High or Low Ligation of the Inferior Mesenteric Artery during Curative Surgery for Rectal Cancer

By

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Di the best position for ligation of the IMA

Since Miles and Moynihan proposed low- and high-ligation techniques, 1908, Miles introduced the concept of the upward spread of carcinoma and recommended division of the IMA just distal to the left colic branch with subsequent en bloc excision of the nodes and bowel below. Conversely, Moynihan ligation and division of the IMA should be flush with the aorta to remove even more proximal nodes., (Charan et al Indian J Surg, 2015)

Ligation level and survival

In relation to 5-year survival rates, no significant difference in survival rates between the two groups. (Lange MM et al Dis Colon Rectum, 2008)

References	Site of tumor	5-year survival (%)	
		High tie* (*n*)	Low tie (*n*)
Rosi et al.	Rectum	65.1 (66)	56.0 (82)
	Rectosigmoid	58.3 (24)	47.0 (17)
Grinnell	Rectum, sigmoid and descending colon	5.7 % higher than low tie (151)	(150)
Bacon et al.	Upper rectum	58.3 (139)	52.3 (NA)
	Lower rectum	53.4 (118)	49.5 (NA)
Pezim and Nicholls	Rectum, rectosigmoid	64.5 (543)	65.2 (690)
Surtees et al.	Rectum, rectosigmoid (Dukes C ctage)	55.7 (150)	54.3 (100)
Slanetz and Grimson	Rectum, colon	70.8 (1027)	68.1 (1053)
Adachi et al.	Rectum, sigmoid colon	83.2 (134)	91.5 (38)
Uehara et al.	Lower rectum	74.6 (133)	77.8 (78)

IMA root nodal metastasis and survival

Lymph node involvement is a major prognostic factor for survival after rectal cancer surgery. High ligation includes the apical group of nodes at and around the origin of the IMA however, the incidence of metastasis to the IMA root nodes is reported to be relatively low, ranging from 0.3 to 11.1 % (Guraya SY et al Saudi Med J, 2016)

Ligation level of the IMA and staging

High Ligation increase the number of nodes harvested, considering that as many as ten nodes have been found along the segment of the IMA between the aorta and the origin of the left colic artery. , high IMA ligation retrieved more than 12 nodes; be the minimum necessary for accurate tumor staging. (Matsuda K et al Br J Surg, 2015)

Incidence of leakage after anterior resection

The low ligation technique preserves adequate blood supply to the colon proximally to the anastomosis, whereas after high ligation, vascularization of the distal colon and sigmoid is completely dependent on the middle colic and marginal arteries Apart from ischemia, tension on the anastomosis is thought to increase the risk of anastomotic leakage . High ligation is technically easier to perform than low ligation and allows for easy tension-free anastomosis. tension-free anastomosis also can be achieved in low-ligation resections by cutting the descending branch of the left colic artery. there were no significant differences in anastomotic leak rates after high or low ligation techniques. (Cirocchi R et al Surg Oncol, 2012)

High ligation of the IMA carries a risk to the hypogastric nerve, which may lead to ejaculatory disorders and urinary incontinence. The origin of the IMA is surrounded by the inferior mesenteric plexus. the preaortic plexus, and the superior hypogastric plexus, lie in the loose connective tissue between the peritoneum and the anterior renal fascia. Until now, there has been insufficient evidence about whether low ligation has a better prognosis with regard to sexual and urinary function. (Cirocchi R, et al 2011)

