Functional Results and Quality Of Life after Ileo Anal-Pouch Anastomosis for Ulcerative Colitis

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INTRODUCTION

The Restorative Proctocolectomy **(RCP)** with Ileal Pouch-Anal Anastomosis **(IPAA)** has become the procedure of choice for the surgical treatment of patients with Ulcerative Colitis **(UC)**. This procedure shares the two goals of removing the pathological mucosa of the colon and rectum, and adds the possibility of maintaining the intestinal continuity [1-6].

In 1978, Parks and Nicholls described an ileal pouch reservoir in an S configuration that was handsewn to the anus following distal rectal mucosectomy. The S pouch was characterized by a long efferent limb that was associated with impaired pouch emptying and a suboptimal functional result [2].

There followed a decade of experimentation with various pouch configuration S, J, H and W, before the J configuration was accepted as the standard operative technique because of ease construction and efficiency of evacuation. The anastomosis is either hand-sewn or mechanically stapled after mucosectomy [1,5,6-8].

Restorative Proctocolectomy **(RPC)** has a low mortality rate below 1%, but is associated with significant morbidity ranging from 15-70% depending on the duration of follow-up. Postoperative complications are also thought to have a negative impact on functional outcome. In the retrospective series of De Silva et al, compiling 666 patients, mortality rate was 1,5 % and the rate of complications was 27% [9]. In the series of Fazio, morbidity rate was 62.2% [10].

The present chapter was conducted to make an update about the long-term functional result and Quality Of Life **(QoL)** after RPC with IPAA in patients with ulcerative colitis.

METHODS

We made an electronic search of Medline, Pubmed, Embase, Cochrane Library, and the Google search engine and we selected potentially relevant papers based on title and abstract. We focused our research on functional outcome of IPAA, pouchites, pregnancy, quality of life, sexual results. Additional articles were identified by cross-referencing from papers retrieved initially.

Functional Outcomes

Functional outcome can be assessed by questions on various aspects of bowel function: the number of stools during the day and night (Bowel movements: bms), stool consistency (solid, semisolid, liquid), soiling or incontinence during the day or at night, incontinence for gas, ability to distinguish between flatus and feces, need for antidiarrheals medication, dietary restrictions, and incidence of perianal skin irritation [3,5,6,10-15].

Patients must be informed that after closure of the temporary iléostomie, functional results could be ameliorated progressively during the first post operative year [4,6,11-15]]. Fecal Continence improved in the first year, and remains stable in the first 5 years after IPAA. The ability to postpone bms until convenient improved too over time in the first year and it's one of the most criteria of improved quality of life after surgery. In the series of **Meagher** AO et al, with more than 1300 patients, the median number of stools per day was 6.5 with continence judged as perfect in 57% of patients but 7% of them were suffering from fecal incontinence [7]. In the series of **Saint Antoine** with 156 consecutive patients, the functional results had improved over time between three and 12 months after restorative surgery. The improvement was very slight after. Continence was normal for 80% of patients, soiling were present in 15% of patients in day, and in 20 to 40% of patients in night. 30% of them had adopted dietary restriction [15]. In the series of **McIntyre** et al, **Bullard et al**, **Michelassi** et al, the median stool frequency was 7 per 24 hours [16-18]. In the case of incontinence, patients could be divided into 3 groups according to the frequency of their incontinence: patients with 1-2 episodes per week (occasional spotting), 3-7 episodes per week (minor leakage), or more tan 7episodes per week (major leakage).

In the meta analysis of **De Zeew** S et al, with 53 studies (14,966 patients operated on for UC or Familial Polyposis Adenoumatous **(PAF)**, moderate or severe fecal incontinence was 14.3% and 6.1% respectively. The mean stool frequency per day was 5.9 and 1.5% per night [19]. The same

author had conducted a comparison of the results with a previous meta analysis composed of 43 studies with 9,317 patients. He concluded that the rate of pelvic sepsis, failure has decreased, but the functional outcomes didn't change irrespective of technical advancement and periopeative management.

QUALITY OF LIFE

Many published studies had evaluated the QoL after restorative IPAA for UC. The results are variable between improvement after surgery and moderate, stabilization or worsening of the QOL after IPAA. The majority of the studies were retrospective so they didn't relate really the course of the QoL because patients change progressively their rhythm of life and their perception of a well being with time [3,5,6,16,18]. In the survey of Michelassi, patient's assessment of their quality of life showed that it's as better as or better than before surgery in 81% and overall satisfaction in 93% of cases [16].

