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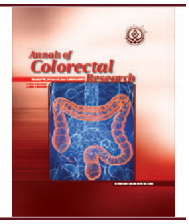

Which Stapler Charge Is Safest for Performing Ileocolic Anastomoses?

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Abstract

Introduction: Ileocolic anastomoses are made using a mechanical stapler or via hand-sewing, with many meta-analyses and reviews discussing their safety. This study compared two mechanical devices and charges, namely Echelon Flex with white charge (2.6 mm) versus EndoGIA with blue charge (3.5 mm), in isoperistaltic side-to-side ileocolic anastomosis after right hemicolectomy for cancer with similar surgical technique and postoperative management.
Methods: We made a retrospective analysis of all right hemicolectomies for malignancies performed between 1 January 2014 and 31 December 2019 in our department, comparing the mechanical device and the stapler charge used for the ileocolic isoperistaltic anastomosis.
Results: A total of 151 patients underwent right hemicolectomy for cancer. In 101 cases, the device used to perform ileocolic side-to-side isoperistaltic anastomosis was Echelon Flex with white charge (2.6 mm). In 50, the device used was EndoGIA with blue charge (3.5 mm). There were no significant differences in the baseline characteristics or complication rate (P=0.727). In particular, no differences were found in the rate of anastomotic leakage (P=0.851) or anastomotic bleeding (P=0.218). The median length of stay was ten and seven for the white and blue groups, respectively (P=0.112).
Conclusion: In our experience, mechanical ileocolic anastomosis is safe, and the two indicated staplers with the described charges do not differ in terms of anastomotic leak or bleeding. We hope that this study will motivate further investigations in this field.

Keywords: Ileocolic anastomosis, Right hemicolectomy, Colon cancer, Stapler, Stapler charge

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Introduction

Colon cancer is one of the most important diseases in Western Countries. Right colon tumor represents about 30% of all colorectal cancer, and right hemicolectomy is a relatively common surgical procedure. Despite this frequency, some surgical details are yet to be standardized well, and anastomotic leakage remains an ongoing challenge.

The importance of the discussion about how to perform the anastomosis to reduce the risk of anastomotic leakage is a central aspect of oncologic colorectal surgery, not only for the short-term morbidity and mortality but also for consequent

delays in adjuvant chemotherapy, with an impact on long-term outcomes (1). The ileocolic anastomosis can be performed with different techniques, and a lot of papers discuss the best surgical approach: open, laparoscopy-assisted, hand-assisted or total laparoscopy (2–4); iso- or anti-peristaltic (5); intra- or extra-corporeal (6); and mechanical or hand-sewn (7, 8). An interesting survey by Anania (9) analyzes many aspects of the anastomosis, including the direction, intra- or extra-corporeal approach, mechanical or manual operation, enterotomy closure, and mesocolon closure. However, it does not consider the charge used to perform the mechanical anastomosis.

Currently, there is no consensus regarding the stapler charge that needs to be used to perform the mechanical ileocolic anastomosis. This study compared Echelon Flex with white charge (2.6 mm) versus EndoGIA with blue charge (3.5 mm) in isoperistaltic side-to-side ileocolic anastomosis after right hemicolectomy for cancer, with otherwise similar surgical technique and postoperative management.

Methods

We made a retrospective analysis of a prospectively collected database. Inclusion criteria were elective right hemicolectomy for first-time diagnosis of malignancy performed between 1 January 2014 and 31 December 2019, patients aged ≥18 years, and informed consent. Splenic flexure cancers treated with extended right hemicolectomy and patients with a diverting stoma were excluded (Table 1). All procedures were performed in accordance with the ethical standards of the institutional research committee and with the Helsinki declaration and its later amendments.

Table 1: Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Elective surgery	Emergency surgery
Patients aged ≥18 years	Age <18 year
Informed consent	Inability to consent
Right hemicolectomy for malignancies	Splenic flexure cancer
Primary anastomosis	Protective stoma

All anastomoses were performed by two surgeons with expertise in oncological colorectal surgery. All anastomoses were primary isoperistaltic and made using two different linear mechanical staplers: Echelon Flex with white charge (2.6 mm) – "white group" – or EndoGIA with blue charge (3.5 mm) – "blue group". The stapler device and the color of the charge were a choice of the surgeon, according to their experience and background; each surgeon always used the same combination of devices. The enterotomy was closed with a continuous, single-layer, absorbable suture, and the mesocolon was routinely closed.

Postoperative complications were defined as any deviation from the normal postoperative course during the hospitalization or in the first 30 days after discharge; they were classified according to the Clavien-Dindo classification (10). Anastomotic leakage was defined as the presence of enteric material from the drainage, whether conservative treatment was provided or a re-operation confirmed the dehiscence.

