

Comparison between Transverse Skin Crease and Vertical Midline Incision for The Resection of Right Sided Colonic Cancer

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Abstract

Background: Vertical midline incisions provide good access for right colon resection, but transverse skin crease incisions are increasingly favored for easier operation, reduced postoperative pain, faster recovery, and shorter hospital stays. The aim of this study is to compare the feasibility and short-term outcome of transverse skin crease incision and vertical midline incision for the resection of right sided colonic cancer.

Materials and methods: An observational study at CMCH and a private hospital in Chittagong compared transverse (Group A) and vertical midline (Group B) incisions in 66 right hemicolectomy patients. Pain (VAS) operation duration, recovery (Oral intake, bowel function, discharge) and oncological outcomes (Resection margins) were assessed on postoperative days 1, 8, and 30.

Results: Group A (Transverse incisions) had shorter operation times (120 vs. 140 minutes, $p < 0.001$) faster recovery, less pain (Days 1, 4-7) and shorter hospital stays (6 vs. 12 days, $p < 0.001$) compared to Group B, with no significant difference in complications or wound events ($p > 0.05$).

Conclusion: Transverse skin crease incisions reduce operative time, postoperative pain and hospital stays compared to vertical midline incisions, while maintaining comparable tumor clearance and safety, making them a viable and effective surgical approach for right-sided colonic cancer.

Key words: Right hemicolectomy; Right sided colonic cancer; Transverse skin crease incision; Vertical midline incision.

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Introduction

The cornerstone to the success of any surgical procedure lies in meticulous planning of the incision. The choice of incision for any abdominal surgery is based primarily on access to the surgical field. Secondary consideration is usually given to other factors, such as postoperative complications and its sequelae likely abdominal wall complications such as wound dehiscence and incisional hernias. The adverse effects of surgery to ensure optimal patient care must be minimized.¹

Colorectal Cancer (CRC) is the most common malignant disease of the gastrointestinal tract world widely. CRC is the second most common cancer in females and the third in males worldwide. It is estimated as second to third most common malignant disease with over one million new diagnoses and 500,000 deaths annually.²

Approximately 40% of all colorectal cancers are in the right hemicolon. In recent years, with the introduction of "Complete Mesocolic Excision" (CME) first described by Hohenberger, has dramatically changed the surgical procedure for colorectal cancer.³ At the same time, the laparoscopic technique for colorectal cancer has shown a marked growth in popularity.⁴ It is found that right-sided tumors have a worse prognosis comparing with left colon cancers and this association was reported particularly in Stage III carcinomas, although the reason of this outcome remains unclear.^{5,6}

Traditionally, vertical midline incisions are preferred for rapid intra-abdominal access and exploration, especially when the diagnosis is uncertain. However, evidence suggests transverse incisions for upper abdominal surgery reduce postoperative pain, wound complications, and pulmonary issues.¹ The preferred approach for right hemicolectomy remains debated, with laparoscopy offering no significant short-term benefits over transverse open surgery. Transverse

incisions, commonly used in bilio-pancreatic and upper abdominal surgeries, are less studied in colonic surgery.^{7,8} This study aims to compare transverse and vertical incisions, addressing the lack of consensus and evaluating their outcomes in colonic surgery, providing valuable insights for surgical practice.^{9,10}

The aim of the present study is to assess and evaluate short term surgical outcomes of transverse skin crease incision and vertical midline incision for right sided colon cancer surgery in a tertiary level hospital.

Materials and methods

It was an observational study took place at Department of Surgery, Chittagong Medical College Hospital (CMCH) Chattogram and Private Hospital (CSCR) in Chattogram, Bangladesh from June 2022 to May 2023. All patients with a diagnosis of right sided colonic cancer and planned for surgery in Department of Surgery of Chittagong Medical College Hospital and Private Hospital (CSCR) in Chattogram. Convenient sampling technique were used. The protocol was approved by the Ethical Review Committee, Chittagong Medical College Hospital, Chattogram, Bangladesh (Ethical ID: Memo no. CMC/PG/2022/864). It was performed on A sample size of 33 subjects per group or a Total 66 subjects were taken to test the hypothesis following selective inclusion & exclusion criteria.

Inclusion criteria

Patients admitted in Surgery ward of CMCH and Private Hospital of Chittagong (CSCR) with right sided colonic cancer

- Elective and curative procedures for right sided colonic cancer
- Age 18 years and above.

