

# Quality of life and functional outcomes of anticlockwise right colon transposition procedure after extended left colectomies

Original  
Article

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## ABSTRACT

**Objective:** This work aimed to compare the postoperative quality of life and functional results after an anticlockwise right colon inversion procedure as a salvage technique for colorectal anastomosis after extended left hemicolectomy with the results of total colectomy and ileorectal anastomosis.

**Patients and Methods:** This study was conducted as a prospective case–control study in Alexandria University Hospital between May 2021 and January 2023. A total of 40 patients were operated on with extended left hemicolectomies for different indications, and the transverse colon could not reach the rectum in the usual clockwise direction and so the bowel integrity had been regained either by colorectal anastomosis using right colon transposition procedure as a salvage technique for colorectal anastomosis (group A) or with ileorectal anastomosis after total colectomy (group B). Postoperative quality of life and functional results were assessed during the follow-up.

**Results:** Group A consisted of 10 (50%) males and 10 (50%) females while group B consisted of 12 (60%) males and eight (40%) females, with a mean age of 53.40 years (range, 21–75 years) in group A and 52.20 years (range, 25.0–73.0 years) in group B. Assessment of the continence using the Wexner score was done on discharge and 12 weeks after the surgery, and it was found that continence was statistically better in patients of group A when assessed on discharge and the mean Wexner score was 1.30 (range, 0.0–4.0) while in group B the mean Wexner score was 4.75 (range, 2.0–8.0).

**Conclusion:** The right colonic transposition is a safe alternative procedure allowing a tension-free colorectal anastomosis instead of total colectomy and ileorectal anastomosis as it offers a better quality of life and better functional outcome through preservation of the ileocecal valve.

**Key Words:** Extended left hemicolectomies, postcolectomy functional outcome, quality of life

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## INTRODUCTION

Colorectal or coloanal anastomoses are often performed by colon and rectal surgeons for a variety of purposes; the proximal colon should be sufficiently long to provide a tension-free and well-perfused anastomosis and to reduce the possibility of anastomotic leakage<sup>[1,2]</sup>. However, after left colectomies there are occasions that obviate the use of the left colon for a rectal or low pelvic anastomosis as in the case of previous left-sided colonic resection, presence of synchronous pathology in the left colon and rectum, a diseased left colon as in diverticular disease, or inadequate blood supply. Because the middle and right colic pedicles are so short, the transverse colon cannot be used in this situation. Moreover, once these blood vessels are ligated, the transverse colon blood supply would become inadequate, necessitating its excision. Consequently, the remaining right colon stump cannot reach the distal rectal stump without undue tension<sup>[3]</sup>.

To restore colonic continuity in a way free of tension, total colectomy with an ileorectal anastomosis is one of the conventional surgical approaches. However, postoperative functional outcomes are not as good as those obtained with colorectal anastomosis with the preserved ileocaecal valve<sup>[4,5]</sup>.

In these cases, the anticlockwise right colon transposition procedure can be used as an alternative to total colectomy with ileorectal anastomosis creating an anastomosis between the right or the transverse colon and the rectum or anus after a complete colonic mobilization and rotation while preserving the ileocaecal valve and the ileocolic artery<sup>[4–6]</sup>.

Colorectal physiology involves absorption of water and electrolytes, coordinated propulsion of fecal matter from the right colon to the rectum, storage and ultimately, expulsion. The alteration of bowel anatomy after colonic resection can lead to a number of functional disturbances which may be of long-term effects on the patient<sup>[7]</sup>.

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The increasing number of survivors after colectomy increased the awareness of long-term complications after colonic resection such as diarrhea, which has been reported in more than one-third of these patients<sup>[8]</sup>. Diarrhea after colectomy might severely affect a patient's quality of life, although it usually resolves 1 year after the surgery. The relationship between bowel function and quality of life after colonic resection is scarcely reported in the literature<sup>[4,9,10]</sup>.

Despite the fact that intestinal symptoms disappeared in the first year following surgery, many patients still have impaired quality of life, urgency, frequent bowel movements, and fecal incontinence<sup>[8,11]</sup>.

