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**Complete mesocolic excision: Lessons from anatomy translating to better oncologic outcome**

Zheng MH *et al*. CME: Lessons from anatomy translating to better oncologic outcome

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**Abstract**

Since the introduction of complete mesocolic excision (CME) for colon cancer, the oncologic outcome of patiens has been geatly improved and the patients have led a longer life and a lower recurrence, just like the total mesorectum excision for rectal cancer. Instead of the fact that the exact anatomy of the organ is one of the most vital things for surgeons to conduct surgery, no team really studied the exact structure of the mesocolon and related attachments for CME, until recently the mesocolonic anatomy was first formally characterized in 2012. Therefore, this article mainly focuses on the anatomy development of the mesocolon and the achievement in this field. Meanwhile, we introduce the latest progress by our team.

**Key words:** Colorectal caner; Complete mesocolic excision; Toldt’s fascia; Laparoscopic Surgery; “Page-turning” approach

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**Core tips:** Despite the complete mesocolic excision (CME) has been conducted for many years, leading colon cancer patients to a better outcome, there are limited researches for the structure of the mesocolon , nor related attachments, which is of great importance for surgeons to carry out surgery, until K. Culligan first formally characterized the mesocolonic anatomy, explaining the reason why CME would have a better oncologic outcome. Meanwhile, based on the exact anatomy of mesocolon, we introduce the latest progress in laparoscopic surgery for colon cancer of our team’s, such as “page-turning” approach, and we also list the most important structure related to the CME.

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**INTRODUCTION**

In the past, patients with rectal cancer had survived less than those with colorectal cancer, however, since Heald *et al*[[[1]](#endnote-1)] first proposed total mesorectum excision(TME) for rectal cancer, the TME has standardized the surgical management of rectal cancer, which is based on the theory that mesorectum is composed of visceral and parietal planes covering rectum-supplying vessels and its lymphatic drainage like envelopes, leading to lower recurrence rate as well as better 5-year-cancer-relrelated survival, which is even higher than that of colon cancer[[[2]](#endnote-2),[[3]](#endnote-3),[[4]](#endnote-4)] while the surgery for colon cancer hadn't changed so much. In 2009, on the basis of the TME, Hohenberger *et al*[[[5]](#endnote-5)] put forward the concept of complete mesocolic excision, he stated that the mesocolon is covered by visceral and parietal planes by an envelope-style just like the mesoretum, and the “holy plane”[[[6]](#endnote-6)] extends to mesoconlon from the mesorectum. In his study, the patients who underwent CME approach had lower local recurrence and better survival, from 6.5% to 3.5% and 82.1% to 89.1% respectively. More and more researches has proven that superiority since then[[[7]](#endnote-7),[[8]](#endnote-8),[[9]](#endnote-9),[[10]](#endnote-10)].

Surgeons are meant to be ones who cure the disease through surgery with excellent knowledge about the organs, therefore, it’s essential to stress the importance of accurately understanding mesocolic anatomy for surgeons to conduct CME. Though there have been researches about CME for years, no team really studied the exact structure of the mesocolon and related attachments, until K. Culligan, *et al*[[[11]](#endnote-11)] first formally characterized the mesocolonic anatomy in 2012. They found many undocumented and important discoveries, which could explain and confirm the feasibility and superiority of CME. Besides presenting the promising oncological outcome , this article mainly focuses on the anatomy of mesocolon and laparoscopic approach of CME to help peers comprehend CME better，and such improvement in anatomy-related understanding may explain why CME is a potential standardized procedure for colon caner.

**METHODS**

A systematic literature search was conducted using Pubmed and EMBASE for “complete mesocolic excision”, ”CME”, “anatomy of CME”, “laparoscopic CME” as well as “colon surgery.” Many related studies were found and we summarized and presented the findings with our clinical experience.

**The anatomy development of mesocolon**

One of the ealiest and the most famous description of mesocolon was made by Sir Frederick Treves in 1885[[[12]](#endnote-12)], he dissected and studied the anatomy of intestinal canal, peritoneum and mesentery with 100 cadavers and reported that mesocolon was discontinuous and fragmental. About half of the cadavers had neither an ascending nor a descending mesocolon, and 14 cadavers had them both. The existence of mesocolon was always described as abnormal, even as “a cleft palate’’[[[13]](#endnote-13)]. Indeed, before Sir Frederick Treves, Carl Toldt in 1879[[[14]](#endnote-14)], whose findings apparently differed from the ones above, studied the development of human mesentery, noted the permanent existence of mesocolon in human being as well as a distinct fascial plane between the mesocolon and the underlying retroperitoneum. Known as Toldt’s fascia, it was formed by the fusion of the visceral peritoneum of the mesocolon with the parietal peritoneum of the retroperitoneum. Today regarding the point of view, Toldt’s findings were almost true while Treves’ not, but it didn’t work well at that time. Treves’ discoveries were so profound and foundational that it was spreaded and accepted extensively into surgery and teaching, even to recent days, it was still accepted widely as Rishabh Sehgal[[[15]](#endnote-15),[[16]](#endnote-16)] mentioned.

