Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 03, 2024

Prospective Study of Role of Multimodal Perioperative Management Protocol in Colorectal Cancer Surgery

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ABSTRACT

Introduction: Patients undergoing colorectal surgery often face prolonged hospital stays and increased complication rates. This study aimed to evaluate the effectiveness of a multimodal perioperative management protocol in reducing hospital stay, complications, 30-day readmission rates, and mortality in patients undergoing elective colorectal cancer surgery.

Methods: This prospective randomized controlled trial included 30 patients admitted for surgery after confirmed diagnosis and randomized into multimodal (n=14) and control (n=16) groups. The multimodal group received specialized perioperative care, while the control group received standard care. Statistical analyses employed unpaired t-tests at a confidence interval of 95% ($p<0.05$).

Results: The multimodal group exhibited significant improvements in various postoperative parameters compared to the control group. Notably, there were reduced durations for post-op mobilization (1.0 vs. 1.68 days, p=0.003), bowel sounds (1.92 vs. 2.64 days, p=0.001), and oral feeding tolerance (2.21 vs. 3.06 days, p=0.021). Hospital stay was notably reduced in the multimodal group (6.64 days) compared to the control group (8.25 days, p=0.002). Additionally, complications were significantly lower in the multimodal group (13.40%) compared to the control group (20.31%, p=0.019), as were 30-day readmission rates (14.28% vs. 25%, p=0.029). Mortality rates were also reduced in the multimodal group (7.14%) compared to the control group (12.5%).

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Conclusion: Implementation of a multimodal perioperative management protocol significantly reduced hospital stays, complications, readmission rates, and mortality in patients undergoing colorectal cancer surgery compared to standard care.

Key Word- Colorectal cancer, perioperative, multimodal, ERAS, Colorectal surgery

INTRODUCTION

Patients undergoing colorectal surgery, where resection of bowel is involved, can have a complication rate of between 15% and 20% [1–3]. Such complications can prolong postoperative hospital stay by 6 to 10 days [4]. The financial burden imposed on health care systems due to prolonged hospital stay after colorectal surgery can be significant. In an effort to reduce the length of hospital stay after colorectal surgery, Kehlet et al. [5] were the first to describe in detail a specific protocol called “fast-track” or “enhanced recovery after surgery” protocol which had the potential to reduce hospital stay to a mean of 4 days. Many protocols have been put forward by hospital groups which consist of varying individual preoperative, intraoperative, and postoperative fast-track elements such as preoperative counselling and feeding, no bowel preparation, perioperative high oxygen concentrations, active prevention of hypothermia, no routine use of nasogastric tubes and drains [6–14]. Wind et al. [15] conducted a metanalysis of six studies (three RCTs and three CCTs) with a total of 512 patients which showed a reduction in primary hospital stay and morbidity for patients in fast-track programs after elective colorectal surgery. However, in 2000, Basse and Kehlet described a clinical pathway to accelerate recovery after colonic resection which dramatically cut down length of stay. Their study described a median stay of 2 days with a readmission rate of 15% [16-17]. The aim of our study is to attenuate the surgical stress response, accelerate recovery, decrease complications, minimize hospital stay, readmission rat e and mortality.

PATIENT AND METHODOLOGY

This was a prospective randomized controlled study. Patients who were undergoing elective colorectal cancer surgery in our hospital over the course of one year were included as subjects of the study. Sample size was calculated to be 30 in both multimodal and control groups. The study was powered 80% ($\alpha = 0.05$, $\beta = 0.80$) to assuming the difference in mean duration of nasogastric tube removal and early feeding to be 1.1 days and SD = 1 in multimodal and control group.

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Randomization of patients was done by Simple block randomization method. Continuous data was analysed by unpaired t-test in multimodal and control group. Continuous data was expressed in the form of proportion or percentage. Continuous data was expressed in mean ± SD. The trend of continuous data was kept at 95% confidence interval (p value=<0.05).

