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ORIGINAL ARTICLE

Evaluation of Mesenteric Lymph Nodes Affection in Right Colon Cancer during D3 Right Hemicolectomy

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Abstract

Background: ***Globally, colorectal cancer (CRC) ranks third in terms of cancer-related mortality for both sexes. More than 5.25 million persons globally (5-year prevalence) have colorectal cancer (CRC), which is marginally less common than breast cancer (7.79 million cancer cases).***

Aim: ***To evaluate the sublocations (subgroups) according to different right cancer colon sites to justify the D3 right hemicolectomy according to different tumor locations.***

Patients and methods: ***Between December 2021 and December 2023, a descriptive prospective study was carried out at the Surgical Oncology Department of Bab El-shaarya University Hospital, Al-Azhar University. Twenty patients, female and eleven males, met the criteria for right colon cancer and underwent treatment with D3 right hemicolectomy, as well as D3 extended right hemicolectomy to examine the distribution of lymph nodes in the mesocolon.***

Results: ***Our study's most common tumor position is cecum, followed by hepatic flexure. The higher the grade, the higher the incidence of mesenteric LN involvement. The higher the preoperative radiological stage, the higher the incidence of mesenteric LN involvement.***

Conclusion: ***The percentage of positive lymph nodes and the stage of the tumor are strongly correlated; of the 13 patients with a grade 2 diagnosis, 2 had positive lymph nodes (22.2 % of positive patients), and all seven patients with a grade 3 diagnosis (77.8% of positive patients) had positive lymph nodes with a high significant P-Value. Under the fascia overlying SMV and SMA, none of our patients had positive central LNs.***

Keywords: Mesenteric Lymph Nodes; Right Colon Cancer; D3 Right Hemicolectomy

1. Introduction

In recent years, the prevalence of colorectal cancer (CRC) has increased alarmingly at a global rate. In 2020, there will likely be 1.93 million new cases of colorectal cancer diagnosed globally and 0.94 million deaths from the disease. These figures represent 10% of the overall cancer incidence (i.e., 19.29 million new cases) and 9.4% of all cancer-related fatalities (i.e., 9.96 million deaths).[1]

The rate of survival of rectal cancer significantly increased in the years following the adoption of total mesorectal resection. The localized recurrence rate dropped from 30% to 5%–8% after its introduction, while the survival rate after five years climbed from 45%–50% to 75%.[2]

D3 lymphadenectomy (LND3) is defined as the dissection of the primary, intermediate, and pericolic lymph nodes by the Japanese Society for Cancer of the Colon and Rectum (JSCCR). It is similar to CME in that all of the neuronal, vascular, and lymphatic tissue in the colonic tumor's drainage area is removed as a whole mesocolic tissue specimen.[3]

LND3 decreases the risk of disease recurrence and increases the rate of overall survival among individuals with cT3/4 or nodal-positive cancer as compared to traditional D2 lymphadenectomy (LND2). Because of this, the JSCCR favours treating these individuals with LND3 rather than LND2.[4]

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In Japan, there needs to be more consensus on the ideal scope of central lymphadenectomy for colon tumors on the right side. Specifically, Kanemitsu et al. proposed that LND3 performance was extended to the left margin of the superior intestinal artery (SMA) for right-sided colon tumours.[5]

This study aims to evaluate the sublocations (subgroups) according to different right cancer colon sites to justify the D3 right hemicolectomy according to different tumor locations.

2. Patients and methods

Between December 2021 and December 2023, a descriptive prospective study was carried out at the Bab El-shaarya University Hospital, Al-Azhar University, in the Surgical Oncology Department. Eight male and twelve female patients who met the criteria for right colon cancer underwent D3 right hemicolectomy, or D3 extended right hemicolectomy, to investigate the distribution of lymph nodes in the mesocolon and how they relate to radiology. The amount and types of mesocolic L.N. involved, how they relate to the original tumor's location, grade, and stage, and any post-treatment problems for the research group.

Inclusion criteria: Histologically proven right-sided cancer colon (right-sided cancers up to mid-transverse colon) and resectable disease under (clinical examination, C.T. abdomen and pelvis with contrast and pathologic examination).

