European Colorectal Congress

28 November – 1 December 2022, St.Gallen, Switzerland

Monday, 28 November 2022

09.50
Opening and welcome
Jochen Lange, St.Gallen, CH

10.00
It is leaking! Approaches to salvaging an anastomosis
Willem Bemelman, Amsterdam, NL

10.30
Predictive and diagnostic markers of anastomotic leak
Andre D'Hoore, Leuven, BE

11.00
SATELLITE SYMPOSIUM
ETHICON

11.45
Of microbes and men – the unspoken story of anastomotic leakage
James Kinross, London, UK

12.15
LUNCH

13.45
Operative techniques to reduce anastomotic recurrence in Crohn's disease
Laura Hancock, Manchester, UK

14.15
Innovative approaches in the treatment of complex Crohn Diseases perianal fistula
Christianne Buskens, Amsterdam, NL

14.45
To divert or not to divert in Crohn surgery – technical aspects and patient factors
Pär Myrelid, Linköping, SE

15.15
COFFEE BREAK

15.45
Appendiceal neoplasia – when to opt for a minimal approach, when and how to go for a maximal treatment
Tom Cecil, Basingstoke, Hampshire, UK

16.15
SATELLITE SYMPOSIUM
Medtronic
Further.Together

17.00
Outcomes of modern induction therapies and Wait and Watch strategies, Hope or Hype
Antonino Spinelli, Milano, IT

17.30
EAES Presidential Lecture - Use of ICG in colorectal surgery: beyond bowel perfusion
Salvador Morales-Conde, Sevilla, ES

18.00
Get-Together with your colleagues
Industrial Exhibition

Tuesday, 29 November 2022

9.00
CONSULTANT'S CORNER
Michel Adamina, Winterthur, CH

10.30
COFFEE BREAK

11.00
SATELLITE SYMPOSIUM
INTUITIVE

11.45
Trends in colorectal oncology and clinical insights for the near future
Rob Glynne-Jones, London, UK

12.15
LUNCH

13.45
VIDEO SESSION

14.15
SATELLITE SYMPOSIUM
BD

15.00
COFFEE BREAK

15.30
The unsolved issue of TME: open, robotic, transanal, or laparoscopic – shining light on evidence and practice
Des Winter, Dublin, IE
Jim Khan, London, UK
Brendan Moran, Basingstoke, UK

16.30
SATELLITE SYMPOSIUM
Takeda

17.15
Lars Pahlman lecture
Søren Laurberg, Aarhus, DK

Thursday, 1 December 2022
Masterclass in Colorectal Surgery
Proctology Day

Wednesday, 30 November 2022

9.00
Advanced risk stratification in colorectal cancer – choosing wisely surgery and adjuvant therapy
Philip Quirke, Leeds, UK

09.30
Predictors for Postoperative Complications and Mortality
Ronan O'Connell, Dublin, IE

10.00
Segmental colectomy versus extended colectomy for complex cancer
Quentin Denost, Bordeaux, FR

10.30
COFFEE BREAK

11.00
Incidental cancer in polyp - completion surgery or endoscopy treatment alone?
Laura Beyer-Berjot, Marseille, FR

11.30
SATELLITE SYMPOSIUM

12.00
Less is more – pushing the boundaries of full-thickness rectal resection
Xavier Serra-Aracil, Barcelona, ES

12.30
LUNCH

14.00
Management of intestinal neuroendocrine neoplasia
Frédéric Ris, Geneva, CH

14.30
Poster Presentation & Best Poster Award
Michel Adamina, Winterthur, CH

15.00
SATELLITE SYMPOSIUM
OLYMPUS

15.45
COFFEE BREAK

16.15
Reoperative pelvic floor surgery – dealing with perineal hernia, reoperations, and complex reconstructions
Guillaume Meurette, Nantes, FR

16.45
Salvage strategies for rectal neoplasia
Roel Hompes, Amsterdam, NL

17.15
Beyond TME – technique and results of pelvic exenteration and sacrectomy
Paris Tekkis, London, UK

19.30
FESTIVE EVENING

Information & Registration **www.colorectalsurgery.eu**

Received: 23 August 2021 | Revised: 31 January 2022 | Accepted: 1 February 2022

DOI: 10.1111/codi.16096

ORIGINAL ARTICLE

A multicentre, prospective cohort study of handsewn versus stapled intracorporeal anastomosis for robotic hemicolectomy