The surgical team of **Cleveland** had published a series of 1800 patients and they demonstrated that 85% of patients had a good Qol, 12% to 14% had adopted social or sexual or professional restrictions. But 96% of their study population was satisfied from the operation [18]. This gain of satisfaction after surgery can be explained because of the severity of symptoms (diarrhea, soiling, rectal bleeding, and abdominal pain) and the majority of patients had a poorly controlled disease as indication for surgery. **Wuthrich** et al, had evaluated the QoL of their patients by means of functional score: SF-36. It is an international test to measure the QoL. It is composed of 8 items dealing with physical activity, social activity, professional activity, physical pain, psychological status, quotidian activities, vitality, and perception of well being [20]. The SF-36 was 50% like in general population. 70% of the patients were satisfied from the operation, 54% had joined their initial job, 38% a partial activities and 8% had stopped working. If we analyses theses results, we can conclude that with this Sf-36 score, a good QoL is not a synonymous of good functional results: the majority of patients (65%) had between 5 to 10 bowel movements per day, with one minimal stool at night. 30% were preoccupied from their digestive functional results and that influenced their socio-professional activities.

In the retrospective study of **Brown** et al, 351 patients had been operated on for UC with IPAA. 85% of patients were satisfied or very satisfied of their results, and 89%had reported that their QoL and been clearly ameliorated after the surgery [21]. In this study, the authors had analyzed many components of the QoL, using many tools and validated scores:

- *Inflammatory Bowel Disease Questionnaire (IBDQ):* With 32 items. Used to measure bowel symptoms systemic symptoms, and emotional and social functioning with respect to UC.
- *EQ-5D :* It assesses five basic life domains: mobility, self-care, usual activities, pain, and anxiety/depression.
- *Body image Questionnaire (BIQ):* used to evaluate body image and satisfaction with surgical scaring post Colectomy.

- *Medical outcomes Study Sexual Functioning Scale (MOS- SFS):* with 4-items that assesses sexual functioning.
- *Hospital Anxiety and Depression Scale (HADS):* with 14-item self-report measure to assess levels of anxiety and depression.
- *Dietary Restrictions Questions:*
- *WHO Work Performance Questionnaire_Absenteesim and presenteeism: with 7-item that measures work performance*.

The author concluded that HRQoL is good after IPAA, but impairments were found in multiples domains of life: 17% of responders suffered from depression, 33% had altered work productivity, 34% had diet restriction, 29% had sexual dysfunction, 29% altered body image, and 46% ongoing need for medical medication to control bowel movements.

Rokke O el al, in their monocentrique study, 85% of their 103 patients operated on for UC were satisfied from operation, but 93% had related some degree of work restriction and familial reinsertion. 17% of women reported altered sexual activities [22].

Few studies had interested to functional outcomes for young patients [5,6,23,24]. **Van Balkom** et al had reported a series of 26 patients operated on for UC or PAF with a mean follow-up of 12.5 years. 23 patients had presented post operative complications; five had excision of the pouch. The respective score analyzing the Quality of life (QoL), the image of the body and sexual results had been decreased comparatively to those before surgery. 50% of women reported sexual dysfunction [24].

SEXUAL FUNCTION

fertility:

There is an increasing body of evidence to suggest that female fertility is adversely affected by restorative coloproctectomie. It has been suggested that the main cause of infertility is obstruction of the fallopian tubes as a result of pelvic adhesions [5,6,16,19,26-30]. In this case, laparoscopic IPAA could be useful by reducing post operative adhesions [28-32]. In a series of **Olsen** et al, with 237 women, 30% of the children born following RPC were conceived using *in vitro* fertilization, compared with 1% in the general population [26]. In the work of **Cornish** JA et al, the females had a significant reduction in fertility following RPC, with 90% of the females referred to a fertility specialist requiring in vitro fertilization [27]. In the meta analysis of **Waljee** et al, the rate of females infertility was three folds that in general population [33]. **Mortier** el al had demonstrated that ileo-rectal anastomosis (IRA) didn't affect female fertility comparatively to IPAA [34].

pregnancy:

Some reports indicate the higher incidence of anterior sphincter defect and lower mean squeeze anal pressures following vaginal delivery compared to caesarean delivery in women

with an IPAA [5,6,16,17,35-39]. In the series of **Polle** et al, he concluded that women who have a complicated vaginal delivery following RPC have a higher risk of incontinence with ageing and long-term follow up [37]. However, in some series, no correlation has been found between mode of delivery and pouch complications [39-41]. An informed decision reading mode of delivery is important. For primiparous women with IPAA, some may consider them candidates for elective caesarean section. More works are needed in this area to ascertain some conclusion.

sexual function:

RPC with IPAA can impact the patient's sexual life due to erectile and ejaculation dysfunction, dyspareunia, incontinence of stool during sexual intercourse.