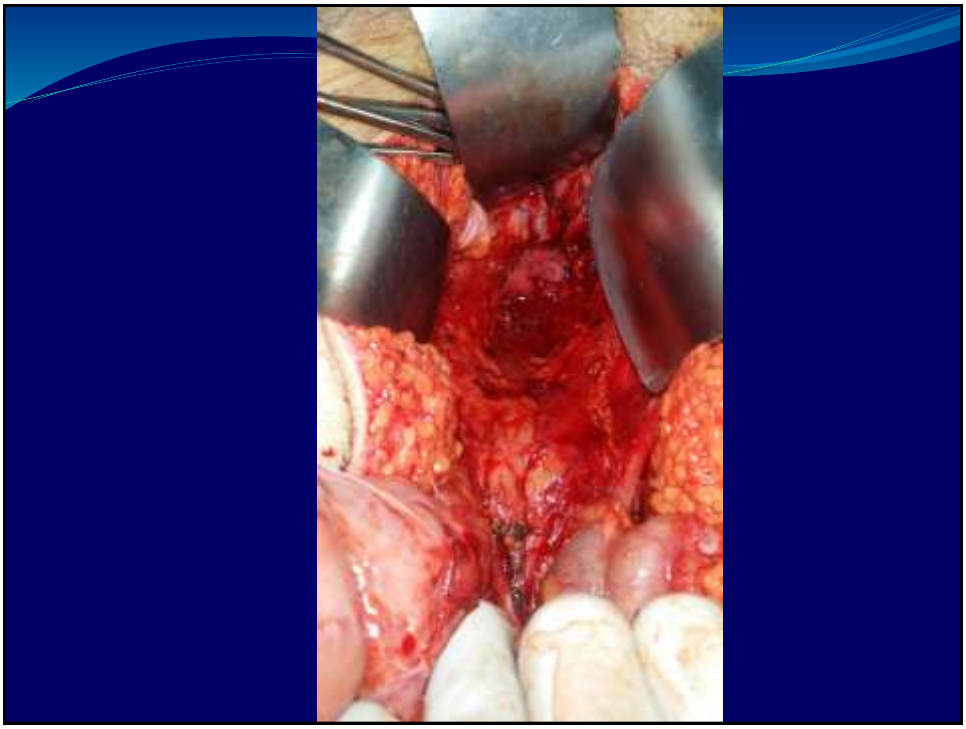
Future direction

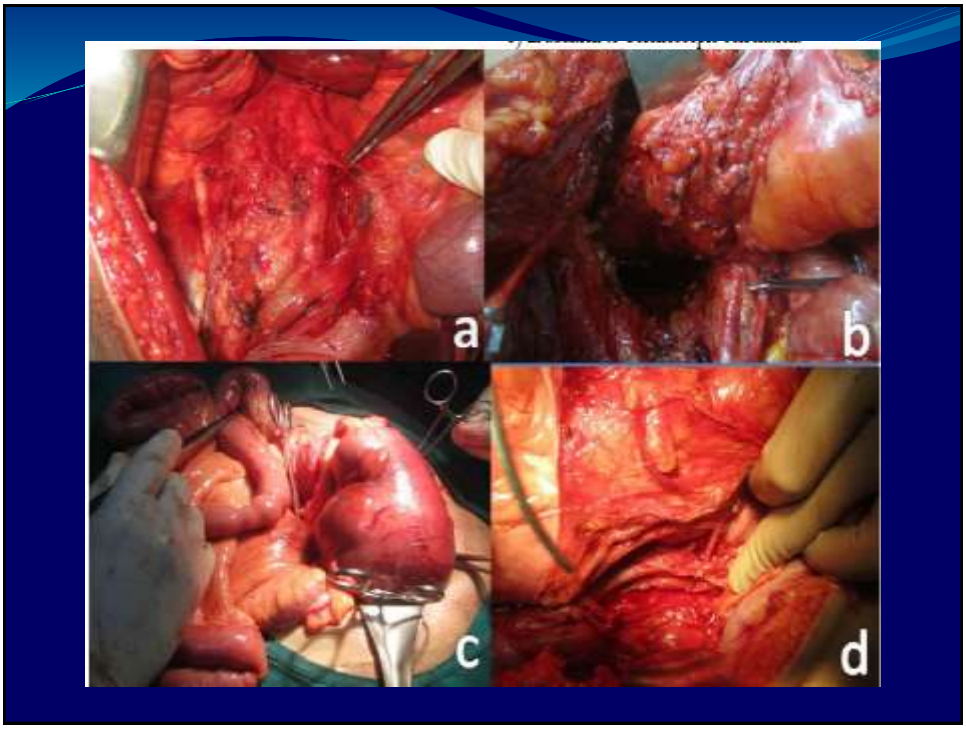
introduction of TME and Neoadjuvant therapy also has the potential to sterilize microscopic metastasis in nodes more central than those at the origin of IMA, The technique of high ligation of the IMA prevents the potential intravascular dissemination of cancer cells during tumor manipulation.. Although the prognosis of patients with metastases to the IMA root nodes is poor, the survival rate of patients with T3 or T4 rectal carcinoma, which carries a higher incidence of metastasis to the IMA root nodes, may be improved by performing high ligation of the IMA combined with neoadjuvant and adjuvant chemotherapy and radiotherapy. (Lange MM, et al 2016).

In 1959 Dumpy a modifie procedure instead of high ligation, in which fatty tissues and nodes were dissected free and excised in the angle between the IMA and aorta, and the artery was ligated below the left colic artery; (Cirocchi R, et al 2011). mobilizing the splenic flexure In 80% of cases, this would be sufficient to create a tension-free anastomosis. Although there is a 100% success rate by performing high-tie

By this study we are aiming to compare the incidence of genito-urinary dysfunction, anastomotic leakage and Oncological outcomes will be assessed in terms of retrieved lymph nodes, number of positive lymph nodes on the root of the inferior mesenteric artery, disease-free survival, overall survival, local recurrence,

Materials and Methods A retrospective analysis of 114 patients. In 38 patients (33.3%), (IMA) 76 patients (66.7%) who were operated on for rectal cancer during the period of 5 years (1 January 2007 – 31 December 2011) at the south Egypt cancer Institute of Assuit University. The pathologic grade and stage of tumors was similar in both groups.