Deena Harji[1] | Philippe Rouanet[2] | Eddy Cotte[3] | Anne Dubois[4] | Eric Rullier[1] | Denis Pezet[4] | Guillaume Passot[3] | Christophe Taoum[2] | Quentin Denost[1]

[1]Department of Digestive Surgery, Colorectal Unit, Haut-Lévêque Hospital, Bordeaux University Hospital, Pessac, France

[2]Department of Colorectal Surgery, Institut du Cancer de Montpellier, Montpellier, France

[3]Department of Digestive and Oncological Surgery, Lyon University Hospital, Lyon-Sud Hospital, Pierre-Bénite, France

[4]Department of Colorectal Surgery, Chu Estaing, Clermont-Ferrand, France

Correspondence
Deena Harji and Quentin Denost, Department of Digestive Surgery, Colorectal Unit, Haut-Lévêque Hospital, Bordeaux University Hospital, Pessac, France.
Emails: deena_harji@hotmail.com; quentin.denost@chu-bordeaux.fr

Funding information
None to declare.

Abstract

Aim: Robotic right hemicolectomy is gaining in popularity due to the recognized technical benefits associated with the robotic platform. However, there is a lack of standardization regarding the optimal anastomotic technique in this cohort of patients, namely stapled or handsewn intra- or extra-corporeal anastomosis. The ergonomic benefit associated with the robotic platform lends itself to intracorporeal anastomosis (ICA). The aim of this study was to compare the short-term clinical outcomes of stapled versus handsewn ICA.

Method: A multicentre prospective cohort study was undertaken across four high-volume robotic centres in France between September 2018 and December 2020. All adult patients undergoing an elective robotic right hemicolectomy with an ICA performed and a minimum postoperative follow-up of 30 days were included. The primary endpoint of our study was anastomotic leak within 30 days postoperatively.

Results: A total of 144 patients underwent robotic right hemicolectomy: 92 (63.8%) had a stapled ICA and 52 (36.1%) a handsewn ICA. The operative indication was adenocarcinoma in 90% with a stapled ICA compared with 62% in the handsewn ICA group ($p < 0.001$). The overall operating time was longer in the handsewn ICA group compared with the stapled ICA group (219 min vs. 193 min; $p = 0.001$). The anastomotic leak rate was 3.3% in stapled ICA and 3.8% in handsewn ICA ($p = 1.00$). There was no difference in the rate or severity of postoperative morbidity.

Conclusion: ICA robotic hemicolectomy is technically safe and is associated with low rates of anastomotic leak overall and equivalent clinical outcomes between the two techniques.

KEYWORDS
Right colectomy, robotic approach, intracorporeal anastomosis, handsewn anastomosis, mechanical anastomosis

INTRODUCTION

There has been a longstanding debate regarding the optimal anastomotic technique in minimally invasive right hemicolectomy, namely intracorporeal anastomosis (ICA) or extracorporeal anastomosis (ECA) and handsewn or stapled anastomosis. The current evidence base suggests that ICA is associated with faster gastrointestinal recovery, a shorter length of stay and reduced opiate consumption [1]. However, despite these demonstrable benefits, ECA is employed more widely due to its ease of formation. Furthermore, in 2015 the

European Society of Coloproctology reported the variable use of anastomotic technique, with stapled anastomosis in 61.6% of patients and handsewn anastomosis in 38.9% of patients undergoing right hemicolectomy [2]. Handsewn ileocolic anastomosis is associated with a longer operating time [3]; however, the evidence for the impact on anastomotic leak rates between the two techniques is mixed [2–5].

As minimally invasive surgery continues to cross over from laparoscopic to robotic surgery, there is likely to be an increase in the number of right hemicolectomies performed robotically, with a concomitant rise in the rate of ICA performed [6]. The robotic platform overcomes some of the difficulties associated with laparoscopic ICA due to its stable platform, improved ergonomics and dexterity, which lends itself well to performing ICA. However, there remains a lack of standardization in anastomotic technique following robotic right hemicolectomy, with Guadagni et al. reporting variation in approach (handsewn versus stapled), stapler use (robotic versus laparoscopic) and closure of enterotomy (single versus double layer). To date, the majority of studies reporting the outcomes of robotic colectomy have focused on comparing outcomes between laparoscopic and robotic colectomy, with comparisons between the two minimally invasive platforms [7–9] or between differing anastomotic techniques, i.e. ICA versus ECA [9–11]. There have been no studies focusing on intracorporeal anastomotic techniques alone in robotic colectomy, despite it being widely accepted that ICA is associated with improved clinical outcomes. The aim of our study was to compare two different techniques of robotic ICA, handsewn and stapled, for patients undergoing right hemicolectomy.