For men, sexual dysfunctions are rare and variables (rate of retrograde ejaculation and erectile dysfunction range from 2% to 19% and 0% to 15% respectively) [4,6,9,14,16,42-47]. **Hueting** et al reported impotence and/or retrograde ejaculation in 25.5% of patients after IPAA and dyspareunia in 30.3% [14]. The best treatment is prevention by sharp dissection of the rectum under vision to respect the pelvic innervations. Even the risk of sexual trouble is rare for men; we must inform patients about this risk and the possibility of sperm freezing before IPAA. For women, the rate of dyspareunia after surgery range between 11% to 22%. In the survey of **Bambrik** from Cleveland Clinic, who studied only female patients. 262 women had been questioned, 35% had responded. The major plaints were vaginal dryness in 24%, dyspareunia in 26%, and pain in the moment of sexual intercourse in 30% of them [46]. **Farouk** et al in their retrospective study compiling 1454 patients, concluded the absence of modification in sexual habits in 56% of patients, improvement in 25%, and 19% reported a decreasing in their sexual function [47]. In the prospective study of **Davis** et al, the authors assessed the sexual function in men by "international index of erectile function" for men and "sexual function index" for women [48]. The conclusion is there was no deterioration of sexual function in men 12 months after IPAA, and improvement in women. In others reports, sexual satisfaction, desire, ability to experience orgasm are maintained or improved after pouch formation, because probably of an overall improvement in health [5,6,17,49,50]. **Kelly** et al, reported that 40% of their patients suffering from sexual perturbations before surgery vs 12% after surgery [3].

FACTORS INFLUENCING LONG-TERM RESULTS

Many factors are susceptible to interfere with post operative results of QoL: extra intestinal manifestations like articular pain that are not ameliorated by surgery, the risk of infertility in women. Post operative complications like intestinal obstruction, pouchitis and chronic pelvic sepsis are factors that could interfere negatively in the course and QoL of patients operated on for UC.

Pelvic sepsis:

One cause of deterioration of functional outcomes is anastomotic fistula and chronic pelvic sepsis. The rate is between 5 and 10% and the consequence is increasing of bms and fecal

incontinence [5,6,16,17,]. Diagnosis is made upon clinical signs of sepsis, pain and worsening of functional results. Computed Tomography and pelvic Magnetic Resonance Imaging (MRI) made diagnosis and eventual drainage. The success rate is about 50% to 70%.

Pouchitis:

Diagnosis is made by histological examination which showed signs of acute inflammation in patients still complaining of diarrhea, fever and endoscopic signs of pouch's inflammation. Making the real incidence of pouchitis is difficult because of varying definitions used to establish the diagnosis of pouchitis. The rate of this event is about 10% to 50% [3,5,6,9,10,12,14,17,51-54]. In the series of Fazio et al, it was 23.5% and 18.8% in the metanalysis of Hueting et al [10,14]. The cumulative risk of developing one episode of pouchitis one year after IPAA is estimated to 18% in survey of Mayo Clinic [13]. We can distinguish acute pouchitis with less than three episodes per year, chronic pouchitis with more than three episodes per year which are subdivided in responders to antibodies, dependents to antibodies or refractors to. The etiology is unknown, but is probably due to the increase in the bacterial flora within the pouch.

Different scores are used to graduate pouchitis "pouchitis scoring system": score of Moscowitz, PAS (pouchitis Activity score), PDAI (Pouchitis Disease Activity index), OPA (Objective Pouchitis Score).

Usually, pouchitis respond well to antibodies (Metronidazole, Ciprofloxacine). Pro biotic can be used succefuly to prevent pouchitis and to maintain remission in the chronic cases. In the refractors pouchitis, topic treatments like Budenoside could be efficient [55].