Exclusion criteria: Previous colonic surgery, locally advanced irresectable cancer colon, metastatic cancer colon, synchronous abdominal pathology and medically unfit for surgery.

Preoperative preparation: Every patient underwent a comprehensive history, including neoadjuvant therapy history, clinical examination, and clinical staging. Comprehensive laboratory studies included serum blood glucose, liver function tests, full blood counts, renal function testing, and tumor markers like CEA.

Perform radiographic tests, such as pelvic and abdominal C.T. or MRI, to identify the tumor's location, extent, and local invasion. Additionally, liver metastases should be looked for, and a metastatic workup should be performed to assess the disease's stage and rule out metastases. A colonoscopy diagnoses pathology (endoscopic biopsy) and comprehensively evaluates the colon and rectum.

Pre-anesthetic assessment: includes blood pressure, ECG, echocardiography, and cardiac and chest exams.

Patient preparation: represents using a conventional colonic preparation technique, preoperative antibiotics, and prophylactic treatment for deep vein thrombosis (DVT). The patient was given LMWH the night before the procedure and kept in elastic stockings throughout and after the procedure until they could walk. In conclusion, the placement of an epidural catheter for postoperative anesthesia and a urine catheter is solely for preoperative purposes.

Surgical technique:

Endotracheal intubation and general anesthesia were used for all surgeries. The patient is supine, with their right shoulder elevated in their lap. Method. A midline incision, either laparoscopic or assisted laparoscopic, is used to access the abdomen. Extensive examination of the liver, pelvis, and abdominal cavity was conducted in order to rule out any signs of the disease spreading. The tying down the providing vessels happens when the colon has fully mobilized. First, the upper mesenteric vessels split the ileocolic and right colic vessels (if existent) at their origin.

The dissection into the surgical area of Henel's gastrocolic trunk and the lymphoadipose tissue located on the medial border of the superior mesenteric vein, commonly known as Gillot's surgical trunk. After that, a precise dissection is performed at the centre of the upper mesenteric artery, guaranteeing the removal of all related lymph nodes. To access the centre of colic vessels, the smaller sac is reached by puncturing the omentum towards the tail end of the gastroepiploic arcade. The division is limited to the right branch of the middle colic arteries for cecal and ascending colon tumors. The dissection of the transverse mesocolon is extended vertically until it intersects with the dissection across the superior mesenteric vascular pedicle. This results in a rectangular specimen that includes the intact mesocolic envelope and all central lymph nodes.

Labelling and enumerating regional lymph nodes for histological evaluation. Following meticulous hemostasis, numerous drains were implanted to ensure sufficient drainage, followed by the closure of the abdomen's wall in layers. Prophylactic triple antibiotics were administered to all patients, and daily LMWH was used as a precaution against DVT within 2-4 days after surgery.

Assessment and evaluation:

We evaluated the proportion of centre lymph node infiltration in right-sided colon cancer, its association with radiological findings, and the quantity and clusters of mesocolic lymph nodes involved. Detected lymph node involvement is associated with several factors, including the location, grade, and stage of the main tumor, intraoperative problems and surgical time. The duration of the surgical procedure is measured from the initial incision to the closing of the skin. The occurrence of complications during surgery, such as bleeding, damage to blood vessels, and specifically harm to the superior mesenteric artery (SMA) and its main branches, as well as harm to other organs and the intestines, and more

recently, complications and findings in the immediate time following the operation.

Early postoperative complications These are examples of wound-related complications, specifically hematoma, seroma, and wound infection. Non-wound-related complications following surgery include postoperative fever, prolonged lymphatic drainage, formation of lymphoceles, deeper venous thrombosis (V.T.), embolism of the lungs, prolonged ileus, urine retention, lower pain in the abdomen, abdominal bleeding, and early postoperative mortality.

Early Postoperative finding: Indicated by the duration of bowel motility (the time it takes after surgery to observe intestinal noises) and the time it takes to start walking.

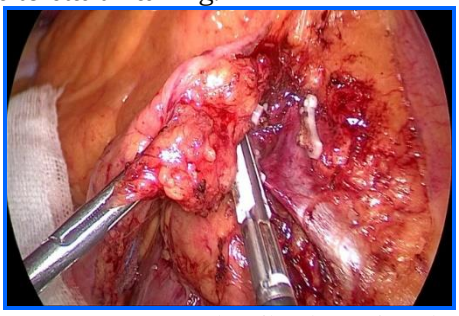

Figure 1. Laparoscopic clipping of main vessels at the central level.