What does this paper add to the literature?

This paper highlights the differing intracorporeal anastomotic techniques available for robotic right hemicolectomy.

METHOD

A multicentre prospective cohort study was undertaken across four expert robotic centres in France to compare outcomes between patients undergoing robotic right hemicolectomy and mechanical ICA with handsewn ICA. Eight expert robotic surgeons participated in this study, with equal numbers performing each technique, thus employing an expertise-based assessment approach to both anastomotic techniques. All surgeons performed their preferred technique in all consecutive cases, irrespective of disease or patient characteristics. All consecutive patients undergoing right hemicolectomy between September 2018 and December 2020 were considered for inclusion in the study. Ethical approval was provided locally by all participating sites with informed consent obtained from all patients.

Eligibility criteria

All adult patients (>18 years old) undergoing an elective robotic right hemicolectomy with an intracorporeal anastomosis and a minimum postoperative follow-up of 30 days were included. Patients were excluded if they underwent a robotic right hemicolectomy with ECA, laparoscopic surgery, emergency surgery or if they had a permanent stoma formed.

Operative technique

All patients underwent a standard robotic right hemicolectomy with a medial to lateral approach. The procedure is started by incising the visceral peritoneum below the ileocolic vessels to dissect along Toldt's fascia between the mesothelium covering the colonic mesentery and that covering the retroperitoneum. This dissection is continued anteriorly to the third part of the duodenum and beyond to under the hepatic flexure. The ileocolic vascular pedicle is then divided close to the superior mesenteric artery/superior mesenteric vein with locking clips or an energy device. If a right colic vessel is present that is also divided in a similar fashion. Following medial-to-lateral dissection, the colon is pulled cephalad and the hepatic flexure attachments divided; this incision is continued along the right paracolic gutter along the white line of Toldt to complete the mobilization. The transverse colon and terminal ileum are then divided using the da Vinci® Xi EndoWrist Stapler (Intuitive Surgical, Inc.). The steps of each anastomotic technique are standardized and performed in a stepwise fashion as outlined below and in Video S1 in the Supporting Information.

Robotic ICA stapled anastomosis

An isoperistaltic stapled ICA anastomosis is performed. A stay suture is placed at the apex of the terminal ileum and transverse colon using a 3/0 Vicryl with a further stay suture placed 6 cm proximally from this. An enterotomy and colotomy are created and the da Vinci® Xi EndoWrist Stapler (Intuitive Surgical, Inc.) is introduced and fired to form the anastomosis. The enterotomy is then closed using a continuous 3/0 V-Loc suture.

Robotic ICA handsewn anastomosis

An isoperistaltic handsewn anastomosis is performed. A 3/0 Vicryl stay suture is placed at the apex of the terminal ileum and transverse colon. A 6 cm longitudinal serosal incision is made over the terminal ileum and transverse colon preserving the integrity of the underlying mucosa to reduce contamination. The posterior wall of the anastomosis is formed using a continuous 3/0 V-Loc suture. Following

this, the mucosa of terminal ileum and transverse colon are incised, and the anterior wall of the anastomosis is formed using a second continuous 3/0 V-Loc suture.

Following formation of the anastomosis the specimen is extracted through the umbilicus.

Quality assurance for each procedure was ensured through appropriate training of each participating surgeon in their preferred technique at each hospital site. Surgeons were trained using a standardized, component-based robotic approach to achieve technical proficiency in robotic right hemicolectomy, with the anastomosis being a key operative step within this training pathway. All surgeons submitted training videos for expert analysis prior to enrolment into the study.

Outcome assessment

The primary endpoint of our study was anastomotic leak within 30 days postoperatively. This was defined as either (i) gross anastomotic leak proven radiologically or clinically requiring either radiological or surgical intervention or (ii) the presence of intraperitoneal (abdominal or pelvic) fluid collection on postoperative imaging [2]. Secondary endpoints included total operating time, blood loss, 30 day postoperative mortality, 30 day postoperative morbidity and length of stay.

Length of hospital stay was defined as the number of days following the day of surgery until medically fit for discharge. Postoperative complications were classified as adverse events within 30 days of the operation and were graded according to the Clavien–Dindo (CD) classification [12].