Loose stool and frequent bowel motion were reported by almost 40% of individuals who had a right hemicolectomy and just 2.5% of those who had a left hemicolectomy. Hard stools, however, were reported by 10% of patients who had a left hemicolectomy but not by any patients who had a right one. Regardless of the indication for which the patient had undergone surgery, diarrhea was frequently associated with right hemicolectomy<sup>[8,12-14]</sup>.

Following colon surgery, many factors may result in diarrhea. Among the proposed mechanisms are ileocecal valve absence which causes bacterial overgrowth in the small intestine, ileal brake disruption, and bile acid diarrhea. Less bile acid loss and less incidence of diarrhea were linked to the preservation of the ileocecal valve<sup>[8,12,15]</sup>.

After ileocecal valve resection, small intestinal bacterial overgrowth may result in persistent diarrhea due to a lack of control over colonic bacterial backwash into the ileum<sup>[16,17]</sup>.

The ileal brake is initiated by a proximal feedback mechanism that is activated by the presence of glucose, protein, and lipids in the terminal ileum. The ileal brake is triggered by an increase in small intestine transit time, a decrease in pancreatic and gastric secretion and a reduction in gastric emptying. As total colectomy often involves resection of the ileocecal junction and may extend to involve part of the ileum, this brake could be disrupted<sup>[8,17]</sup>.

Here we compare the anticlockwise right colon inversion procedure with total colectomy and ileorectal anastomosis aiming to report on indications and postoperative outcomes of both procedures, with a focus on the functional results<sup>[11,12]</sup>.

#### **PATIENTS AND METHODS:**

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Between May 2021 and January 2023, this study was carried out at the Alexandria University Hospital as a prospective case-control study. Forty patients were included according to the inclusion criteria of the study. The patients were classified into two groups: group A

included 20 patients who had undergone a right colon transposition procedure as a salvage technique for colorectal anastomosis. Group B included 20 patients who had undergone total colectomy with ileorectal anastomosis. After approval of the protocol by the Alexandria Faculty of Medicine Ethics Committee, all patients were informed well about all the procedures performed in the study, and they all signed an informed consent before being enrolled in the study. Demographic data of all patients were recorded. All patients in this study were subjected to thorough history taking, physical examination including abdominal examination and digital rectal examination.

#### **The following postoperative data were collected:**

- (1) Time of first bowel movement.
- (2) Duration of in-hospital stay.
- (3) Incidence of ileus.
- (4) Assessment of the continence using the Wexner score on discharge and 12 weeks after surgery<sup>[18]</sup>.
- (5) Morbidity was classified using the modified Clavien-Dindo system (during the first 30 postoperative days or hospitalization)<sup>[19]</sup>.
- (6) Assessment of quality of life using the gastrointestinal quality of life scale score, which is a validated questionnaire consisting of 36 questions to assess emotional or psychological well-being, physical functioning, social functioning, and symptoms of the disease. Each question had a score from 0 (least desirable option) to 4 points (most desirable option), and the sum of the points revealed the gastrointestinal quality of life scale score of the patient. The patients were assessed by gastrointestinal quality of life scale on discharge and after 12 weeks of surgery in the outpatient clinic and through phone calls<sup>[20]</sup>.
- (7) Anastomotic leakage was defined (an anastomotic defect visualized on imaging, sigmoidoscopy, at laparotomy or upon rectal examination).
- (8) Median daily stool frequency on discharge.
- (9) Median daily stool frequency after 8 and 12 weeks.
- (10) Assessment of gastrointestinal transit times by a radiopaque marker study.
- (11) Incidence of intestinal bacterial overgrowth.

### Statistical analysis

The computer was given data, and IBM SPSS software package, version 20.0 was used for analysis (IBM Corp., Armonk, New York, USA). Numbers and percentages were used to describe the qualitative data. To confirm the distribution's normality, the Shapiro–Wilk test was performed. The terms range (minimum and maximum), mean, SD, median, and interquartile range were used to characterize quantitative data. The results were deemed significant at the 5% level.