This prospective randomized controlled trial enrolled patients undergoing elective colorectal cancer surgery at our institution. Patients meeting inclusion criteria were randomized into multimodal and control groups using the Simple block method. The multimodal group received specialized perioperative care, including intravenous fluid restriction, prokinetic agents for oral intake, early ambulation, nasogastric tube removal, enteral feeding, and preoperative antibiotic prophylaxis. The control group received standard care. Statistical analyses employed unpaired t-tests at a confidence interval of 95% ($p<0.05$) to compare outcomes between the two groups.

OBSERVATION AND RESULTS

1. Post operative parameters distribution in study groups. (Table 1)

SNo.	Post op parameters	Multimodal group(n=14) Mean(2SD) days	Control group (n=16) Mean(2SD) days	P value
1	NG removal	1.35(1.99)	2.06(1.54)	0.038
2	Post op mobilization	1.0(0.78)	1.68(1.40)	0.003
3	Bowel sounds	1.92(0.95)	2.64(1.20)	0.001
4	Flatus	2.42(1.02)	3.31(1.40)	0.001
5	Motion	2.78(1.78)	4.0(2.42)	0.004
6	Oral feeding	2.21(1.73)	3.06(2.07)	0.021
7	Normal /solid diet	3.85(1.32)	4.81(2.09)	0.007
8	Urine catheterization	2.71(1.22)	3.37(2.05)	0.044
9	Fluid restriction	2.42(1.09)	3.65(1.07)	0.001
10	Hospital stay	6.64(1.68)	8.25(3.04)	0.002

**NG-nasogastric tube,op-operative,n=number of patientss,SD=standard deviation,SNo.-serial number*

(Table 1)

2. Postoperative complications distribution in study groups (Table 1)

S No.	complications	Multimodal group (n=14)						Control group(n=16)						P value
		AR n=4		APR n=4		Hemi colectomy n=6		AR n=4		APR n=6		Hemi colectomy n=6		
		n	%	n	%	n	%	n	%	n	%	n	%	
1	Wound infection	1	25	1	25	1	16.67	1	25	2	33.33	2	33.33	0.019
2	Anastomotic leak	1	25	0	0	0	0	1	25	0	0	1	16.67	
3	Urinary /sexual dysfunction	0	0	2	50	0	0	1	25	3	50	0	0	

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4	Stoma complication	0	0	1	25	0	0	0	0	2	33.33	0	0	
5	Chest infection	1	25	0	0	1	16.67	2	50	1	16.67	1	16.67	
6	Cardiac	1	25	1	25	0	0	2	50	1	16.67	0	0	
7	PONV	1	25	0	0	2	33.33	2	50	1	16.67	1	16.67	
8	Mortality	1	25	0	0	0	0	1	25	0	0	1	16.67	

**PONV-post operative nausea and vomiting, AR-anterior resection, APR-abdominal perineal resection, %-percentages*

(Table 1)

3. Comparison of multimodal perioperative protocol in various Randomized control studies (Table 3)

Study	**Preoperative counselling**	**Bowel preparation**	**Preoperative Feeding**	**Fluid restriction**	**Minimal invasive incision**	**NG removal**	**No use of drain**	**Post operative mobilization**	**Post operative feeding**	**urine catheter**	**Systemic use of morphine**	**Antibiotic prophylaxis**
Anderson ADG et al (2003)	+	_	+	_	+	+	+	+	+	_	_	+
Delney CP et al(2003)	+	+	_	+	_	+	_	+	+	+	+	_
Gatt M et al(2005)	+	_	+	_	+	+	+	+	+	_	_	+
KhooCK et al(2007)	+	+	_	_	_	+	_	+	+	_	_	_
Present study	+	+	+	+	+	+	_	+	+	+	_	+

(Table 3)

4. Comparision of results of various Randomized control studies (Table 4)

Study	Year	Design	No. of patients (n)		Hospital stay(days) Mean(2SD)		Mortality %		Readmission %	
			MG (n)	CG (n)	MG	CG	MG	CG	MG	CG
Anderson ADG[6]	2003	RCT	14	11	4 (1.8)	7(2.1)	0	9	0	0
Delney CP[8]	2003	RCT	31	33	5.4 (2.5)	7.1 (4.8)	-	-	10	18