Statistical analysis

This manuscript was prepared in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology statement for observational studies. Continuous variables are expressed as median and interquartile range. Categorial variables are expressed as number and percentage. Given the exploratory nature of our cohort study a formal sample size calculation was not performed. Analysis between groups was performed using the chi-square test or Fisher exact test to compare categorical variables and the nonparametric Mann–Whitney *U*-test to compare continuous variables. All tests were two-sided, with type I error set at $\alpha = 0.05$. All analyses were conducted using IBM SPSS Statistics version 26.0.0.1 for Macintosh (IBM Corp., Armonk, NY).

RESULTS

A total of 144 patients underwent robotic right hemicolectomy during the study period, with 92 (63.8%) patients undergoing a stapled ICA and 52 (36.1%) undergoing a handsewn ICA. The operative indication was adenocarcinoma in 90% of patients who underwent a stapled ICA compared with 62% in the handsewn ICA group ($p < 0.001$). Baseline patient and clinical characteristics are outlined in Table 1.

Postoperative outcomes

The overall median operating time was longer in the handsewn ICA group than the stapled ICA group: 219 min vs. 193 min ($p = 0.001$). The overall conversion rate was similar in both groups, with rates of 5.4% ($n = 5$) in the stapled ICA group and 5.8% ($n = 3$) in the handsewn ICA group ($p = 1.00$). Of the five conversions in the stapled ICA group, four were converted to open surgery and one to laparoscopic surgery. In comparison, all three conversions in the handsewn anastomosis group were converted to open surgery. There were no observed differences in anastomotic leak rates between the stapled ICA and handsewn ICA groups, with observed rates of 3.3% and 3.8%, respectively ($p = 1.00$). The median length of stay was shorter in the handsewn ICA group compared with the stapled ICA group, at 5 and 6 days respectively, $p = 0.03$. There were no differences between the two groups with regard to 30 day postoperative morbidity, grade of morbidity or 30 day postoperative mortality (Table 2).

DISCUSSION

This study reports on the differing approaches to ICA in robotic right hemicolectomy including handsewn and stapled techniques, and demonstrates the safety of both approaches, with low rates of anastomotic and overall morbidity. The ICA approach, irrespective of technique, is associated with low rates of postoperative gastrointestinal dysfunction and earlier postoperative recovery. Our work demonstrates largely equivalent clinical outcomes between the two approaches, echoing previous works in this area [13], and supports broader works supporting superior clinical outcomes observed with ICA overall [14].

This study employs an expertise-based approach to surgical technique, in which participating surgeons provide the intervention in which they have expertise alone, this helps to overcome issues with equipoise, systemic bias and the learning curve [15]. Handsewn ICA was associated with increased operating time and a shorter length of overall hospital stay compared with stapled ICA. The difference in the observed operating time is a reflection of the different technical requirements and abilities between the two approaches. Our study does not specifically measure the individual learning curve associated with either technique; however, is likely that the differences observed in operating time will converge as further expertise and experience are gained [16,17]. Furthermore, the shorter length of stay observed in the handsewn ICA group is reflective of the younger overall population with benign disease enrolled into this cohort, with a median age of 62 compared with 70 in the stapled ICA cohort ($p = 0.03$) and a higher proportion of patients with Crohn's disease (10% vs. 38%; $p < 0.001$).

The robotic platform has revolutionized minimally invasive right hemicolectomy and primary anastomosis by enabling the

TABLE 1 Baseline patient and clinical characteristics

Variable	Stapled ICA (*N* = 92), *n* (%)	Handsewn ICA (*N* = 52), *n* (%)	*p*-value
Gender			
Male	51 (55)	21 (40)	0.083
Female	41 (45)	31 (60)	
Age (years)[a]	70 (59–78)	62 (46–75)	0.03
ASA grade			
1	12 (15)	6 (11)	0.644
2	43 (54)	20 (38)	
3	23 (29)	7 (13)	
4	2 (3)	0 (0)	
Missing data	12 (13)	19 (36)	
BMI (kg/m^2)[a]	24.2 (22.5–26.7)	24.7 (21.5–27.1)	0.694
Indication			
Adenocarcinoma	83 (90)	32 (62)	<0.001
Crohn's disease	9 (10)	20 (38)	

Abbreviations:: ASA, American Society of Anesthesiologists; BMI, body mass index; ICA, intracorporeal anastomosis.