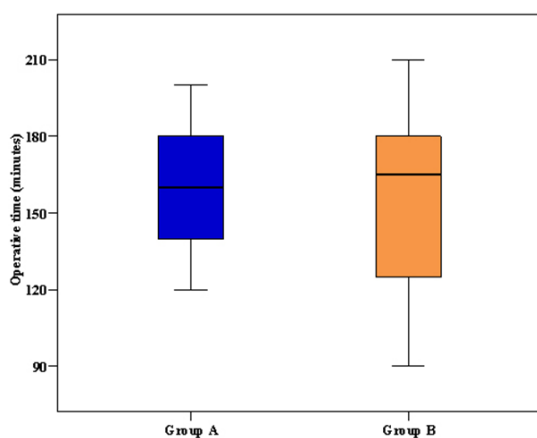
### RESULTS:

Group A consisted of 10 (50%) males and 10 (50%) females while group B consisted of 12 (60%) males and eight (40%) females, with a mean age of 53.40 years (range, 21–75 years) in group A and 52.20 years (range, 25.0–73.0 years) in group B.

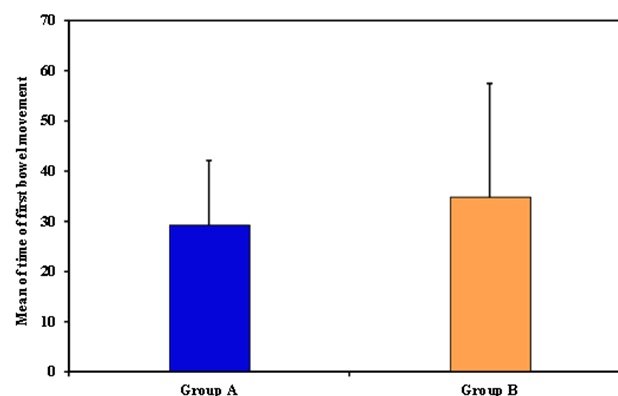
There was no statistically significant difference between the two groups regarding the operative time as shown in (Fig. 1), with a mean time of 160.5 min (range, 120.0–200.0 min) in group A and 161.0 (range, 90.0–210.0 min) in the other group.

Regarding the incidence of postoperative paralytic ileus, the two groups had equal incidence as six (30.0%) patients in each group experienced ileus. As regards the time of first bowel motion, there was no statistically significant difference between the two groups with an equal median time of 24 h in both groups, while the mean is longer in group B patients (Fig. 2). The duration of the hospital stay also was not statistically different in the two groups as the mean days of the hospital stay in group A was 4.65 (range, 3.0–7.0), while it was 4.45 (range, 3.0–8.0) in group B patients (Fig. 3).

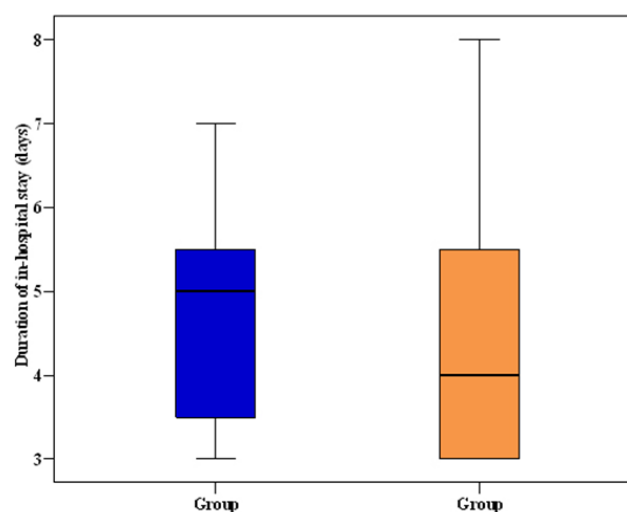
Comparing the two groups regarding morbidity using the modified Clavien–Dindo system<sup>[3]</sup> (during the first 30 postoperative days or hospitalization) showed no statistically significant difference between the two groups (Table 1).



