases of delayed diagnosis of CD was significantly lower than in cases of confirmed UC, suggesting that a misdiagnosed CD is an important risk factor for pouch failure. In the present cohort, pouch failure in CD patients was mainly due to severe perianal fistulas (5 pts) or to recurrence of CD in the pouch or in the pre-pouch ileal loop (2 pts). On the basis of these data and according to other authors, we can state that IPAA in CD patients could be a valid option only in high selected patients with an isolated colonic disease without ileal or perianal involvement [27, 28].

Data from our series indicate that chronic pouchitis was the most frequent long-term pouch-related complication, occurring in 28.6 % of cases. Indeed, similar results are described in two large series with follow-up shorter than 20 years with a rate of chronic pouchitis up to 21 % [10, 29]. A study from the Cleveland Clinic emphasized a significantly higher rate of pouchitis after 15 years up to 39 % [16], similar to another series in which episodes of pouchitis were reported in more than 47 % [8, 19]. These heterogeneous data could be explained by the authors' use of a non-standard accepted definition of "pouchitis" and by different length of follow-up in the different studies. We also observed a significantly higher risk of pouchitis in patients with a delayed diagnosis of CD compared with UC patients as already reported by others with pouchitis rates in CD ranging between 30.7 and 72 % [16, 27].

The present study showed that pouch-anal and pouch-vaginal fistulas were frequent long-term complications reported by 17.3 % of patients during follow-up, including patients who developed a pouch failure, patients who healed after surgical and medical therapy and patients with chronic fistulas. Their incidence in still functioning IPAA was lower, with fistulas reported by 5.4 % of patients.

This result is similar to data from other series that report a fistula occurrence rate of 3 % in patients with short follow-up, which increases to 10 % in patients with follow-up longer than 15 years [12, 16]. Fistulas were mainly pouch-anal with 9 cases of pouch-vaginal fistulas. We reported vaginal involvement in 14.7 % of females according to other studies in which females developed a vaginal fistula in 3 to 15 % of cases [30]. Fistulas represent an ever demanding complication, with a challenging treatment and with a healing rate in our cohort of 47.8 and 22.2 % in pouch-anal and pouch-vaginal fistulas, respectively. In our series, fistulizing disease is associated to an overall risk of pouch failure of 31.2 %, with worse results occurring in cases of vaginal involvement compared to perianal fistulas alone (66.6 vs 17.4 %, respectively).

Based upon our experience, pouch fistulas, together with pelvic sepsis, could be considered the main reasons for pouch excision as previously reported by many authors [19–21].

The overall incidence of anastomotic stenosis was 12,9 % with no differences according to the type of anastomosis. This result is similar to data recently reported by Fazio in a large cohort of patients who described an anastomotic stricture in 11.2 % of patients [16]. Stenosis could be easily treated with self dilations with good compliance of patients and a high healing rate of more than 75 % of cases; moreover, it has never alone led to a pouch failure.

Pre-pouch ileitis was an uncommon long-term complication that occurs in less than 8 % of cases in our series. Similarly, other studies report incidences of between 5 and 14 % [14, 31]. Actually, the pathogenesis of pre-pouch ileitis is unclear. Many studies suggest a misdiagnosis of CD [31, 32]; while some authors have proposed instead that pre-pouch ileitis may be the result of the reflux of pouch contents often associated with a concomitant pouchtis [14].

In the present study, the incidence of pre-pouch ileitis was 7.6 % with a delayed diagnosis of CD in 42.8 % of cases. Our results suggest that pre-pouch ileitis is significantly associated with a misdiagnosed CD. However, we also observed that in all patients with confirmed UC a pre-pouch ileitis is always associated with chronic pouchitis, suggesting an evolution of pouchitis in the ileal loop proximal to the pouch.

In our experience, many patients with pre-pouch ileitis could be treated with medical therapy with good results. In cases of onset of symptomatic stenosis without entero-enteric fistula or other complications, patients could be successfully submitted to surgical resection of the stenotic ileus with an ileo-pouch anastomosis. A pre-pouch ileitis could lead to a pouch failure only in a few cases due to associated complex entero-enteric fistulas.

Many studies show that IPAA confers good long-term functional results after an initial period of adjustment of 12–18 months, after which the frequency of bowel movements stabilizes at 6–7 days with good continence and the ability to postpone a bowel movement until convenient [7]. Subsequently, bowel movement frequency remains constant in the first decade after surgery, without the need of dietary restriction and with a decrease of use of antimotility drugs over time. According to these data, a systematic review by Heikens conducted on more than 4000 patients concludes that QoL improves in the first 12 months after surgery and reaches results indistinguishable from the healthy population [33].

As the follow-up period becomes longer, however, the results become ever more conflicting.

In our study, we observed an increase of median bowel movements over time since surgery, but this difference reached significance only for night-time evacuation. Urgency does not change after primary surgery. However, use of antimotility drugs and the incidence of major and minor incontinence increase significantly after more than 20 years. The slight worsening of functional results over time is probably influenced by the physiological aging of the studied population after such a long follow-up [19, 34], or by the increasing in incidence of pouchitis as already reported in the literature [7, 19].

Our data are in agreement with those reported by a recent study of the Cleveland Clinic Group [12] in a large cohort of 396 patients with a follow-up over a minimum of 15 years; they reported a significant increase in bowel movements, urgency and incontinence after 15 years. A similar trend in bowel movements has been reported by a Mayo Clinic study (1885 patients with a mean follow-up of 10.8 years), which showed a slight deterioration in stool frequency during the day and the night [35]. Moreover, they reported episodes of fecal incontinence, more frequent after 10 years from surgery, which remained relatively stable between 10 and 20 years after surgery [35, 36].

Similar results have been presented by Bengtsson et al. [37] in 2007 in a smaller group of patients with a median follow-up of 16 years, in which they also confirmed their data performing periodical manovolumetric evaluations.

Despite a slight deterioration in function over time, our patients are highly satisfied with the surgical procedure and report a good QoL. Patients' subjective perceptions of their own QoL, energy and vitality did not show any changes after restorative proctocolectomy, with high scores reported throughout follow-up.

In our cohort, only sexual function got worse during follow-up. The deterioration of sexual function could be due to aging of the study population; indeed many studies conducted on a normal population of men and women showed a physiological decline in sexual desire and sexual activity over time [38, 39].

CGQLI score remained high all over time. All patients are willing to recommend ileoanal pouch to others in a similar medical situation; none of our patients declared preference for a permanent stoma formation. Hahnloser et al. [35] reported comparable high QoL scores in their study; similarly Berndtsson et al. [23] support the high satisfaction rate after surgery with more than 94 % of patients satisfied after surgical procedure.

Conclusion

We can state unequivocally that ileoanal pouch remains an excellent surgical option for the treatment of refractory UC. The pouch retention rate is high, even after more than 20 years, and decreases gradually over time. Many of the unsuccessful procedures are associated to a delayed diagnosis of CD or to fistulizing perianal disease that still represents a demanding condition. Functional results are good and are maintained over time, although with a slight worsening. The QoL remained high and most patients expressed satisfaction with the procedure and were willing to recommend it to others.

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