[a]Median (interquartile range).

TABLE 2 Operative and clinical outcomes

Variable	Stapled ICA (*N* = 92), *n* (%)	Handsewn ICA (*N* = 52), *n* (%)	*p*-value
Operating time (min)[a]	193 (150–234)	219 (186–280)	0.001
Blood loss (ml)[a]	0 (0–100)	50 (0–100)	0.269
Conversion rates	5 (5)	3 (6)	1.000
30-day postoperative morbidity	42 (46)	19 (37)	0.288
30-day postoperative mortality	1 (1)	0 (0.0)	1.000
Clavien–Dindo grade			
0	50 (54)	33 (64)	0.470
I–II	32 (35)	13 (25)	
III–V	10 (11)	6 (12)	
Anastomotic leak rate	3 (3.3)	2 (3.8)	1.000
Ileus/bowel obstruction	6 (6.5)	7 (13.5)	0.226
Length of hospital stay[a]	6 (5–10)	5 (5–7)	0.034

Abbreviation:: ICA, intracorporeal anastomosis.

[a]Median (interquartile range).

transition from ECA to ICA [18–20]; with a stapled ICA, robotic anastomosis is now considered to be the gold standard [13]. The ongoing development of robotic stapling technology enhances the utility and application of stapled ICA. The da Vinci® Xi EndoWrist Stapler 45 incorporates SmartClamp™ technology (Intuitive Surgical, Inc.), which provides objective feedback prior to firing, thus optimizing staple line formation. Furthermore, the robotic platform offers a number of marginal gains in terms of technical advantages over traditional laparoscopic surgery, including three-dimensional vision, articulating wristed instruments and lack of tremor, thus making it ideally suited for handsewn ICA. These key technical advancements enable the safe formation of ICA, with a low associated rate of anastomotic leak, irrespective of anastomotic technique. Our overall rate of anastomotic leak was 3.4%, with no observed differences between the stapled and handsewn groups ($p = 1.00$). This is supported by previous works, with Johnston et al. reporting an anastomotic leak rate of 0.9% following stapled robotic ICA [21] and Guadagni et al. reporting an anastomotic leak rate of 1.5% in handsewn robotic anastomosis [13]. The overall reported rates of anastomotic leak following robotic hemicolectomy are low, ranging from 0.9% to 3.1% [13,21–23]. In comparison, the reported anastomotic leak rates for open and laparoscopic right hemicolectomy are much higher, with the European Society of Coloproctology right hemicolectomy audit reporting anastomotic leak rates of 11.4% and 5.4%, respectively [2]. The technical advantages associated with the robotic platform

and the subsequent precision that is afforded in creating an anastomosis are likely to contribute to the overall low rates of anastomotic leak [24]. Reducing anastomotic leak in colorectal surgery has been identified as a key priority [25], with focus on a number of areas including standardization of anastomotic technique [26] and the use of indocyanine green enhanced fluorescence [27]. The robotic platform must be considered as a key technological advancement in reducing the anastomotic leak rate, given the uniformly low rates of anastomotic leak reported in the literature.

One of the key criticisms of robotic colorectal surgery centres on its lack of cost-effectiveness; however, there are now emerging data to the contrary [7,28]. Ferri et al. demonstrated the cost-effectiveness of robotic right hemicolectomy with a handsewn ICA compared with laparoscopic right hemicolectomy with a handsewn ECA. This group demonstrated that despite higher operative costs associated with the robotic platform, overall associated hospital costs were lower than with laparoscopic surgery. Furthermore, their cost–utility analysis demonstrated an increase in quality adjusted life years (QALYs) for patients undergoing robotic surgery (0.105 QALY per patient) [7]. Holzmacher et al. demonstrated the cost-effectiveness of the robotic stapler compared with a laparoscopic stapler when performing colorectal resections, with stapler costs of $473.28 and $631.45, respectively ($p = 0.001$) [29].

Our work contributes to the evolving landscape and utility of robotic surgery for colonic surgery and pushes the boundaries in achieving entirely intracorporeal robotic procedures whilst demonstrating good clinical outcomes.

The key strengths of our work include the reporting of standardized robotic techniques across a number of expert French centres, thus ensuring surgical quality assurance and reducing operator variability. Furthermore, the multicentre nature of our work ensures the overall generalizability of our findings. The key limitations of our work are its nonrandomized nature which may have led to selection bias that is reflected in the observed differences between the two population cohorts. Furthermore, the lack of cost-effectiveness data limits our findings given the equivalent clinical outcomes observed. It is likely that future cost-effectiveness data will help inform the superiority of one technique over the other.