Others problems linked to technical procedures and mimicking pouchitis could be responsible of worsening of functional results like "prepouch-ileitis" and "cuffitis". Diagnosis is made by rectal examination, endoscopy (pochoscopy) that showed the high site of anastomosis (ileo sus anal anastomosis) and inflammation of the residual rectal mucosa confirmed by biopsies. In the series of Mc Laughlin et al, prepouch-ileitis was estimated to 5.7% [5,6,56].

Crhon's disease misdiagnosed initially as UC is responsible of alteration of functional results. The course of these forms is marked by the occurrence of fistula, pelvic sepsis and chronic pouchitis. This event is estimated to 2% to 3% of patients operated on for UC and had had IPAA [5,6,16,17,22,57-59].

Others mechanical causes of mediocre functional results:

- Obstruction of the IPAA: anal stenosis could be supple, pliable and easily resolved by dilatation [5,6,16,17,60-62]. Prudhomme M et al, in their series of 1884 patients who underwent RPC and IPAA, the incidence of anal stenosis was 11.6% and 86.4% of them was resolved with dilatation [62]. In cases of stenosis associated with fixed fibrotic pelvis, reoperations were necessary for excision of stenosis and mucosal flap lowering, refashioning the pouch or defection of the pouch with terminal ileostomy (failure of the IPAA) [60-63].

- Irritable pouch syndrome: it was described for the first time by Shen et al in 2002 [5,617]. It is characterized by increased stool frequency, urgency and abdominal pain but, without evidence of endoscopic, histological or mechanical lesions that explain these symptoms. Antidiarrheals medication, dietary restrictions could improve the situation.

- Failure: failure is defined as the need to excise the pouch or the need for a permanent ileostomy. The rate of this complication range from 1.5% to 10%. The causes of this issue are unrecognized Crhon's disease, recurrent abscess and fistula leading to chronic pelvis sepsis, mediocre functional results [3-6,10,13,14,16,59].

**Dysplasia and cancer:*

The risk of cancer transformation after RPC and IPAA is very rare when we compare it to PAF. Only 20 cases were reported in the literature. In any cases, the risk of this evolution seems to be increased in patients where dysplasia or cancer was present in the proctocolectomy specimen, sclerosing cholangitis, and grade C of villous atrophy of ileal pouch [5,6,62,65,66]. In this situation, some authors have recommended mucosectomy with handsewn anastomosis to leave as little anal mucosa as possible.

**Small bowel obstruction:*

It is a frequent complication after IPAA and the risk increase with time. Approximatively 20% to 30% of patients will develop at least one episode of intestinal obstruction in their post operative course [5,6,17]. Fazio et al reported a series of 1005 patients who underwent IPAA, 25.4% of them had developed intestinal obstruction, and 27.6% of these underwent reoperation [10]. In the meta analysis of Hueting et al, the rate of intestinal obstruction was 13.1% [14].

**Technical aspects of IPAA:*

The search of technical aspects that could influence the post operative course and then the functional results like the type of the ileal pouch, the type of anastomosis, the surgical approach (classical or mini-invasive) with or without anal mucosectomy had given discordant results, variable with the series because the criteria of evaluation and judgment were not similar.

*In the meta analysis of Cochrane data base published in 2009 with 11 studies (only one randomized trial (RT)) comparing laparoscopic approach to classical one, there was no difference between the two techniques regarding mortality, morbidity, re operations rate, and hospital stay. Laparoscopic surgery was associated with a good cosmetic result, short incisions but longer operation time [67]. Dunker et al, had compared the two approach, and the results were similar (functional outcomes, QoL), but better cosmetic results for laparoscopic arm [68]. We found the same results in the systematic review published by Singh et al [69].

*Three prospective RCT and one comparative study didn't found a significative difference between manual anastomosis and stapled anastomosis regarding post operative complications

and functional results [70-73]. For Heald and Johnston, the functional outcomes were better after stapled anastomosis when transitional mucosa was conserved [74,75].

*Many configuration of ileal pouch were fashioned with the aim to reduce the rate of post operative complications and functional results: J pouch, H pouch, S pouch, and W pouch. Two RCT didn't found significative difference when we used a larger pouch, with the same rate of fecal incontinence, soiling, emergency, and the use of antidiarrheals medications [75,76].

CONCLUSION

Restorative proctocolectomy has revolutionized the surgical approach of Ulcerative colitis. In patients with functioning pouch, functional outcomes and QoL is similar to that of general population and is durable with time.