Exclusion criteria

- Patients with grossly disseminated carcinoma
- Tumor fixation to adjacent organs
- Patients with generalized peritoneal metastasis and recurrent tumour
- Patients with neurologic deficit or chronic pain syndrome or with regular use of immunosuppressant
- Unfit patients either for surgery or anesthesia due to bad general conditions or hematological disorders or liver cirrhosis or other comorbidities.

Patients diagnosed with right-sided colonic cancer and planned for elective surgery at Chittagong Medical College Hospital (CMCH) and selected private hospitals in Chittagong were assessed for eligibility. Eligible patients were allocated into two groups based on surgeon preference: Group A underwent transverse skin-crease incision and Group B underwent vertical midline incision. Informed written consent was obtained from all patients and their attendants after explanation of study objectives, procedures, risks, and benefits. Participants were informed of their right to withdraw at any stage.

Preoperative data included age, sex, general condition, relevant medical history (Hematological disorders, liver cirrhosis, immunosuppressant use, previous malignancy) comorbidities and presence of neurological deficits or chronic pain. Preoperative investigations included colonoscopy or barium enema and tumor staging using ultrasonography and/or computed tomography. All patients received standard bowel preparation and prophylactic antibiotics.

All operations were performed under general anesthesia in the supine position by an assistant professor of surgery or above. Abdominal access was obtained through either a vertical midline incision of appropriate length or a transverse skin-crease incision starting approximately 1 cm above the umbilicus and extending across the right abdomen. A standard oncological right or extended right hemicolectomy done involves en bloc resection of the diseased colon segment along with its mesocolon following oncological principles. High vascular ligation is performed at the origin of the ileocolic, right colic, and when necessary middle colic vessels to ensure complete lymphovascular clearance. Adequate lymphadenectomy is achieved by removing regional draining lymph nodes along the central vascular pedicle for accurate pathological staging and improved oncological outcomes. Restitution of bowel continuity was carried out in all patients by an ileo-colic anastomosis using linear stapler. Usually, a low vacuum drainage system was placed for peritoneal fluids collection. Vertical midline incision was closed in a single layer with a continuous no-1 prolene suture. The peritoneum, rectus sheath, rectus muscle and linea alba were included. Transverse incision was closed in two

layers, one including peritoneum and posterior rectus sheath, another including muscle and anterior rectus sheath. Skin was closed by skin staplers.

Postoperatively, patients received intravenous analgesia followed by oral analgesics as tolerated. Oral fluids and diet were introduced progressively. Patients were discharged when they were mobilizing independently, tolerating a full diet, had normal bowel function, pain score <4 on the Visual Analogue Scale (VAS) and no complications. Follow-up was conducted on postoperative days 1, 8 and 30.

Operative time, resection margins, time to oral intake, time to solid diet, hospital stay and postoperative pain were recorded. Pain was assessed daily for the first seven postoperative days using the VAS. Data were analyzed on an intention-to-treat basis using SPSS version 26, with $p < 0.05$ considered statistically significant.

Results

Table I Demographic characteristics of two study groups (n=66)

	Group A (n=33)	Group B (n=33)	p value
Age (Years)			
Mean $\pm$ SD	50.06 $\pm$ 16.73	47.14 $\pm$ 17.24	0.474 ^{ns}
Range (Min-max)	(15-86)	(15-85)	
BMI (Kg/m²)			
Mean $\pm$ SD	18.73 $\pm$ 1.957	19.08 $\pm$ 1.801	0.434 ^{ns}
Range (Min-max)	(16-24)	(16-23)	
Gender	n (%)	n (%)	
Male	18 (54.5%)	19 (56.8%)	0.853 ^{ns}
Female	15 (45.5%)	14 (43.2%)	

ns= not significant.

p value reached from Independent sample t-test and Chi-square test.

The mean ($\pm$ SD) age of the study patients were 50.06 $\pm$ 16.73 years in group A and 47.14 $\pm$ 17.24 years in group B. BMI shows, mean $\pm$ SD BMI was 18.73 $\pm$ 1.957 Kg/m² in group A and 19.08 $\pm$ 1.801 Kg/m² in group B. In both A and B group, there was male predominance. The difference was statistically not significant ($p > 0.05$) among the groups regarding age, BMI and gender.