Figure 2. After dissection and removal of the central tissue in front of the SMV and SMA during open right hemicolectomy.

3. Results

Table 1. Demographic data and characteristics of the studied patients preoperative.

		TOTAL NO. = 20
AGE	Mean ± SD	54.35 ± 9.94
	Range	42 – 79
SEX	Females	9 (45.0%)
	Males	11 (55.0%)
POSITION OF MALIGNANCY IN RT COLON	Hepatic Flexure	5 (25.0%)
	Cecal	7 (35.0%)
	Ileocecal	2 (10.0%)
	Appendix and Cecaum	2 (10.0%)
	Ascending	2 (10.0%)
	Proximal transversen	2 (10.0%)
PREOPERATIVE STAGE BY RADIOLOGY	II	2 (10.0%)
	III	12 (60.0%)
	IV	6 (30.0%)
PREOPERATIVE PATHOLOGY (GRADE)	II	13 (65.0%)
	III	7 (35.0%)
COLONOSCOPY	Mass	17 (85.0%)
	Circumferential	3 (15.0%)
PREOPERATIVE PATHOLOGY (TYPE)	Adenocarcinoma	17 (85.0%)
	Signet ring carcinoma	3 (15.0%)
TUMOUR MARKER CEA	Negative	13 (65.0%)
	Positive	7 (35.0%)
TECHNIQUE OF SURGERY	Open	9 (45.0%)
	Lap.	11 (55.0%)
PROCEDURE	D3 RT Hemicolectomy	14 (70.0%)
	Extended D3 Rt Hemicolectomy	6 (30.0%)
SURGERY TIME (HRS)	Mean ± SD	3.28 ± 0.50
	Range	2.5 – 4

Eleven patients were males and 9 patients were females. Five patients presented by hepatic flexure mass, 7 by cecal mass, 2 of each site (ileocecal, appendix and cecum ascending and proximal transverse. Two patients with stage 2, 12 patients with stage 3 and 6 patients with stage 4.

Seventeen patients presented by mass at colonoscopy and 3 patients presented by circumferential mural thickening. Seventeen patients with a pathology adenocarcinoma and 3 with signet ring carcinoma. Thirteen patients with positive CEA and 7 patients were negative. Eleven patients treated with laparoscopic surgery and 9 patients treated by open surgery. A mean surgery time of 3.28 ± 0.50 (range from 2.5- 4 hrs.).

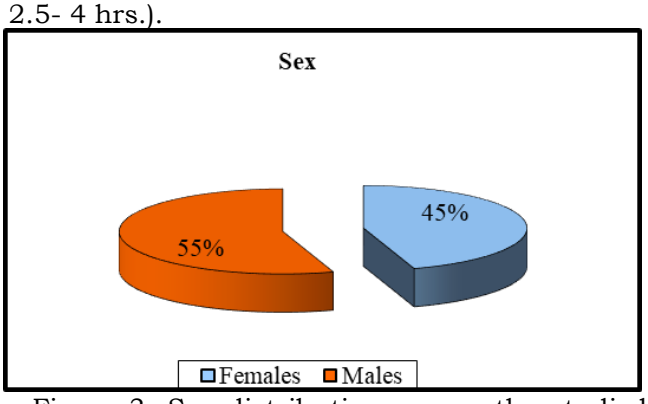

Figure 3. Sex distribution among the studied patients.

Table 2. Showed postoperative results of the studied patients.