Statistical analysis was performed using IBM SPSS Statistics version 26 (IBM corp., Armonk, NY). Data were expressed as median and interquartile range (IQR), and number and relative percentage. We aimed to compare the rate of anastomotic leakage, anastomotic bleeding, and surgical site infections (SSIs) and assess the two techniques' equivalence. The distribution of continuous variables was assessed with the Kolmogorov-Smirnov test. Continuous variables were analyzed using the T-test or U Mann-Whitney and categorical variables by Pearson's chi-squared test and Fisher's exact test, as appropriate. All statistics were two-tailed, and statistical significance was accepted when P was below 0.05.

Results

A total of 377 patients affected by colorectal cancer underwent surgery at Policlinico San Pietro (Ponte San Pietro, Bergamo, Italy) between January 2014 and December 2019. During this period, 151 patients underwent elective right hemicolectomy for cancer. In 101 cases, the ileocolic anastomosis was made using Echelon Flex with white charge (2.6 mm) – "white group" – and in 50 cases, it was made using EndoGIA blue charge (3.5 mm) – "blue group".

There were no significant differences between the groups in age (P=0.259), sex (P=0.858), previous abdominal surgery (P=0.447), comorbidities, length of surgery (P=0.569), and cancer stage (P=0.097) (Table 2).

Postoperative complications were recorded in 19 (38%) patients in the white group and in 49 (48.52%) in the blue group. No significant differences were found in the complications rate according to the Clavien-Dindo classification system (P=0.727). In particular, no significant difference was found in the rate of postoperative abdominal abscess between the two groups (P=0.839) (Table 3).

The analysis on anastomotic leakage showed no significant differences between open, laparoscopic, or converted surgery (P=0.430), planned or emergency surgery (P=0.871), and the types of stapler and charge used to make the anastomosis (P=0.851) (Table 4).

Statistical analysis for anastomotic bleeding showed similar results (Table 5).

The median length of stay was ten days (IQR 7-13) for the white group and seven (IQR 6-11) for the

Table 2: Baseline analysis.

		Stapler charge								
		Blue				White				P
		N (%)	Mean	Median	IQR	N (%)	Mean	Median	IQR	
Sex	Female	22 (44%)				46 (45.55%)				0.858
	Male	28 (56%)				55 (54.45%)				
Age at surgery			71	69	64-79		72	74	65-81	0.259
Previous abdominal surgery	No	30 (60%)				54 (53.47%)				0.447
	Yes	20 (40%)				47 (46.53%)				
Previous diverticulitis	No	49 (98%)				95 (94.06%)				0.278
	Yes	1 (2%)				6 (5.94%)				
Diverticulosis	No	42 (84%)				78 (77.23%)				0.332
	Yes	8 (16%)				23 (22.77%)				
Hypertension	No	27 (54%)				43 (42.57%)				0.185
	Yes	23 (46%)				58 (57.43%)				
Diabetes	No	43 (86%)				88 (87.13%)				0.847
	Yes	7 (14%)				13 (12.87%)				
Hepatopathy	No	45 (90%)				95 (94.06%)				0.366
	Yes	5 (10%)				6 (5.94%)				
Kidney failure	No	48 (96%)				96 (95.05%)				0.794
	Yes	2 (4%)				5 (4.95%)				
COPD	No	48 (96%)				90 (89.11%)				0.155
	Yes	2 (4%)				11 (10.89%)				
Vasculopathy	No	48 (96%)				88 (87.13%)				0.086
	Yes	2 (4%)				13 (12.87%)				
TNM	Stage 0	17 (34%)				16 (15.84%)				0.097
	Stage 1	6 (12%)				21 (20.79%)				
	Stage 2	12 (24%)				26 (25.75%)				
	Stage 3	11 (22%)				32 (31.68%)				
	Stage 4	4 (8%)				6 (5.94%)				
Length of surgery			162	150	125-200		164	160	135-200	0.569

IQR, Interquartile range; COPD, Chronic obstructive pulmonary disease

Table 3: Postoperative complications in both groups.

		Stapler charge		
		Blue	White	P
		N (%)	N (%)	
Postoperative complication	No	31 (62%)	52 (51.49%)	0.323
	Yes	19 (38%)	49 (48.52%)	
Clavien-Dindo	1	4 (21.05%)	6 (12.25%)	0.727
	2	8 (42.11%)	28 (57.14%)	
	3a	1 (5.26%)	1 (2.04%)	
	3b	6 (31.58%)	12 (24.49%)	
	4a	0	1 (2.04%)	
	4b	0	0	
	5	0	1 (2.04%)	
Abdominal abscess	No	44 (88%)	90 (89.11%)	0.839
	Yes	6 (12%)	11 (10.89%)	

Table 4: Anastomotic leakage analysis.