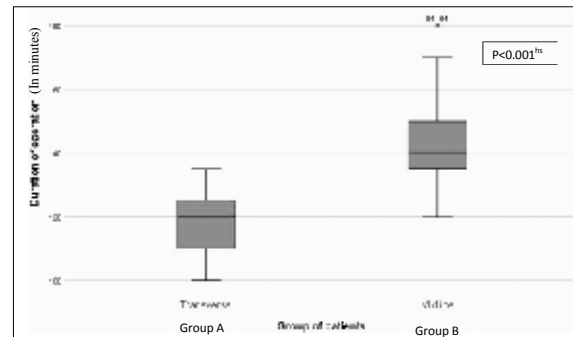


Figure 1 Duration of operation of the patients between the study groups (n=66)

Box plot shows the median (IQR) duration of operation (Minutes) of the patients between the treatment groups. Median (IQR) duration of operation was 120.0 $\pm$ 28 (110-125) minutes in group A and 140.3 $\pm$ 36.2 (135-150) minutes in group B. According to p value, statistically highly significant differences was found between the study groups ($p < 0.001$).

Table II Post-operative findings of the patients of two study groups (n=66)

Variables (Hours)	Group A (n=33)	Group B (n=33)	p value
NG removal time			
Mean $\pm$ SD	22.91 $\pm$ 3.609	37.73 $\pm$ 10.895	<0.001 ^{hs}
Range (min-max)	(16-36)	(24-72)	
Start oral feed			
Mean $\pm$ SD	23.03 $\pm$ 5.028	37.73 $\pm$ 10.895	<0.001 ^{hs}
Range (Min-max)	(16-36)	(24-72)	
Bowel sound audible			
Mean $\pm$ SD	22.58 $\pm$ 4.630	37.73 $\pm$ 10.895	<0.001 ^{hs}
Range (Min-max)	(16-36)	(24-72)	
First passage of flatus			
Mean $\pm$ SD	22.88 $\pm$ 4.400	33.08 $\pm$ 9.343	<0.001 ^{hs}
Range (Min-max)	(18-36)	(20-48)	
First passage of stool			
Mean $\pm$ SD	63.09 $\pm$ 9.180	92.00 $\pm$ 13.070	<0.001 ^{hs}
Range (Min-max)	(48-78)	(72-120)	

hs= highly significant.

p value reached from independent sample t-test test.

Table shows, the post-operative findings as mean ($\pm$ SD) time for NG removal, start oral feed, bowel sound audible, first passage of flatus, first passage of stool etc. of the both study groups. Less time was needed for every event in group A in comparison to group B. The difference was statistically highly significant ($p < 0.001$) among the groups.

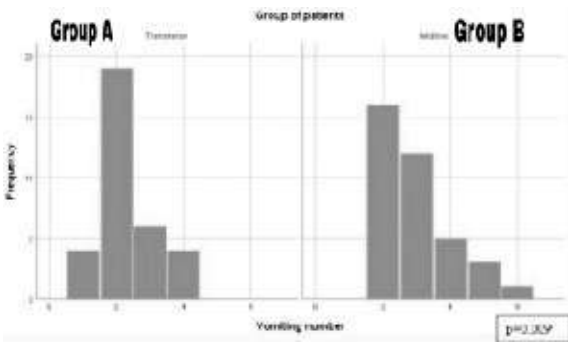


Figure 2 Postoperative Vomiting frequency between the study groups (n=66)

Histogram shows the frequency of postoperative vomiting of the patients between the treatment groups. Median (IQR) frequency of vomiting was 2 (2-3) in group A and 3 (2-3.5) in group B. According to p value, statistically significant differences between the study groups (p=0.009).

Table III Post-operative pain intensity by VAS at rest of two study groups (n=66)

POD	Group A (n=33)	Group B (n=33)	p value
1st POD			
Mean ±SD	6.88 ± 0.781	5.65 ± 0.716	<0.001 ^{hs}
Range (Min-max)	(5-8)	(4-7)	
2nd POD			
Mean ±SD	3.97 ± 1.334	4.11 ± 1.075	0.637 ^{ns}
Range (Min-max)	(2-6)	(3-6)	
3rd POD			
Mean ±SD	2.45 ± 0.833	2.73 ± 0.560	0.115 ^{ns}
Range (Min-max)	(1-5)	(2-4)	
4th POD			
Mean ±SD	0.79 ± 0.696	1.76 ± 0.683	<0.001 ^{hs}
Range (Min-max)	(0-2)	(1-3)	
5th POD			
Mean ±SD	0.00 ± 0.000	0.92 ± 0.682	<0.001 ^{hs}
Range (Min-max)	(0-0)	(0-3)	
6th POD			
Mean ±SD	0.00 ± 0.000	0.24 ± 0.495	0.005 ^s
Range (Min-max)	(0-0)	(0-2)	
7th POD			
Mean ±SD	0.00 ± 0.000	0.03 ± 0.164	0.324 ^{ns}
Range (Min-max)	(0-0)	(0-1)	