ACKNOWLEDGEMENTS

We would like to acknowledge Intuitive Surgical, Inc., Sunnyvale, CA USA, and the support of the French Colorectal Robotic Research Group.

CONFLICT OF INTEREST

No conflict.

AUTHOR CONTRIBUTIONS

conception and design: Q. Denost, P. Rouanet, E. Cotte, A. Dubois; acquisition of datas: all. interpretation of data: Q. Denost, P. Rouanet, E. Cotte, A. Dubois, D. Harji; writing: D. Harji, Q. Denost; final approval :all author.

ETHICAL APPROVAL

CPP Authorization 24/05/2018. CNIL Reviews MR003

ORCID

Deena Harji https://orcid.org/0000-0002-8493-3312
Quentin Denost https://orcid.org/0000-0003-3088-5244

REFERENCES

1. Emile SH, Elfeki H, Shalaby M, Sakr A, Bassuni M, Christensen P, et al. Intracorporeal versus extracorporeal anastomosis in minimally invasive right colectomy: an updated systematic review and meta-analysis. Tech Coloproctol. 2019;23(11):1023–35.
2. 2015 European Society of Coloproctology Group. The relationship between method of anastomosis and anastomotic failure after right hemicolectomy and ileo-caecal resection: an international snapshot audit. Colorectal Dis. 2017. https://doi.org/10.1111/codi.13646
3. Jurowich C, Lichthardt S, Matthes N, Kastner C, Haubitz I, Prock A, et al. Effects of anastomotic technique on early postoperative outcome in open right-sided hemicolectomy. BJS Open. 2019;3(2):203–9.
4. Choy PY, Bissett IP, Docherty JG, Parry BR, Merrie A, Fitzgerald A. Stapled versus handsewn methods for ileocolic anastomoses. Cochrane Database Syst Rev. 2011(9):CD004320.
5. Nordholm-Carstensen A, Schnack Rasmussen M, Krarup PM. Increased leak rates following stapled versus handsewn ileocolic anastomosis in patients with right-sided colon cancer: a nationwide cohort study. Dis Colon Rectum. 2019;62(5):542–8.
6. Sheetz KH, Claflin J, Dimick JB. Trends in the adoption of robotic surgery for common surgical procedures. JAMA Netw Open. 2020;3(1):e1918911.
7. Ferri V, Quijano Y, Nuñez J, Caruso R, Duran H, Diaz E, et al. Robotic-assisted right colectomy versus laparoscopic approach: case-matched study and cost-effectiveness analysis. J Robot Surg. 2021;15(1):115–23.
8. Solaini L, Cavaliere D, Pecchini F, Perna F, Bazzocchi F, Avanzolini A, et al. Robotic versus laparoscopic right colectomy with intracorporeal anastomosis: a multicenter comparative analysis on short-term outcomes. Surg Endosc. 2019;33(6):1898–902.
9. Cleary RK, Kassir A, Johnson CS, Bastawrous AL, Soliman MK, Marx DS, et al. Intracorporeal versus extracorporeal anastomosis for minimally invasive right colectomy: a multi-center propensity score-matched comparison of outcomes. PLoS One. 2018;13(10):e0206277.
10. Widmar M, Aggarwal P, Keskin M, Strombom PD, Patil S, Smith JJ, et al. Intracorporeal anastomoses in minimally invasive right colectomies are associated with fewer incisional hernias and shorter length of stay. Dis Colon Rectum. 2020;63(5):685–92.
11. Liu D, Li J, He P, Tang C, Lei X, Jiang Q, et al. Short- and long-term outcomes of totally robotic versus robotic-assisted right hemicolectomy for colon cancer: a retrospective study. Medicine (Baltimore). 2019;98(13):e15028.
12. Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, et al. The Clavien–Dindo classification of surgical complications: five-year experience. Ann Surg. 2009;250(2):187–96.
13. Guadagni S, Palmeri M, Bianchini M, Gianardi D, Furbetta N, Minichilli F, et al. Ileo-colic intra-corporeal anastomosis during robotic right colectomy: a systematic literature review and meta-analysis of different techniques. Int J Colorectal Dis. 2021;36(6):1097–110.
14. Creavin B, Balasubramanian I, Common M, McCarrick C, El Masry S, Carton E, et al. Intracorporeal vs extracorporeal anastomosis following neoplastic right hemicolectomy resection: a systematic review and meta-analysis of randomized control trials. Int J Colorectal Dis. 2021;36(4):645–56.