		Anastomotic leakage		
		No	Yes	P
		N (%)	N (%)	
Technique	Open	48 (34.78%)	5 (38.46%)	0.430
	Laparoscopy	74 (53.62%)	8 (61.54%)	
	Converted	16 (11.60%)	0 (0%)	
Planned vs emergency surgery	Planned	129 (93.48%)	12 (92.30%)	0.871
	Emergency	9 (6.52%)	1 (7.70%)	
Stapler charge	Blue	46 (33.33%)	4 (30.77%)	0.851
	White	92 (66.67%)	9 (69.23%)	

Table 5: Anastomotic bleeding analysis.

		Anastomotic bleeding		
		No	Yes	P
		N (%)	N (%)	
Planned vs emergency surgery	Planned	139 (93.92%)	2 (66.7%)	0.060
	Emergency	9 (6.08%)	1 (33.3%)	
Stapler charge	Blue	50 (33.78%)	0 (0%)	0.218
	White	98 (66.22%)	3 (100%)	
Technique	Open	53 (35.81%)	0 (0%)	0.276
	Laparoscopy	79 (53.38%)	3 (100%)	
	Converted	16 (10.81%)	0 (0%)	

Table 6: Length of stay in the two groups.

	Stapler charge						
	Blue			White			P
	Mean	Median	IQR	Mean	Median	IQR	
Length of stay (days)	10	7	6-11	12	10	7-13	0.112

IQR, Interquartile range

blue group. No significant differences were found between the two groups (P=0.112) (Table 6).

The thirty-day readmission rate was 2% in both groups. One patient in the white group was readmitted for fever due to pneumonia. Two patients in the blue group were readmitted – one for fever due to an abdominal abscess and one for defecation difficulties.

Discussion

Despite the frequency of right colon cancer, the surgical technique is not yet well standardized and anastomotic leakage represents an ongoing challenge, with a risk of up to 7.5% (11). Multiple papers have discussed the best technique to perform the ileocolic anastomosis, comparing manual and mechanical, iso- and anti-peristaltic, and intra- and extra-corporeal approaches (5, 6, 8, 12). A Cochrane review analyzed the differences between stapled versus hand-sewn ileocolic anastomosis (8). Cirocchi et al. (6) compared intracorporeal versus extracorporeal mechanical anastomosis, while the ISOVANTI trial analyzed isoperistaltic versus antiperistaltic side to side anastomosis (5). However, no prior investigations are available concerning the stapler charge used to perform the mechanical anastomosis.

The most important Italian multicenter analysis performed by the ColonDx Italian Group (9) took into consideration stapled or hand-sewn, single or double layer, isoperistaltic or antiperistaltic closure of the enterotomies, interrupted or continuous suture, and intracorporeal or extracorporeal anastomosis, but did not consider the charge of the stapler. In 2017, Van Oostendorp (13) published a systematic review and meta-analysis including 12 retrospective case-controlled series about intra- versus extra-corporeal anastomosis in laparoscopic right hemicolectomy, indicating the superiority of intracorporeal anastomosis in terms of morbidity and length of stay, with no differences in anastomotic leakage. The observed decreased morbidity of the intracorporeal anastomosis technique seemed primarily related to the extraction site. Also, in this case, all the mechanical anastomoses were considered together without considering the technical differences.

In 2015, Gustaffson (14) reported an increase in anastomotic leakage in mechanical anastomoses relative to hand-sewn anastomoses. This conclusion was supported by a Spanish multicentric prospective study (15) and more recently by Nordholm-Cartensen (12), who analyzed the Danish Colorectal Cancer Group and the National Patient Registry databases, demonstrating a two-fold increase in anastomotic leak after stapled ileocolic anastomosis versus hand-sewn anastomosis. These results disagreed with the Cochrane review by Choy (8), which asserted the safety of stapled anastomosis. It is important to note that no one considered and clarified the charge used to perform the ileocolic anastomosis, and variations in findings may be due to differences in the technique used to perform the mechanical anastomosis.

To date, a comparative analysis was yet to exist about the charge used to perform the ileocolic mechanical anastomosis. Our data showed that the device and the charge used to perform the ileocolic side-to-side, isoperistaltic anastomosis after right hemicolectomy for cancer does not affect the rates of anastomotic leakage or bleeding. However, this study had some limitations, incldluing the retrospective and non-randomized nature as well as the small sample size. Nonetheless, this is the first report in the literature comparing different charges – Echelon white and EndoGIA blue – in performing the mechanical side-to-side ileocolic isoperistaltic anastomosis after right hemicolectomy for cancer in a homogeneous population operated on by only two members of the same department with expertise in oncological colorectal surgery.

Conclusion

This study provides an additional discussion topic to the debate about ileocolic anastomosis after right hemicolectomy. In our experience, the use of Echelon Flex White 2.6 mm or EndoGia Blue 3.5 mm stapler charge does not show differences in terms of anastomotic leakage or bleeding. We hope that this study will motivate further investigations in this field.

Conflicts of interest: None declared.

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