ns= not significant, s= significant, hs= highly significant.
p value reached from Independent sample t-test test.

Table shows, the post-operative mean (±SD) VAS score of the study patients at rest from 1st to 7th POD. On 1st POD, 4th POD, 5th POD and 6th POD, significantly less pain intensity was observed in group A than group B according to p value.

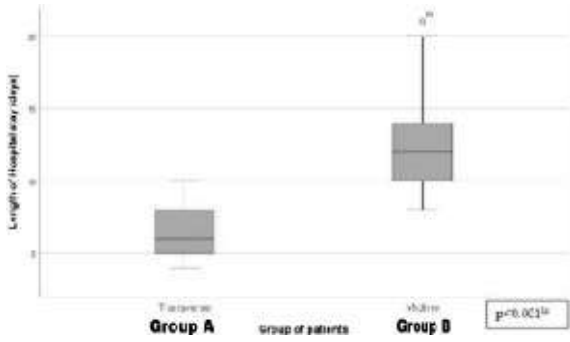


Figure 3 Length of hospital stay of the patient groups (n=66)

Box plot showing Median (IQR) length of hospital stay was 6 (5-8) days in group A and 12 (10-14) days in group B which was statistically highly significant (p<0.001).

Discussion

The right hemicolectomy can be performed using transverse or midline incision laparotomy, laparoscopic or robotic surgery. Compared to the midline laparotomy and laparoscopy, the transverse laparotomy has some advantages.¹¹

In this study, the mean (±SD) age of the study patients were 50.06 ± 16.73 years in group A and 47.14 ± 17.24 years in group B. The difference was statistically not significant (p>0.05) among the groups regarding age. A study showed that the mean ± SD age among the patients in transverse incision group was 71.4 ±11.9 years and in midline incision group was 67.9 ±13.7 years (p>0.05).¹² Another study stated that median (Range) age among the patients in transverse incision group was 73 (54–85) years and in midline incision group was 74 (47–83) years (p=0.90).¹⁰ Different study reported that the mean ± SD age among the patients in transverse incision group was 58.6 ±14.2 years and in midline incision group was 60.5 ±12.1 years (p=0.53).^{13,14}

Present study shows, in both A and B group, there was male predominance. Eighteen (54.5%) patients were in group A and 19 (56.8%) patients were in group B. The difference was statistically not significant (p>0.05) among the groups regarding gender. Some studies also showed, gender was not significantly different between the intervention and control groups.^{12,10,15,13}

BMI shows, mean $\pm$ SD BMI was 18.73 ± 1.957 kg/m² in group A and 19.08 ± 1.801 kg/m² in group B. The difference was statistically not significant ($p > 0.05$) among the groups regarding BMI. As high or low BMI is associated with per and post operative complications along with high morbidity, this study emphasized on patients BMI as a variable. Study described that mean $\pm$ SD BMI was 26.4 ± 3.2 kg/m² in transverse incision group and 25.5 ± 4.1 kg/m² in midline incision group ($p < 0.05$) in their study.¹² Another study found the median (Range) BMI was 25 (19–34) kg/m² in midline incision group and 24 (20–30) kg/m² in transverse incision group with a p value of 0.92.¹⁰

The box plot revealed a significantly shorter median operative time for Group A (Transverse incision) at 120 ± 28 minutes compared to Group B (Midline incision) at 140.3 ± 36.2 minutes ($p < 0.001$). This aligns with other studies which also reported shorter operative times for transverse incisions.^{10,12} The ease of mobilizing the right colon, including the hepatic flexure, and smaller incision size in transverse approaches likely contributed to faster wound approximation and reduced operative time without prolonging resection or anastomosis. These findings underscore the efficiency of transverse incisions, supporting their use as a quicker and equally effective alternative to midline incisions in right-sided colon cancer surgery.