References

1. McGuire BB, Brannigan AE, O'Connell PR. Ileal pouch-anal anastomosis. Br J Surg. 2007; 94: 812-823.
2. Parks AG, Nicholls RJ. Proctocolectomy without ileostomy for ulcerative colitis. Br Med J. 1978; 2: 85-88.
3. Kelly KA, Pemberton JH, Wolff BG, Dozois RR. Ileal pouch-anal anastomosis. Curr Probl Surg. 1992; 29: 57-131.
4. Beliard A, Prudhomme M. Ileal reservoir with ileo-anal anastomosis: long-term complications. J Visc Surg. 2010; 147: e137-144.
5. Ross H, Steele SR, Varma M, Dykes S, Cima R. Practice parameters for the surgical treatment of ulcerative colitis. Dis Colon Rectum. 2014; 57: 5-22.
6. McLaughlin SD, Clarks SK, Tekkis PP, Ciclitira PJ, Nicholls RJ. Review article: Restorative proctocolectomy, indications, management of complications and follow-up. A guide for gastroenterologists. Aliment Pharmacol Ther. 2008; 27: 895-909.
7. Meagher AP, Farouk R, Dozois RR, Kelly KA, Pemberton JH. J ileal pouch-anal anastomosis for chronic ulcerative colitis: complications and long-term outcome in 1310 patients. Br J Surg. 1998; 85: 800-803.
8. Berndtsson I, Oresland T. Quality of life before and after proctocolectomy and IPAA in patients with ulcerative proctocolitis--a prospective study. Colorectal Dis. 2003; 5: 173-179.
9. de Silva S, Ma C, Proulx MC, Crespin M, Kaplan BS. Postoperative complications and mortality following colectomy for ulcerative colitis. Clin Gastroenterol Hepatol. 2011; 9: 972-980.
10. Fazio VW, O'Riordain MG, Lavery IC, Church JM, Lau P. Long-term functional outcome and quality of life after stapled restorative proctocolectomy. Ann Surg. 1999; 230: 575-584.
11. Martin A, Dinca M, Leone L, Fries W, Angriman I. Quality of life after proctocolectomy and ileo-anal anastomosis for severe ulcerative colitis. Am J Gastroenterol. 1998; 93: 166-169.
12. Thirlby RC, Sobrino MA, Randall JB. The long-term benefit of surgery on health-related quality of life in patients with inflammatory bowel disease. Arch Surg. 2001; 136: 521-527.
13. Fazio VW, Kiran RP, Remzi FH, Coffey JC, Heneghan HM. Ileal pouch anal anastomosis: analysis of outcome and quality of life in 3707 patients. Ann Surg. 2013; 257: 679-685.
14. Hueting WE, Buskens E, van der Tweel I, Gooszen HG, van Laarhoven CJ. Results and complications after ileal pouch anal anastomosis: a meta-analysis of 43 observational studies comprising 9,317 patients. Dig Surg. 2005; 22: 69-79.
15. Daudé F, Penna C, Tiret E, Frileux P, Hannoun L. [Results of ileoanal anastomosis with mucosectomy and "J" pouch in hemorrhagic rectocolitis]. Gastroenterol Clin Biol. 1994; 18: 462-468.
16. Michelassi F, Stella M, Block GE. Prospective assessment of functional results after ileal J pouch-anal restorative proctocolectomy. Arch Surg. 1993; 128: 889-894.
17. Bullard KM, Madoff RD, Gemlo BT. Is ileoanal pouch function stable with time? Results of a prospective audit. Dis Colon Rectum. 2002; 45: 299-304.
18. Mc Intyre PB, Pemberton JH, Wolff BG, Beart RW, Dozois RR. comparing functional results one year and ten years after ileal pouch anal anastomosis for chronic ulcerative colitis. Dis Colon rectum 1994; 37: 303-307.

19. De Zeeuw S, Ahmed Ali U, Donders RA, Hueting WE, Keus F. Update of complications and functional outcome of the ileo-pouch anal anastomosis: overview of evidence and meta-analysis of 96 observational studies. Int J Colorectal Dis. 2012; 27: 843-853.

20. Wuthrich P, Gervaz P, Ambrosetti P, Soravia C, Morel P. Functional outcome and quality of life after restorative proctocolectomy and ileo-anal pouch anastomosis. Swiss Med Wkly. 2009; 139: 193-197.

21. Brown C, Gibson PR, Hart A, Kaplan GG, Kachroo S. Long-term outcomes of colectomy surgery among patients with ulcerative colitis. Springerplus. 2015; 4: 573.