**Fig. 1:** Comparison between the two studied groups according to operative time.



**Fig. 2:** Comparison between the two studied groups according to time of first bowel movement.



**Fig. 3:** Comparison between the two studied groups according to the duration of in-hospital stay (days).

**Table 1:** Comparison between the two studied groups according to morbidity grade

Morbidity grade	Group A (N=20) [n (%)]	Group B (N=20) [n (%)]	$\chi^2$	MCP
Grade I	6 (30.0)	4 (20.0)	1.536	0.889
Grade II	9 (45.0)	11 (55.0)		
Grade III	3 (15.0)	2 (10.0)		
Grade IV	1 (5.0)	1 (5.0)		
Grade V	1 (5.0)	2 (10.0)		

$\chi^2$ ,  $\chi^2$  test.

P: P value for comparing between groups A and B.

**Group A:** patients will undergo a right colon transposition procedure as a salvage technique for colorectal anastomosis.

**Group B:** patients will undergo total colectomy with ileorectal anastomosis.

Assessment of the continence using the Wexner score was done on discharge and after 12 weeks of surgery, and it was found that continence was statistically better in patients of group A when assessed on discharge and the mean Wexner score was 1.30 (range, 0.0–4.0) while in group B the mean Wexner score was 4.75 (range, 2.0–8.0). When the score was reassessed after 12 weeks, patients of group B experienced better control with a mean Wexner score of 3.65 (range, 2.0–5.0) but still, there was a statistically significant better continence score in group A patients (Fig. 4).

Daily stool frequency was assessed on discharge, at 8 and 12 weeks after surgery and compared between the two groups, and there was a statistically significant increase in stool frequency in group B patients. The median daily stool frequency on discharge was 7.5 motions per day in group B, while it was 2.0 motions per day in group A patients. The stool frequency decreased in both groups over time but was still statistically significantly higher in group B with a median daily bowel motion of 4.0 after 12 weeks compared with 1.0 motion per day in group A patients (Fig. 5).

As regards the study of the incidence of intestinal bacterial overgrowth, there was no statistical significance between the two groups, but the incidence of bacterial overgrowth was clinically higher in group B patients as it was detected in nine (45%) patients in group B compared with only four (20%) patients in group A (Fig. 6).

The gastrointestinal quality of life scale<sup>[20]</sup> was assessed after 12 weeks of surgery. There was no statistical significance between the two groups as regards the gastrointestinal quality of life scores. The mean score of group A patients was 66.55 points (range, 53.0–90.0), while it was 67.90 points (range, 50.0–82.0) in group B patients (Fig. 7).

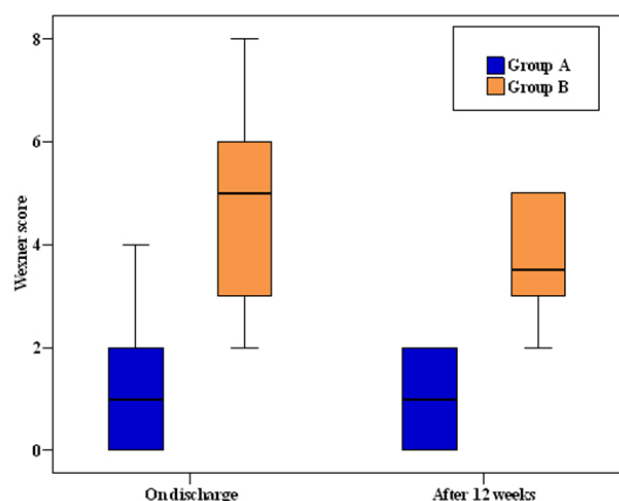


Fig. 4: Comparison between the two studied groups according to the Wexner score.

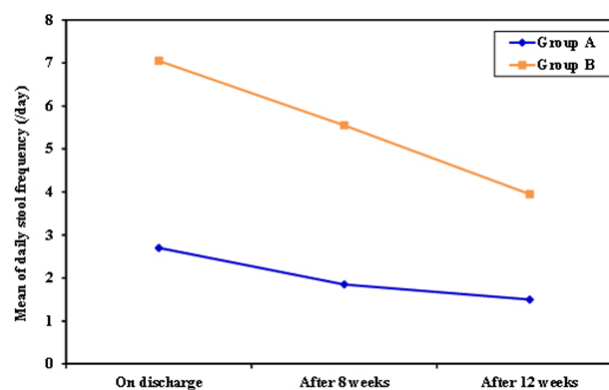


Fig. 5: Comparison between the two studied groups according to daily stool frequency.