Table III demonstrates comparable peri-operative and post-operative complication rates between the two groups. Per-operative complications occurred in 5 (15.2%) patients in Group A and 7 (16.9%) in Group B, while post-operative complications were seen in 3 (9.1%) and 8 (21.6%) patients, respectively, with no statistically significant difference ($p > 0.05$). However, postoperative recovery was significantly faster in Group A, with earlier nasogastric tube removal, oral feeding, return of bowel sounds, first flatus, and stool passage ($p < 0.001$). Group A also experienced fewer vomiting episodes. Transverse incisions likely reduced pain and opioid requirement, contributing to faster recovery and fewer side effects.¹⁶

This study found significantly lower post-operative pain in Group A (Transverse incision)

compared to Group B (Vertical incision) at rest and during activity, likely due to reduced nerve injury, preserved muscle integrity and lower wound tension. While a study noted no difference in pain at rest, Group B reported more pain (On VAS score) during activity on days 1–4.^{16,17} Wound complications (Hematoma/seroma: 12.1% vs. 16.2%, surgical site infection: 18.2% vs. 29.7%) were slightly higher in Group B but not statistically significant ($p > 0.05$). Transverse incisions offer advantages in reducing post-operative pain, particularly during movement.

The study found transverse incisions (Group A) resulted in significantly shorter hospital stays (6 vs. 12 days, $p < 0.001$) and lower 30-day morbidity rates (13% vs. 50%, $p = 0.04$) compared to midline incisions (Group B). Reduced pain and faster recovery likely contributed to the shorter stays, benefiting patients and healthcare systems by lowering costs and freeing beds.¹⁸ Consistent with previous studies, transverse incisions also reduced operative time and postoperative pain. The authors recommend incorporating transverse incisions into fast-track colonic surgery protocols.^{20,19} Compared to midline incisions, transverse incisions are safe, efficient and effective for right-sided colon cancer, offering superior recovery and patient-centered outcomes.^{13,21}

Limitations

- It is a non-randomized study, in which selected bias could occur.
- The expertise of the surgeons who made the different incision was not identical.

Conclusion

The transverse skin crease technique is a safe, effective and aesthetically favorable approach for right-sided colon cancer surgery. It reduces operative time, minimizes postoperative pain and shortens hospital stays compared to vertical midline incisions, offering comparable or superior outcomes while prioritizing patient-centered benefits and technical feasibility.

Recommendations

- Prospective randomized controlled trials, especially with long-term follow up, are required
- Require multicenter studies throughout the country.
- Large sample size is needed.

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Contribution of authors

SAU-Conception, design, gathering of data, data interpretation & final approval.

SB- Interpretation of the data, critical revision & final approval.

KFA-Data analysis, drafting & final approval.

TN-Critical revision, data interpretation & final approval.

RK-Data interpretation, analysis, critical revision & final approval.

KAH- Analysis, drafting & final approval.

MRK -Analysis, critical revision & final approval.

Disclosure

All the authors declared no conflict of interest.