22. Røkke O, Iversen K, Olsen T, Ristesund SM, Eide GE. Long-Term Followup of Patients with Active J-Reservoirs after Restorative Proctocolectomy for Ulcerative Colitis with regard to Reservoir Function, Mucosal Changes, and Quality of Life. ISRN Gastroenterol. 2011; 2011: 430171.

23. Delaney CP, Fazio VW, Remzi FH, Hammel J, Church JM. Prospective, age-related analysis of surgical results, functional outcome, and quality of life after ileal pouch-anal anastomosis. Ann Surg. 2003; 238: 221-228.

24. Van Balkom KA, Beld MP, Visschers RG, Van Gemert WG, Breukink SO. Long-term results after restorative proctocolectomy with ileal pouch-anal anastomosis at a young age. Dis Colon rectum 2012; 55: 939-947.

25. Bednarz W, Olewinski R, Wojczys R, Sutkowski K, Domoslawski P. Ileal-pouch-anal anastomosis after restorative proctocolectomy in patients with ulcerative colitis or familial adenomatous polyposis. Hepatogastroenterology. 2005; 52: 1101-1105.

26. Olsen KO, Joelsson M, Laurberg S, Oresland T. Fertility after ileal pouch-anal anastomosis in women with ulcerative colitis. Br J Surg. 1999; 86: 493-495.

27. Cornish JA, Tan E, Singh B, Bundock H, Mortensent N, et al. Female infertility following restorative proctocolectomy. Colorectal Disease 2011; 13: 339-344.

28. Larson DW, Davies MM, Dozois EJ, Cima RR, Piotrowicz K. Sexual function, body image, and quality of life after laparoscopic and open ileal pouch-anal anastomosis. Dis Colon Rectum. 2008; 51: 392-396.

29. Kjaer MD, Laursen SB, Qvist N, Kjeldsen J, Poornoroozy PH. Sexual function and body image are similar after laparoscopy-assisted and open ileal pouch-anal anastomosis. World J Surg. 2014; 38: 2460-2465.

30. Larson DW, Dozois EJ, Piotrowicz K, Cima RR, Wolff BG. Laparoscopic-assisted vs. open ileal pouch-anal anastomosis: functional outcome in a case-matched series. Dis Colon Rectum. 2005; 48: 1845-1850.

31. Beyer-Berjot L, Maggiori L, Birnbaum D, Lefevre JH, Berdah S, Panis Y. A total laparoscopic approach reduces the infertility rate after ileal pouch-anal anastomosis: A 2- center study. Ann Surg. 2013; 258: 275-282.

32. Bartels SA, D'Hoore A, Cuesta MA, Bensdorp AJ, Lucas C, et al. Significantly increased pregnancy rates after laparoscopic restorative proctocolectomy: A cross-sectional study. Ann Surg. 2012; 256: 1045-1048.

33. Waljee A, Waljee J, Morris AM, Higgins PD. Threefold increased risk of infertility: a meta-analysis of infertility after ileal pouch anal anastomosis in ulcerative colitis. Gut. 2006; 55: 1575-1580.

34. Mortier PE, Gambiez L, Karoui M, Cortot A, Paris JC. Colectomy with ileorectal anastomosis preserves female fertility in ulcerative colitis. Gastroenterol Clin Biol. 2006; 30: 594-597.

35. Kitayama T, Funayama Y, Fukushima K, Shibata C, Takahashi K. Anal function during pregnancy and postpartum after ileal pouch anal anastomosis for ulcerative colitis. Surg Today. 2005; 35: 211-215.

36. McLeod RS. Ileal pouch anal anastomosis: pregnancy--before, during and after. J Gastrointest Surg. 2008; 12: 2150-2152.

37. Polle SW, Vlug MS, Slors JF, Zwinderman AH, van der Hoop AG. Effect of vaginal delivery on long-term pouch function. Br J Surg. 2006; 93: 1394-1401.

38. Ravid A, Richard CS, Spencer LM, O'Connor BI, Kennedy ED. Pregnancy, delivery, and pouch function after ileal pouch-anal anastomosis for ulcerative colitis. Dis Colon Rectum. 2002; 45: 1283-1288.

39. Remzi FH, Gorgun E, Bast J, Schroeder T, Hammel J. Vaginal delivery after ileal pouch-anal anastomosis: a word of caution. Dis Colon Rectum. 2005; 48: 1691-1699.

