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Original Research Article

Effect of body mass index and obesity on lymph node harvest in colorectal cancer resections

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ABSTRACT

Background: Body mass is generally perceived by surgeons as a factor increasing technical difficulty in most surgical procedures. This is a retrospective observational study on colorectal cancer resections considering obesity, to see how patient body mass index (BMI) affects lymph node harvest in colorectal cancer.
Methods: This was a retrospective observational study between October 2021 and November 2023 at a district general hospital in England. Ethical approval was not sought as this was an observational anonymised study without any patient identifiable information. Data was collected consecutively from MDT lists and grouped by procedure and subgroups with BMI and node harvest was checked in each subgroup and group.
Results: We had 171 patients and a statistically significant effect on node harvest was only seen in abdominoperineal resections with BMI over 30
Conclusions: Obesity did not influence lymph node harvest in colorectal resections other than in abdominoperineal resections in BMI over 30.

Keywords: Laparoscopic, Colorectal, BMI, Obesity, Lymph nodes, Cancer

INTRODUCTION

Surgery in obese patients have been seen to raise intraoperative complications and surgical difficulty.[1-3] In laparoscopic colorectal resections, the recommendation is to harvest at least 12 nodes, especially in colonic cancers.[4,5] Increased node harvest improves staging and may prevent inaccurate treatment based on inaccurate staging. Preoperative treatment in rectal cancers may affect the number of nodes harvested and examined. Improved pathological examination techniques have improved mean number of nodes examined.[1] Other studies have not seen any effect on lymph node harvest.[7] We did not restrict this study to laparoscopic resections. Higher node ratios were also a significant predictor of survival in one study.[8]

Obesity has been one of the factors decreasing lymph node retrieval in rectal cancer resections.[9] With the stress on increased number of nodes harvested, examined and reported, this study attempts to look at how BMI affects the number of nodes harvested in laparoscopic colorectal cancer resections in a single unit in a DGH.

METHODS

This was a retrospective observational study between October 2022 and November 2023 at Dr Grays Hospital and Aberdeen Royal Infirmary, NHS Grampian. We collected patient demographics from the colorectal MDT list and reviewed the data for age, procedure, node harvest and BMI for different procedures for colorectal cancer, with patient demography. Patients were divided

into specific procedures and BMI range. The procedures taken into consideration for comparison of node harvest are anterior resection, right hemicolectomy, left hemicolectomy, abdominoperineal resection and Hartmann's operation.

The BMI groups were 18.5 to 25. 25-30 and greater than 30. The WHO definition for obesity was taken into consideration for classification and allocation to groups.[10] BMI greater than 30 were noted as obese and below 30 as non-obese.

Ethical approval was not sought as it was an observational study.

Inclusion criteria

Live patients between 18-90 years, colorectal cancer patients and open or laparoscopic resections, including converted procedures were included in the study.

Exclusion criteria

Patients outside age range, recurrent cancer and anal cancer were exclude from the study.

Statistical analysis

Statistical analysis consisted of Student's t test and chi-square analysis where appropriate, with significance set at $p<0.05$.

RESULTS

Demographics

We had a total of 171 patients, of which there were 78 females and 93 males (Table 1).

The mean age was 66 (range 41-95). The mean BMI was 27 (range 18-44), mean lymph nodes 12 (5-43) and most patients were ASA 2/3 with 2 patients ASA 4.

Table 1: Demographics.

Variables	N
Total patients	171
Gender	
Male	93
Female	78
Median age (in years)	66
Range	41-93
Median BMI (kg/m^2)	27
Range	16-44

Table 2: Procedures.

Procedures	N
Anterior resection	80
AP resection	14
Hartmanns	6
Left hemicolectomy	3
Open right hemicolectomy	2
Pan proctocolectomy	1
Right hemicolectomy	64

Table 3: Mean nodes by procedure.

Procedure	N	Mean BMI	Mean node harvest
Anterior resection	80	26.5	18
AP resection	14	28	15.3
Hartmanns	6	30	18.3
Left hemicolectomy	3		
Right hemicolectomy	64	27	18.7
Panproctocolectomy	1		

Table 4: Normal BMI as reference.