References

- Ishida H, Sobajima J, Yokoyama M, Nakada H, Okada N, Kumamoto K, Ishibashi K et al. Comparison Between Transverse Mini-Incision and Longitudinal Mini-Incision for the Resection of Locally Advanced Colonic Cancer. *Int Surg*. 2014;99:216–222.
- Siegel R L, Miller K D, Fedewa S A, Ahnen D J, Meester R G S, Barzi A et al. Colorectal cancer statistics, 2017. *CA Cancer J Clin*. 2017;67(3):177–193.
- Hohenberger W, Weber K, Matzel K, Papadopoulos T, Merkel. Standardized surgery for colonic cancer, Complete mesocolic excision and central ligation-technical notes and outcome. *Colorectal Dis*. 2009.
- Jurowich C, Lichthardt S, Kastner C, Haubitz I, Prock A, Filser J, Germer C T, Wiegering A. Laparoscopic versus open right hemicolectomy in colon carcinoma: A propensity score analysis of [the DGAV StuDoQ]ColonCancer registry. *PLoS ONE*. 2019;14: e0218829.
- Meguid R A, Slidell M B, Wolfgang C L et al. Is there a difference in survival between right- versus left-sided colon cancers? *Ann Surg Oncol*. 2008;15:2388–2394.
- Ishida H, Ishiguro T, Ishibashi K, Ohsawa T, Okada N, Kumamoto K et al. Curative resection of transverse colon cancer via minilaparotomy. *Int Surg*. 2011;96(1):6–12.
- Ishida H, Ishiguro T, Ishibashi K, Ohsawa T, Kuwabara K, Okada N et al. Impact of prior abdominal surgery on curative resection of colon cancer via minilaparotomy. *Surg Today*. 2011;41(3): 369–376.
- Theodosopoulos T, Yiallourou A I, Dafnios N, Polymeneas G, Papaconstantinou I, Staikou C et al. Right Kocher's incision: A feasible and effective incision for right hemicolectomy: A retrospective study. *World J Surg Oncol*. 2012;10:101.
- Feo C F, Paliogiannis P, Fancellu A, Zinellu A, Ginesu G C, Feo C V, Porcu A. Laparoscopic versus Open Transverse-Incision Approach for Right Hemicolectomy: A Systematic Review and Meta-Analysis. *Medicina*. 2021;57:80.
- Tanis E, van Geloven A A, Bemelman W A and Wind J. A comparison of short- term outcome after laparoscopic, transverse, and midline right-sided colectomy. *International journal of colorectal disease*. 2012;27(6):797–802.
<https://doi.org/10.1007/s00384-011-1404-4>
- Santoro A, Boselli C, Renzi C, Gubbiotti F, Grassi V, Di Rocco G, Cirocchi R and Redler A. Transverse skin crease versus vertical midline incision versus laparoscopy for right hemicolectomy: A systematic review--current status of right hemicolectomy. *BioMed Int'l*. 2014;643685.
<https://doi.org/10.1155/2014/643685>.
- Lorenzon L, Montebelli F, Mercantini P, Sebastiani S, Ziparo V, and Ferri M. Right Colectomy for Cancer: A Matched Comparison of Three Different Surgical Approaches. *Journal of investigative surgery: The official journal of the Academy of Surgical Research*. 2016;29(6):405–412.
<https://doi.org/10.1080/08941939.2016.1183735>.
- Seiler C M, Deckert A, Diener M K, Knaebel H P, Weigand M A, Victor N and Büchler M W. Midline versus transverse incision in major abdominal surgery: A randomized, double-blind equivalence trial (POVATI: ISRCTN60734227). *Annals of surgery*. 2009;249(6): 913–920.
<https://doi.org/10.1097/SLA.0b013e3181a77c92>.
- Donati D, Brown S R, Ballan K, Seow-Choen F, Eu K W, Ho Y H. Comparison between midline incision and limited right skin crease incision for right-sided colonic cancers. *Tech Coloproctol*. 2002;6: 1–4.
- Lohsiriwat V, Lohsiriwat D, Boonnuch W, Chinswangwatanakul V, Akaraviputh T, Methasade A et al. Comparison between midline and right transverse incision in right hemicolectomy for right-sided colon cancer: a retrospective study. *J Med Assoc Thai*. 2009;92(8): 1003–1008.
- Lindgren P G, Nordgren S R, Oresland T, Hulten L. Midline or transverse abdominal incision for right-sided colon cancer : A randomized trial. *Colorectal Dis*. 2001;3(1):46–50.

17. Couper M P, Tourangeau R, Conrad F G & Singer E. Evaluating the Effectiveness of Visual Analog Scales: A Web Experiment. *Social Science Computer Review*. 2006;24(2):227-245.
<https://doi.org/10.1177/0894439305281503>.
18. Grantcharov T P and Rosenberg J. Vertical compared with transverse incisions in abdominal surgery. *Eur J Surg*. 2001;167: 260–267.
19. Ishida H, Ishiguro T, Ohsawa T, Okada N, Yokoyama M, Kumamoto K et al. Curative colectomy via minilaparotomy approach without utilizing specific instruments. *Tech Coloproctol*. 2010;14(2):153–159.
20. Basse L, Thorbol J E, Lossl K, Kehlet H. Colonic surgery with accelerated rehabilitation or conventional care. *Dis Colon Rectum*. 2004;47(3):271–277.
21. Lohsiriwat V, Lohsiriwat D, Chinswangwatanakul V, Akaraviputh T, Comparison of short-term outcomes between laparoscopically-assisted vs. transverse-incision open right hemicolectomy for right-sided colon cancer: A retrospective study. *World J Surg Oncol*. 2007; 5:49.