40. Hahnloser D, Pemberton JH, Wolff BG, Larson D, Harrington J. Pregnancy and delivery before and after ileal pouch-anal anastomosis for inflammatory bowel disease: immediate and long-term consequences and outcomes. Dis Colon Rectum. 2004; 47: 1127-1135.

41. Gearhart SL, Hull TL, Schroeder T, Church J, Floruta C. Sphincter defects are not associated with long-term incontinence following ileal pouch-anal anastomosis. Dis Colon Rectum. 2005; 48: 1410-1415.

42. Tiainen J, Matikainen M, Hiltunen KM. Ileal J-pouch--anal anastomosis, sexual dysfunction, and fertility. Scand J Gastroenterol. 1999; 34: 185-188.

43. Metcalf AM, Dozois RR, Kelly KA. Sexual function in women after proctocolectomy. Ann Surg. 1986; 204: 624-627.

44. Wax JR, Pinette MG, Cartin A, Blackstone J. Female reproductive health after ileal pouch anal anastomosis for ulcerative colitis. Obstet Gynecol Surv. 2003; 58: 270-274.

45. Damgaard B, Wettergren A, Kirkegaard P. Social and sexual function following ileal pouch-anal anastomosis. Dis Colon Rectum. 1995; 38: 286-289.

46. Bambrick M, Fazio VW, Hull TL, Pucel G. Sexual function following restorative proctocolectomy in women. Dis Colon Rectum. 1996; 39: 610-614.

47. Farouk R, Pemberton JH, Wolff BG, Dozois RR, Browning S. Functional outcomes after ileal pouch-anal anastomosis for chronic ulcerative colitis. Ann Surg. 2000; 231: 919-926.

48. Davies RJ, O'Connor BI, Victor C, MacRae HM, Cohen Z. A prospective evaluation of sexual function and quality of life after ileal pouch-anal anastomosis. Dis Colon Rectum. 2008; 51: 1032-1035.

49. Berndtsson I, Oresland T, Hultén L. Sexuality in patients with ulcerative colitis before and after restorative proctocolectomy: a prospective study. Scand J Gastroenterol. 2004; 39: 374-379.

50. Gorgun E, Remzi FH, Montague DK, Connor JT, O'Brien K. Male sexual function improves after ileal pouch anal anastomosis. Colorectal Dis. 2005; 7: 545-550.

51. Penna C, Dozois R, Tremaine W, et al. Pouchitis after ileal pouch-anal anastomosis for ulcerative colitis with increased frequency in patients with associated primary sclerosing cholangitis. Gut. 1996; 38: 234-239.

52. Simchuk EJ, Thirlby RC. Risk factors and true incidence of pouchitis in patients after ileal pouch-anal anastomoses. World J Surg. 2000; 24: 851-856.

53. Schmidt CM, Lazemby AJ, Hendrickson RJ, Sitzmann JV. Preoperative terminal ileal and colonic resection histopathology predicts risk of pouchites in patients after ileoanal pull-through procedure. Ann Surg. 1998; 227: 663-665.

54. Holubar SD, Cima RR, Sandborn WJ, Pardi DS. Treatment and prevention of pouchites after ileal pouch-anal anastomosis for chronic ulcerative colitis. Cochrane Data base Syst Rev. 2010; 6: CD001176.

55. Sambuelli A, Boerr L, Negreira S, Gil A, Camartino G. Budesonide enema in pouchitis--a double-blind, double-dummy, controlled trial. Aliment Pharmacol Ther. 2002; 16: 27-34.

56. Mc Laughlin SD, Clark SK, Bell AJ, Tekkis PP, Ciclitiria PJ, et al. Incidence and short-term implications of pre pouch ileitis following restorative proctocolectomy with ileal pouch – anal anastomosis in ulcerative colitis. Dis Colon rectum. 2009; 52: 879-883.

57. Yu CS, Pemberton JH, Larson D. Ileal pouch-anal anastomosis in patients with indeterminate colitis: long-term results. Dis Colon Rectum. 2000; 43: 1487-1496.

58. Panis Y, Poupard B, Nemeth J, Lavergne A, Hautefeuille P. Ileal pouch/anal anastomosis for Crohn's disease. Lancet. 1996; 347: 854-857.

59. Regimbeau JM, Panis Y, Pocard M, Bouhnik Y, Lavergne-Slove A. Long-term results of ileal pouch-anal anastomosis for colorectal Crohn's disease. Dis Colon Rectum. 2001; 44: 769-778.