		TOTAL NO. = 20
POSTOPERATIVE STAGE	II	2 (10.0%)
	III	11 (55.0%)
	IV	7 (35.0%)
POSTOPERATIVE GRADE	II	15 (75.0%)
	III	5 (25.0%)
DISSECTED NODES	Mean ± SD	18.75 ± 3.26
	Range	13 – 26
POSITIVE LYMPH NODES	Mean ± SD	4.25 ± 6.15
	Range	0 – 19
NO. OF PTS. WITH +VE LN	9 (45.0%)	
CENTRAL LYMPH NODES	0 / 9 (0.0%)	
QUALITY OF SPECIMEN	Intact entire mesocolon	20 (100.0%)
POSTOPERATIVE COMPLICATIONS	No	11 (55.0%)
	Yes	9 (45.0%)
	Wound Infection	*5 (25.0%)*
	Ileus	*4 (20.0%)*
HOSPITAL STAY (DAYS)	Mean ± SD	7.80 ± 1.15
	Range	6 – 10
INTRAOPERATIVE BLOOD LOSS	Minimal	20 (100.0%)

Postoperative grade was 2 in 15 patients and 3 in 5 patients. Mean number of harvested lymph nodes (18.75 ± 3.26) with range (13 -26). A mean of positive LNS (4.25 ± 6.15) with range (0-19). Number of patients with positive lymph nodes was 9 patients (45%).There were not any positive lymph nodes in the central fascia over the SMV and SMA. All specimens with good quality with intact mesocolon. Five patients complicated by wound infection, 4 patients with ileus and 9 patients without any complications. A mean hospital stay of (7.80 ± 1.15) with range (6- 10) days. Intraoperative blood loss was minimal.

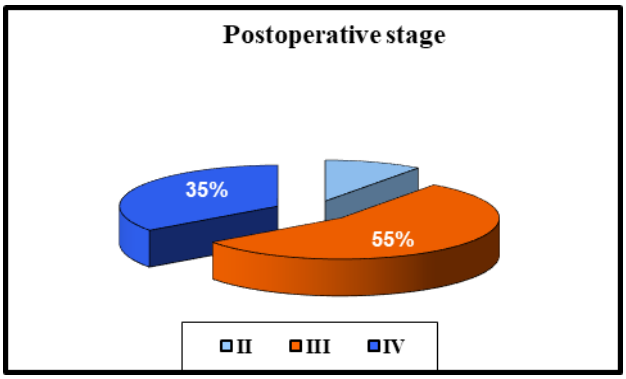

Figure 4. Postoperative stage of the studied patients.

Table 3. Comparison between preoperative and postoperative stage and grade.

	PREOPERATIVE	POSTOPERATIVE	TEST VALUE	P-VALUE	SIG.
STAGE			0.120*	0.942	NS
II	2 (10.0%)	2 (10.0%)			
III	12 (60.0%)	11 (55.0%)			
IV	6 (30.0%)	7 (35.0%)			
GRADE			0.000*	1.000	NS
II	13 (65.0%)	13 (65.0%)			
III	7 (35.0%)	7 (35.0%)			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant

*: Chi-square test

There is no difference in the grade between preoperative and postoperative pathology. Only one case changed postoperative pathology from stage 3 to stage 4.

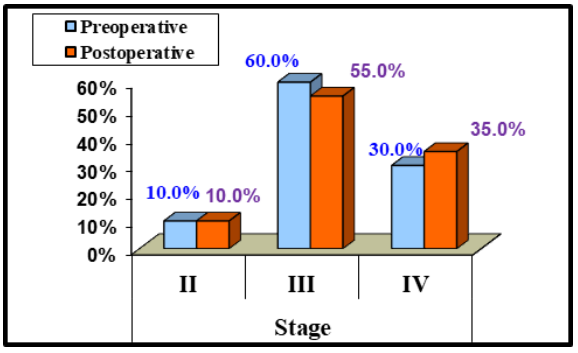

Figure 5. Comparison between preoperative and postoperative stage.

Table 4. Comparison between patients with and without positive lymph nodes regarding the other studied parameters.