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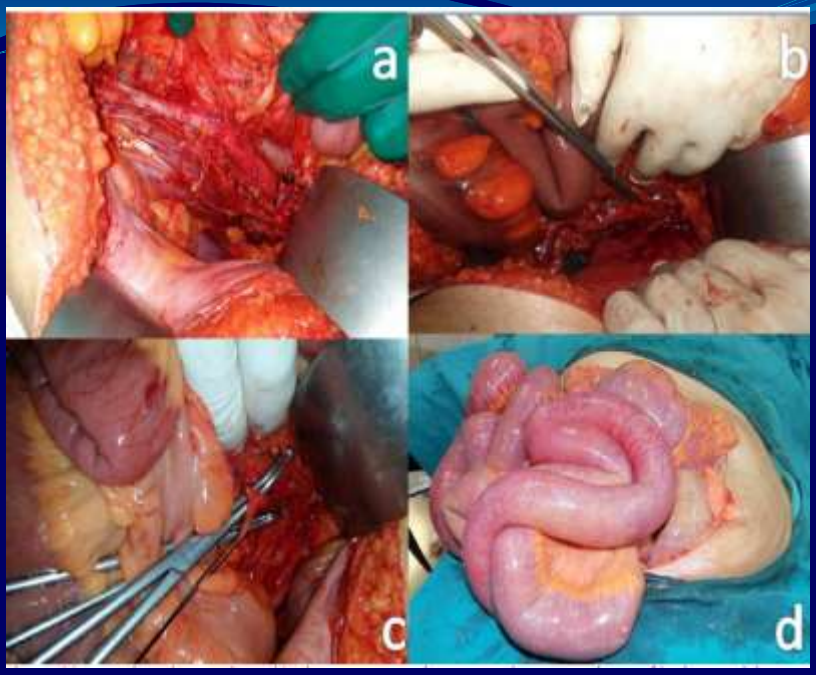

Table (1): operative data among study groups

	Low tie group	high tie group	*p*-value
Number of patients	76	38	0.22
Mean age (Years)	63	60	0.26
Type of operation APR(Abdomenoperineal resection)	13.2%	19.7%	
Hartmann's	10.5%	9.2%	
LAR(low anterior resection)	76.3%	71.1%	
Mean operative time in minutes	170	186	
Mean number of lymph node (range)	18 (8-33)	21 (9-36)	0.35
Positive lymph node	3 (1-5)	4 (1-9)	
Length of specimen in cm	30	34	0.11

Table (2): complications among study groups

	Low tie group	high tie group	*p*-value
Patients with Defunctioning stoma (%)	20(26%)	9(24%)	
Urinary dysfunction(%)	6(7.9%)	4(10.5%)	0.73
Sexual dysfunction(%)	8(10.5%)	5(13.2%)	0.76
GIT dysfunction(%)	3(3.9%)	2(5.3%)	1.0
Wound infection (%)	3(3.9%)	2(5.3%)	1.0
Cardiopulmonary complications (%)	2(2.6%)	2(5.3%)	0.6
Anastomotic leakage	4(5.3%)	3(7.9%)	0.68

Table (3): oncological outcome among study groups

	Low tie group	high tie group	*p*-value
5 years overall survival	78.2%±2.7	79.7%±3.3	0.98
Five years recurrence survival(%)	9(11.8%)	4(10.5%)	
Mortality	2(2.6%)	1(2.6%)	

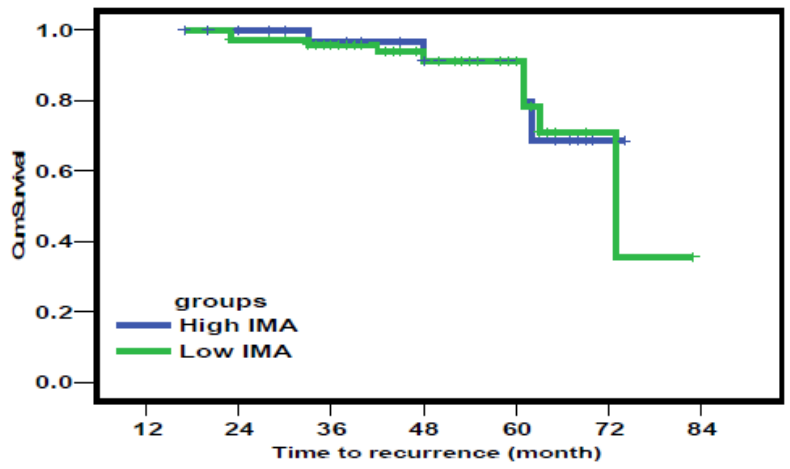

Figure (4): relation of survival to time to recurrence among study groups

CONCLUSIONS

No significant difference in five-year survival rate operating time and other variable between the groups, both techniques give adequate oncological results low tie is anatomically less invasive with respect to circulation and autonomous innervation of the proximal limb of anastomosis. As a consequence, in rectal cancer surgery low tie with the fatty tissue and metastatic nodes at the root of th IMA are removed should be the preferred method.