60. Shawki S, Belizon A, Person B, Weiss EG, Sands DR. What are the outcomes of reoperative restorative proctocolectomy and ileal pouch-anal anastomosis surgery? Dis Colon Rectum. 2009; 52: 884-890.

61. Benoist S, Panis Y, Berdah S, Hautefeuille P, Valleur P. New treatment for ileal pouch-anal or coloanal anastomotic stenosis. Dis Colon Rectum. 1998; 41: 935-937.

62. Prudhomme M, Dehni N, Dozois RR, Tiret E, Parc R. Causes and outcomes of pouch excision after restorative proctocolectomy. Br J Surg. 2006; 93: 82-86.

63. Tulchinsky H, McCourtney JS, Rao KV, Chambers W, Williams J. Salvage abdominal surgery in patients with a retained rectal stump after restorative proctocolectomy and stapled anastomosis. Br J Surg. 2001; 88: 1602-1606.

64. Tekkis PP, Heriot AG, Smith JJ, Das P, Canero A. Long-term results of abdominal salvage surgery following restorative proctocolectomy. Br J Surg. 2006; 93: 231-237.

65. Walker M, Radley S. Adenocarcinoma in an ileoanal pouch performed for ulcerative colitis in a patient with primary sclerosing cholangitis and a liver transplant: report a case a review of the literature. Dis Colon Rectum. 2006; 49: 909-912.

66. Veress B, Reinholt FP, Lindquist K, Lofberg R, Liljeqvist L. Long-term histo-morphological surveillance of the pelvic ileal pouch: Dyslasia develops in a subgroup of patients: Gastroenterology. 1995; 109: 1090-1097.

67. Ahmed Ali U, Keuus F, Heikens JT, Bemelman WA, Berdah SV, Gooszen HG, van Laarhoven CJ. Open versus laparoscopic (assisted) ileo-pouch anal anastomosis for ulcerative colitis and familial adenomatous polyposis. Cochrane Database Syst Rev. 2009; 21: CD006267.

68. Dunker MS, Belmeman WA, Slors JF, Van Duijvendijk P, Gouma DJ. Functional outcome, quality of life, body image, and cosmesis in patients after laparoscopic-assisted and conventional restorative proctocolectomy: a comparative study. Dis Colon rectum. 2001; 44: 1800-1807.

69. Singh P, Bhangu A, Nicholls RJ, Tekkis P. A systematic review and meta-analysis of laparoscopic vs open restorative proctocolectomy. Colorectal Dis. 2013; 15: e340-351.

70. Seow-Cohen A, Tsunoda A, Nicholls RJ. Prospective randomized trial comparing anal function after handsewn ileoanal anastomosis versus stapled ileoanal anastomosis without mucosectomy in restorative proctocolectomy. Br J Surg. 1991; 78: 430-434.

71. Keighley MR, Yoshioka K, Kmiot W. Prospective randomized trial to compare the stapled double lumen pouch and the sutured quadruple pouch for restorative proctocolectomy. Br J Surg. 1988; 75: 1008-1011.

72. Luukkonen P, Järvinen H. Stapled vs hand-sutured ileoanal anastomosis in restorative proctocolectomy. A prospective, randomized study. Arch Surg. 1993; 128: 437-440.

73. Reilly WT, Pemberton JH, Wolff BG, Nivatvongs S, Devine RM. Randomized prospective trial comparing ileal pouch-anal anastomosis performed by excising the anal mucosa to ileal pouch-anal anastomosis performed by preserving the anal mucosa. Ann Surg. 1997; 225: 666-676.

74. Heald RJ, Allen DR. Stapled ileo-anal anastomosis: a technique to avoid mucosal proctectomy in the ileal pouch operation. Br J Surg. 1986; 73: 571-572.

75. Johnston D, Williamson ME, lewis WG, Miller AS, Sagar PM, Holsworth PJ. Prospective controlled trial of duplicated (J) versus Quadruplicated (W) pelvic ileal reservoirs in restorative proctocolectomy for ulcerative colitis. Cut. 1996; 39: 242-247.

76. Keighley MR, Yoshioka K, Kmiot W. Prospective randomized trial to compare the stapled double lumen pouch and the sutured quadruple pouch for restorative proctocolectomy. Br J Surg. 1988; 75: 1008-1011.