Procedure	N	BMI	Mean nodes	T test	Mean nodes +ve	T test
AR, (80)	6	BMI 18-25	17	Reference	4.81	Reference
	1	BMI<18.5	24	Insufficient data	0	Insufficient data
	63	BMI>25	14.55	0.244891	0.98	0.08492339
RH, (64)	19	BMI 18-25	20.31	Reference	2.894737	REF
	2	BMI<18.5	27	0.6975408	0	0.00152
	43	BMI>25	17.95349	0.341678	1.744186	0.22253
LH (0)	0	BMI 18-25	NA	Reference	NA	Reference
		BMI<18.5	NA	Insufficient data	NA	Insufficient data
		BMI>25	13	Insufficient data	1	Insufficient data
APR, (14)	3	BMI 18-25	11	Reference	0	Reference
	1	BMI<18.5	20	Insufficient data	0	
	10	BMI>25	12.4	Insufficient data	1.7	0.28140
H, (6)	3	BMI 18-25	23.6667	Reference	4.66667	Reference
	0	BMI<18.5		Insufficient data		Insufficient data
	3	BMI>25	22	0.8957944	11.33333	0.5546425

Tabel 5: Non-obese BMI vs obese BMI.

Procedure	Mean nodes taken	T test	Mean nodes	T test	Mean nodes	T test
AR, (80)	55	BMI<30	15.76364	Reference	1.872727	Reference
	25	BMI>Or=30	13.84	0.3513517	1.44	0.6444541
RH, (64)	47	BMI<30	18.8051	Reference	2.297872	Reference
	17	BMI>Or=30	19.29412	0.814567	1.294118	0.3334962
LH, (4)	3	BMI<30	13.6667	Reference	0	Reference
	1	BMI>Or=30			4	Insufficient data
APR, (14)	12	BMI<30	13.3333	Reference	1.416667	Reference
	2	BMI>Or=30	8.5	0.03789941	0	0.2774631
H, (6)	3	BMI<30	23.66667	Reference	4.66667	Reference
	3	BMI>Or=30	22	0.2707749	11.33333	0.5546245

DISCUSSION

Optimum lymph node harvest is vital to accurate staging and making decisions regarding treatment and for communication with patients. Adjuvant treatments which decisions are led by oncological data and therefore it is vital that variables affecting node harvest are examined. Higher numbers of nodes examined may lead to stage migration. Whilst guidelines quote 12 nodes, there are variable views.[11]

Obesity has been an indicator of technical difficulty in laparoscopic or open surgery. Challenges may be preoperative, intraoperative or post operative and out of the intraoperative problems the anatomic problems could be a variable in lymph node harvest.[12] Anatomic problems such as abdominal wall thickness, heavy omentum/ mesentery as well as thicker vascular pedicles could be a challenge in obese patients. Right-sided resections, high surgeon volume, and examination of gross specimens by a staff pathologist were associated with improved node harvest.[13] Fung et al found that obesity posed an increased technical challenge during laparoscopic colorectal resections.[14] Due to this, performing laparoscopic resections on obese patients may increase technical difficulty, cause bleeding or make pelvic dissections difficult.[15,16]

While Linebarger et al and others found no evidence of the effect of obesity on lymph mode harvest, others found that it adversely affected node harvest.[17-23] Haboubi et al found that, while obesity did not affect lymph node harvest and that this should not be used as the sole indicator of good surgery.[24] Within reasonable limits, our experience has shown that obese patients are more difficult to manage during surgery due to dissection and bleeding, as well as perioperatively.

Our observation was from a single hospital, under a single consultant surgeon with the same technique of laparoscopic colorectal resection for cancer for each operation. In this study, we were keen to analyse if our experience was reflecting work by others. This was about colorectal resections alone whether laparoscopic or open.

Obesity has also been shown to either reduce node harvest in rectal cancer resections, or not affect results.[25-27] Preoperative treatment in rectal cancers like chemoradiotherapy or long course radiotherapy can also reduce harvest number of nodes.

In this study, right hemicolectomy and anterior resections were seen to have the highest number of lymph nodes harvested and obesity did not affect it in both these groups. A statistically significant effect on lymph node harvest was only seen in abdominoperineal resections in patients with BMI>30. We have not looked at operative notes, which may have given us some evidence about technical difficulty in terms of bleeding, decreased space in low rectal resections or tumour size issues during resections. We have also not speculated on learning curves as this was an experienced colorectal surgeon performing these resections.

The study was not looked at any subgroup analysis as to whether factors such as comorbidities, smoking or diabetes affected these results. Suwa et al did not find a significant difference in laparoscopic and robotic resections in obese patients.[28] A further RCT or systematic review may be needed to test the results in high-risk groups like obesity and in male patients with android pelvis.

CONCLUSION

The study was not found that obesity affected lymph node harvest numbers in obese patients, except in those having abdominoperineal resections with BMI over 30.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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