		NEGATIVE LN No. = 11	POSITIVE LN No. = 9	TEST VALUE	P-VALUE	SIG.
POSITION OF MALIGNANCY IN RT COLON	hepatic Flexure	5 (45.5%)	0 (0.0%)	14.228*	0.014	S
	cecal	2 (18.2%)	5 (55.6%)			
	Ileocecal	2 (18.2%)	0 (0.0%)			
	appendix and Cecaum	0 (0.0%)	2 (22.2%)			
	ascending	2 (18.2%)	0 (0.0%)			
	proximal transversen	0 (0.0%)	2 (22.2%)			
PREOPERATIVE STAGE	II	2 (18.2%)	0 (0.0%)	2.828*	0.243	NS

BY RADIOLOGY	III	7 (63.6%)	5 (55.6%)			
	IV	2 (18.2%)	4 (44.4%)			
COLONOSCOPY	mass	8 (72.7%)	9 (100.0%)	2.888*	0.089	NS
	circumferential	3 (27.3%)	0 (0.0%)			
PREOPERATIVE PATHOLOGY (TYPE)	adenocarcinoma	11 (100.0%)	6 (66.7%)	4.314*	0.038	S
	Signet ring carcinoma	0 (0.0%)	3 (33.3%)			
PREOPERATIVE PATHOLOGY (GRADE)	II	11 (100.0%)	2 (22.2%)	13.162*	0.000	HS
	III	0 (0.0%)	7 (77.8%)			
TUMOUR MARKER CEA	negative	11 (100.0%)	2 (22.2%)	13.162*	0.000	HS
	positive	0 (0.0%)	7 (77.8%)			
TECHNIQUE OF SURGERY	open	2 (18.2%)	7 (77.8%)	7.103*	0.008	HS
	Lab	9 (81.8%)	2 (22.2%)			
PROCEDURE	D3 Rt. Hemicolectomy	7 (63.6%)	7 (77.8%)	0.471*	0.492	NS
	Extended D3 Rt Hemicolectomy	4 (36.4%)	2 (22.2%)			
SURGERY TIME (HRS)	Mean±SD	3.14 ± 0.55	3.44 ± 0.39	1.408•	0.176	NS
	Range	2.5 - 4	3 - 4			
POSTOPERATIVE STAGE	II	2 (18.2%)	0 (0.0%)	13.388*	0.001	HS
	III	9 (81.8%)	2 (22.2%)			
	IV	0 (0.0%)	7 (77.8%)			
POSTOPERATIVE GRADE	II	11 (100.0%)	2 (22.2%)	13.162*	0.000	HS
	III	0 (0.0%)	7 (77.8%)			
POSTOPERATIVE COMPLICATIONS	Uncomplicated	9 (81.8%)	2 (22.2%)	7.103*	0.008	HS
	Complicated	2 (18.2%)	7 (77.8%)			
HOSPITAL STAY (DAYS)	Mean±SD	7.36 ± 0.5	8.33 ± 1.50	2.019•	0.059	NS
	Range	7 - 8	6 - 10			

P>0.05: Non significant (NS); P <0.05: Significant (S); P <0.01: Highly significant (HS)
•: Independent t-test; *: Chi-square test

Among seven patients with cecal mass, there were five patients with positive LNs; the two patients with malignancy at the appendix and cecum have positive LNs; the two patients with malignancy at the proximal transverse colon have positive LNs and no positive LNs in patients with malignancy at the ileocecal, ascending colon with significant P-Value. There were positive LNs in 5 of 12 patients with stage 3 disease, positive LNs in 4 of 6 patients with stage 4 disease, and no positive lymph nodes in patients with stage 2 with no significant P-value.

There were positive LNs in 9 of 17 patients presented with mass in colonoscopy, and there were no positive LNs in patients presented by circumferential mural thickening with no significant P-value. There were positive LNs in 6 of 17 patients with Adenocarcinoma, and all patients (3 patients) with signet ring differentiation have positive LNs with significant P-values. Of the thirteen individuals with grade 2, 2 had positive lymph nodes. Additionally, all seven individuals with grade 3 had positive lymph nodes; this correlation was statistically significant with a high P-value. There were positive LNs in 2 of 13 patients with negative CEA, and all patients (7 patients) with positive CEA have positive LNs with high significant P-Value. Seven out of 9 treated by open surgery have positive LNs, and 2 of 11 patients treated by laparoscopic surgery have positive LNs with high significant P-value. Seven patients out of 14 treated by D3 right hemicolectomy have positive nodes, and 2 of 4 patients treated by extended right hemicolectomy have positive nodes with no significant P-value.