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Gatt M[10]	2005	RCT	19	20	6.6 (4.4)	9 (4.6)	5	0	5	20
Khoo CK[13]	2007	RCT	35	35	5 (8.5)	7 (14.35)	0	6	9	3
Present	2017	RCT	14	16	6.64 (1.68)	8.25 (3.04)	7.14	12.5	14.28	25

**MG-multimodal group, CG-control group, RCT-randomized control trial*

(Table 4)

CONCLUSION

In our study mean duration of bowel sounds (1.92+/-0.95 vs.2.64+/-1.20), motion (2.78+/-1.78 vs.4.0+/-2.42) and tolerance to normal diet (3.85+/-1.32 vs.4.81+/-2.09) days found significantly in multimodal and control group respectively which is concordance with Arenal JJ et al [1] concluded bowel movements (1.7±0.89 vs. 3.27±1.3), defecation (3.4±0.77 vs. 4.38±1.18) and time of tolerance of solid diet (2.48±0.85 vs. 4.77±1.81). Mean duration of nasogastric removal (1.35+/-1.99 vs.2.06+/-1.54),flatus (2.42+/-1.02 vs.3.31+/-1.40) days observed significantly in study groups which is comparable with Reissman et al [24] concluded the early and regularfeeding groups in the rate of vomiting (21% vs. 14%), nasogastric tube reinsertion (11% vs. 10%), length of ileus (3.8 +/- 0.1 days vs. 4.1 +/- 0.1 days), early feeding (2.21+/-1.73 vs. 3.06+/-2.07) days which resemable with Anderson et al [6]. concluded that patients in the optimization group tolerated a regular hospital diet significantly earlier than controls (48 versus 76 h; P < 0.001). Hospital stay noticed (6.64+/-1.68 vs.8.25+/-3.04) days which show concordance with Anderson ADG et al [6] concluded (4+/-1.8 vs 7+/-2.1d, P = 0.002) Delaney CP et al [8] (5.4 vs. 7.1 days; P = 0.02) Gatt M et al, [10] (6.6 +/-4.4 vs 9 +/-4.6d, P = 0.027) Khoo CK et al,[13] (5 vs. 7 days; P < 0.001) Yang et al, [18] (6.0 ± 1.0 vs 11.7 ± 3.8 d, P < 0.001) maximum hospitalization found in Khoo CK et al [13] and minimum in Anderson ADG et al [6]. Mean duration of catheterization (2.71+/-1.22 vs.3.37+/-2.05) which concordance with Gatt M et al [10] who concluded that duration of catheterization (P = 0.022) significant. Mean intravenous fluid restriction (2.42+/-1.22 vs.3.37+/-2.05) litres comparable with. Mackay et al [21] concluded that the median total intravenous fluid intake in the restricted group was 4.50 (4.00-5.62) litres compared with 8.75 (8.00-9.80) litres in the standard group (P < 0.001) overall

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complication in our study (13.40% vs.20.31% p=.0019) in multimodal and control group respectively which show concordance with Brandstrup et al [22] concluded that The restricted intravenous fluid regimen significantly reduced postoperative complications both by intention-to-treat (33% versus 51%, P = 0.013) and per-protocol (30% versus 56%, P = 0.003) analyses. The numbers of both cardiopulmonary (7% versus 24%, P = 0.007) and tissue-healing complications (16% versus 31%, P = 0.04) were significantly reduced. Noblett et al [26] concluded that major postoperative complications (2 versus 15 per cent; P = 0·043).

In our series readmission rate is calculated (14.28 vs 25% p =0.029) which comparable with Christensen et al [20] concluded the readmission rate was 15% in the fast-track group and 16% with the control patients. Gustafsson et al [23] concluded readmissions was significantly reduced with increasing adherence to the ERAS protocol (>90%) compared with low ERAS adherence (<50%). In our study mortality recorded 7.5% in multimodal and 12.5% in control group significantly which is concordance with Anderson ADG et al,[6] (0% vs9%), Gatt M et al,[10] (5% vs 0%), Khoo CK et al,[13] (0% vs 6%) respectively.

Conclusion

Enhanced recovery programs is shown to be effective in reducing overall hospital stay and readmission without compromising patient safety or increasing morbidity. There is good evidence that multimodal management protocol form the mainstay of elective colorectal surgery.

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