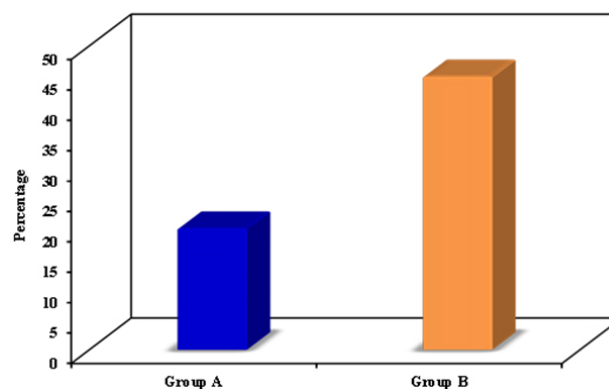


Fig. 6: Comparison between the two studied groups according to intestinal bacterial overgrowth.

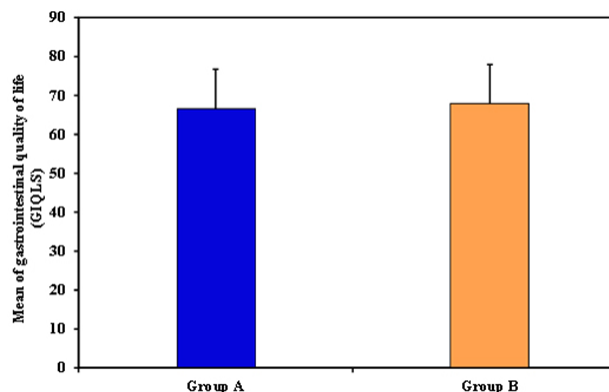


Fig. 7: Comparison between the two studied groups according to gastrointestinal quality of life.

## DISCUSSION

Following a left extended colectomy, bowel continuity restoration might be difficult because the residual colon would not be able to reach the rectal stump without tension to make a secure anastomosis. It is possible to do a complete colectomy with ileorectal anastomosis; however, loose stools and increased frequency of bowel movements can seriously compromise quality of life<sup>[21]</sup>.

However, a higher quality of life may result from the preservation of the right colon and ileocaecal valve

in the right colonic transposition, which may also improve stool consistency and bowel transit time<sup>[21]</sup>.

Our study was conducted as a prospective case–control one in the Alexandria University Hospital between May 2021 and January 2023. A total of 40 patients were operated on with extended left hemicolectomies for different indications and the transverse colon could not reach the rectum in the usual clockwise direction, so the bowel integrity had been regained either by colorectal anastomosis using right colon transposition procedure as a salvage technique for colorectal anastomosis (group A) or with ileorectal anastomosis after total colectomy (group B). Postoperative quality of life and functional results were assessed during the follow-up.

Using the modified Clavien–Dindo system to compare the two groups' morbidity during the first 30 days postoperatively or hospitalization, our study found no statistically significant differences between the groups, with five patients in each group reporting grades III, IV, or V.

Manceau *et al.*<sup>[5]</sup> found that the right colonic transposition technique was linked to a low rate of morbidity. Manceau and colleagues further said that due to poor functional results, one (2%) patient in their study had a definitive stoma. This patient was previously treated with neoadjuvant chemoradiation and rectal resection with total mesorectal resection for rectal cancer and developed an anastomotic leakage. Pelvic radiation and pelvic chronic sepsis may have both contributed to the anastomotic stenosis after the procedure in this patient.

This compares favorably with the 10–15% of septic complications reported after low colorectal for rectal cancer<sup>[22]</sup>, and with the 3–17% of anastomotic leak after total colectomy with ileorectal anastomosis<sup>[2]</sup>.