15. Devereaux PJ, Bhandari M, Clarke M, Montori VM, Cook DJ, Yusuf S, et al. Need for expertise based randomised controlled trials. BMJ. 2005;330(7482):88.
16. Iwata T, Kobayashi Y, Maruyama Y, Kawada T, Sadahira T, Oiwa Y, et al. Comparison of intracorporeal versus extracorporeal urinary diversion after robot-assisted radical cystectomy at a medium-sized facility. Int J Clin Oncol. 2021;26(9):1714–21.
17. Parisi A, Scrucca L, Desiderio J, Gemini A, Guarino S, Ricci F, et al. Robotic right hemicolectomy: analysis of 108 consecutive procedures and multidimensional assessment of the learning curve. Surg Oncol. 2017;26(1):28–36.
18. Scotton G, Contardo T, Zerbinati A, Tosato SM, Orsini C, Morpurgo E. From laparoscopic right colectomy with extracorporeal anastomosis to robot-assisted intracorporeal anastomosis to totally robotic right colectomy for cancer: the evolution of robotic multiquadrant abdominal surgery. J Laparoendosc Adv Surg Tech A. 2018;28(10):1216–22.
19. Gerbaud F, Valverde A, Danoussou D, Goasguen N, Oberlin O, Lupinacci RM. Experience with transitioning from laparoscopic to robotic right colectomy. JSLS. 2019;23(4).
20. Reitz ACW, Lin E, Rosen SA. A single surgeon's experience transitioning to robotic-assisted right colectomy with intracorporeal anastomosis. Surg Endosc. 2018;32(8):3525–32.
21. Johnson CS, Kassir A, Marx DS, Soliman MK. Performance of da Vinci stapler during robotic-assisted right colectomy with intracorporeal anastomosis. J Robot Surg. 2019;13(1):115–9.
22. Milone M, Elmore U, Allaix ME, Bianchi PP, Biondi A, Boni L, et al. Fashioning enterotomy closure after totally laparoscopic ileocolic anastomosis for right colon cancer: a multicenter experience. Surg Endosc. 2020;34(2):557–63.
23. Miller PE, Dao H, Paluvoi N, Bailey M, Margolin D, Shah N, et al. Comparison of 30-day postoperative outcomes after laparoscopic vs robotic colectomy. J Am Coll Surg. 2016;223(2):369–73.
24. Marchegiani F, Huscher C. Comment on 'Predictors for anastomotic leak, postoperative complications, and mortality after right colectomy for cancer: results from an international snapshot audit'. Dis Colon Rectum. 2021;64(2):e40.
25. McDermott FD, Heeney A, Kelly ME, Steele RJ, Carlson GL, Winter DC. Systematic review of preoperative, intraoperative and postoperative risk factors for colorectal anastomotic leaks. Br J Surg. 2015;102(5):462–79.
26. ESCP EAGLE Safe Anastomosis Collaborative. ESCP Safe Anastomosis ProGramme in CoLorectal SurgEry (EAGLE): study protocol for an international cluster randomised trial of a quality improvement intervention to reduce anastomotic leak following right colectomy. Colorectal Dis. 2021;23(10):2761–71.
27. Santi C, Casali L, Franzini C, Rollo A, Violi V. Applications of indocyanine green-enhanced fluorescence in laparoscopic colorectal resections. Updates Surg. 2019;71(1):83–8.
28. Ahmadi N, Mor I, Warner R. Comparison of outcome and costs of robotic and laparoscopic right hemicolectomies. J Robot Surg. 2021. https://doi.org/10.1007/s11701-021-01246-z
29. Holzmacher JL, Luka S, Aziz M, Amdur RL, Agarwal S, Obias V. The use of robotic and laparoscopic surgical stapling devices during minimally invasive colon and rectal surgery: a comparison. J Laparoendosc Adv Surg Tech A. 2017;27(2):151–5.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Harji D, Rouanet P, Cotte E, Dubois A, Rullier E, Pezet D, et al. A multicentre, prospective cohort study of handsewn versus stapled intracorporeal anastomosis for robotic hemicolectomy. Colorectal Dis. 2022;24:862–867. https://doi.org/10.1111/codi.16096