Out of the 11 patients who had postoperative pathological staging, 2 of them with stage 3 had positive nodes. Additionally, all seven patients with stage 4 had positive nodes. Notably, patients with stage 2 had no positive nodes, and this difference was statistically significant with a high P-value. The mean time of surgery in patients with positive nodes was (3.14 ± 0.55) with range (2.5-4 hrs.) and the mean time of surgery in patients with negative nodes was (3.44 ± 0.39) with range (3-4 hrs.) with no significant P-Value. The mean hospital stay in patients with positive nodes was (8.33 ± 1.50) with a range (of 6-10 days), and the mean hospital stay in patients with negative nodes was (7.36 ± 0.5) with a range (of 7-8 days) with no significant P-Value. Among complicated patients, 7 of 9 patients had positive nodes; among uncomplicated patients, 2 of 9 patients had positive nodes with a high significant P-value.

4. Discussion

During the current investigation's dissection, the colon and its draining lymph nodes were removed from the embryonic planes, and the blood vessels at its point of origin were clipped while all fascial planes remained intact.

Zaho et al.,[6] found that although the laparoscopic technique required much longer

operation, there were short-term benefits in less blood loss and quicker recovery of gastrointestinal function.[6]

The current study's findings showed that while the laparoscopic approach had a longer recovery following surgery, it was superior to the open procedure in terms of less blood loss, no risk of wound infection, and early gastrointestinal function recovery.

Zaho et al.,[6] said that big and aggressive malignancy was the primary reason for converting five LERH group cases to open surgery. Previous research has demonstrated a poor short-term survival rate, prolonged hospital stays, increased operation times, and morbidity for conversion cases. Furthermore, the study demonstrated that locally progressed tumors were a separate risk factor for conversion.[6]

The current study found a correlation between higher stage and longer operating times, hospital stays, and post-operative problems.

Ow et al. [7] stated that the primary indicator of a surgical procedure's safety is its post-operative results. According to our research, CME/LND3 and NCME/LND2 did not differ statistically significantly in the rates of peri- or post-operative complications, such as intraoperative loss of blood, post-operative mortality and morbidity, wound infection, anastomotic leakage, and post-operative bleeding.[7]

Two reported problems in this study were ileus (20%) and wound infection (25%). Open surgery was linked to the increased incidence of both. There were no fatalities linked to difficulties.

Zaho et al.,[6] found that the group that underwent laparoscopic surgery had a shorter mean length of hospital stay (10.1 ± 8.3 versus 11.3 ± 7.4, P = 0.328). In this study, the laparoscopic surgery group also had a shorter hospital stay.[6]

Shin, J. W. et al. 8 found that the sigmoid colon (n = 74, 44%) was the most frequently found location of the tumor. This was followed by the right-sided colon (n = 65, 38.7%), the transverse colon (n = 15, 8.9%), and the left-sided colon (n = 14, 8.3%) (descending colon and splenic flexure).8

In the current investigation, two of each site (ileocecal, appendix, and cecum ascending, as well as the proximal transverse colon) had two individuals with hepatic flexure masses and seven with cecal masses.

Shin, J. W. et al.[8] reported that, on average, 27.8 ± 13.6 (range, 3-76) lymph nodes were extracted. In most patients (n = 158, 94%), more than 12 lymph nodes were removed.8

Lee et al. [9] stated that 45 dissected lymph nodes were found on average (ranging from 18 to 92). There has been no surgical deat.[9]

The average number of extracted lymph nodes in the current study was 18.75 ± 3.26, with a range of 13-26). A positive LNS mean (4.25 ± 6.15), with a range of 0–19. There were nine individuals (45%) with positive lymph nodes. The SMV and SMA's central fascia did not include positive lymph nodes.

5. *Conclusion*

The most common tumor posit the tumor in our study is the cum f, followed by hepatic flexure. Most patients (72%) with cecal tumors presented with mass have positive mesenteric LNs, while 100% of patients in the cecum and appendix have positive LNs. The higher the grade, the higher the incidence of mesenteric LN involvement. The higher the preoperative radiological stage, the higher the incidence of mesenteric LN involvement. The more tumor invasion, the more likely there is to be mesenteric LN involvement. There were no positive central LNs in our patients. For right colon cancer, CME is the accepted treatment; nevertheless, D3 right hemicolectomy is still debatable..

Disclosure

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Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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