The time required to identify the markers in the rectum was statistically significantly longer in group A patients compared with group B patients in our study on gastrointestinal transit times using a radiopaque marker study. The mean time in group A was 11.20 h (range, 6.0–24.0 h), while it was 3.90 h (range, 3.0–6.0 h) in group B patients. In terms of how long it took for the markers to be fully removed from the rectum, group A patients required a statistically significantly longer time than group B patients; in group A, the mean time was 43.20 h (range, 24.0–96.0 h) while in group B, it was 26.40 h (range, 12.0–72.0 h).

Manceau *et al.*<sup>[5]</sup> revealed that 39 individuals in their research were assessed for functional outcomes after a median follow-up of 27 months. They propose that the preservation of the ileocecal junction, which functions

as a sphincter to prevent a rapid inflow of ileal content in the cecum, may be partially responsible for the good functional results reported following the right colonic transposition procedure, as more than 80% of their patients experienced fewer than four bowel movements per day. The right colonic transposition operation is a safe and feasible alternative to total colectomy with ileorectal anastomosis as demonstrated by their findings (82% of patients with less than four bowel movements/day).

Compared with an ileorectal anastomosis, the right colon transposition has the advantage of preserving the ileocecal valve, which allows for slower emptying of intestinal content from the small intestine to the remaining colon and rectum. This can lead to better consistency, a reduction in the frequency of bowel movements, and increased absorption of water, sodium, and vitamin B12<sup>[10]</sup>.

At 18 months of follow-up, Salgado-Nesme *et al.*<sup>[17]</sup> found that the mean number of bowel movements per day was 4.

You *et al.*<sup>[23]</sup> revealed that even with the use of antidiarrheal medicine and dietary modification, the median frequency of defecation following ileorectal anastomosis was five times per 24 h.

Chen *et al.*<sup>[24]</sup> sought to present the results of a group of 13 consecutive patients and describe the trans-mesenteric colorectal anastomosis and the inverted right colonic transposition technique utilizing the laparoscopic method. After 6 months, they found that the median number of bowel motions per day was two.

The gastrointestinal quality of life scale was evaluated in our study after the surgery by 12 weeks, and there was no statistically significant difference between the two groups. Group A patients had a mean score of 66.55 points (range, 53.0–90.0), but group B patients had a mean score of 67.90 points (range, 50.0–82.0).

These findings were supported by Carpinteyro  $\square$  Espin *et al.*<sup>[21]</sup>, who found that patients with right colon transposition were superior to ileorectal anastomosis patients in terms of physical discomfort ( $P=0.02$ ) and general health ( $P<0.01$ ).

Grasso *et al.*<sup>[25]</sup> concluded that the 1-year follow-up surgical and clinical outcomes were encouraging to support the feasibility of the right colon transposition procedure in terms of improving the quality of life: avoiding diarrhea, incontinence, and postoperative urgency.



Quality of life following ileorectal anastomosis might be troublesome with high daily stool frequency, a need for antidiarrheal treatment, and potential incontinence<sup>[23,26]</sup>.

Prior studies on the results of patients treated with a right colon transposition technique showed that most patients did not require loperamide-based medications and had a good quality of life for around a year following the procedure, with less than three bowel movements per day<sup>[5,10]</sup>.

Sciuto and colleagues recently shared their experience with 10 patients undergoing a comparable laparoscopic operation. Their early and late results were consistent with ours and the previously referenced papers<sup>[5,10,27]</sup>.

The limitations of this study include its small sample size, which may have limited the statistical power to detect certain differences. The study was conducted at a single center, which may limit the generalizability of the findings. Besides, the follow-up period was relatively short, and long-term outcomes were not assessed. Further studies with larger sample sizes, multicenter participation, longer follow-up periods, and comprehensive assessment of long-term outcomes are needed to validate these findings and provide a more robust understanding of the comparative outcomes of these surgical techniques.

## CONCLUSION

Instead of total colectomy and ileorectal anastomosis, a right colonic transposition is a safe alternative treatment that allows for tension-free colorectal anastomosis. This procedure gives a higher quality of life scale and a better functional result as it preserves the ileocecal valve.

## CONFLICT OF INTEREST

There are no conflicts of interest.

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