 There has been no research really studying the exact structure of mesocolon for decades, until K. Culligan, *et al*[11] first formally characterized the mesocolonic anatomy in details. They chose 109 patients to undergo total abdominal colectomy, observed and recorded the anatomy of mesocolon, the related attachments and spicemens, and finally noted many undocumented and meaningful findings: (1) mesocolon was continuous from ileocaecal to rectosigmoid level; (2)Toldt’s fasical was identified where mesocolon was apposed to the retroperitoneum, such an ascending, descending mesocolon and non-mobile portion of mesosigmoid when not in the transversemesocolon and the mobile component of the mesosigmoid are mobile; (3) the proximal rectum originated from the confluence of the mesorectum and mesosigmoid, and so on. What’s more admirable, besides the important macroscopic discoveries above, Culligan’s team first investigated the microscopic structures of mesocolon, Toldt’s fascia and retroperitoneum before and after the colonic mobilization[[[17]](#endnote-17),[[18]](#endnote-18)]. They obtained samples from 24 cadavers, stained with hematoxylin and eosin (HE), Masson trichrome (MT), and by immunohistochemistry to identify lymphatic vessels. Some samples were directly observed by scanning electron microscopy(SEM). Just like the macroscopic findings, they found microscopic structures of mesocolon and associated fascia were consistent from ileocecal to mesorectal level; where mesocolon was apposed to the retroperitoneum. We identified a connective tissue between them (ie, Toldt;s fascia). Nowdays, we appreciate the excellent work done by Culligan’s team. It was incredible and profound. For the first time, they described the exact anatomy of mesocolon, confirmed the continuity and surgical plane, and provided a convincing proof for surgeons to conduct complete mesocolic excision from the anatomical and histological aspects. Later, Zhidong Gao[[[19]](#endnote-19)] finished a similar study, also proving the continuity of mesocolon and the existence of visceral fascia，in which he also thought to be able to block the tumor migrate. Although Zhidong Gao and Culligan used different terminology referred to the same thing, such as Zhidong Gao named it “visceral fascia” while Culligan didn't approve of this word and called it “Told’s fascia”[[[20]](#endnote-20)]. Such phenomenon is very normal, there is no standardized nomenclature for the CME, for instance, “righ-hemi colorectomy”, “enlarged righ-hemi colorectomy”, “Gerot’s fascia”, or “visceral fascia” and “parietal fascia”. Not being accurate and definite [20,[[21]](#endnote-21)] may confuse the new learners regarding explanations of the surgical procedures, which may have a bad impact on such improvement. Even though there is no “gold standard” for colon cancer, it’s essential and necessary to have a unified terminology.

**The laparoscopic approach of CME**

Unexpectedly, despite of the misconception in the textbook for centuries, the surgeons have always seen mesocolon as a whole and conducted surgery based on the surgical plane between mesocolon and retroperitoneum[[[22]](#endnote-22)]. Back to 100 years ago, Jamieson (Jamieson & Dobson, 1909) suggested surgery for colon cancer that resects the lesion, cleans the regional lymph nodes to the vascular roots, and dissects lymph nodes of the interperitoneal colon, mesocolon and vascular roots, which was similar to the technique strategies of CME proposed by Hohenberger[5]. Hohenberger demanded sharp separation of visceral and parietal fascia based on embryonic anatomy, ligation at the root of central supply vessels(CVL), and more radical lymph node dissection. The feasibility and promising outcome of CME have been confirmed in open surgery.

 The improvement of laparoscopic techniques and further definition of equipment make it possible for surgeons to conduct colon cancer surgery. Taking the right-hemi colon cancer for example, it is relatively more complicated and has more vessel variations. Feng B[[[23]](#endnote-23)] from our team first confirmed the feasibility and technical strategies in laparoscopic CME with medial access, following the dissection starts at ileocolic vessel, proceeding along superior mesenteric vein, exposing the inborn surgical plane composed of Toldt’s and prerenal fascia to uncover head of pancreas and to mobilize duodenum. The exposing range begins from the origin of transverse colon mesentery to the peritoneal reflection, and ligation at the origin of the central vessels to dissect the entire mesocolon as a whole. Compared to the lateral access, the medial access complies more the “no touch” principle, when the latter starts with mobilizing the colon and then dissecting and ligating the central vessel. Not only is the pathological result comparable to the open surgery, but also the long-term outcome works well too[2,4,[[24]](#endnote-24),[[25]](#endnote-25)]. Based on the surgical experience through extensive surgeries, Feng B[[[26]](#endnote-26)]then exploited and distinguished two approaches for media access: completely medial and hybrid medial approach(CMA and HMA). The major difference between them is the approach to dissect the inferior edge of pancreas. The CMA uses a “bottom-to-top” fashion when the HMA uses a blending of “top-to-bottom and bottom-to-top” fashion. Compared to the HMA, the surgery time and ligation time of central vessel were significantly shorter, while the latter induced more vessel-related complications. Besides，our team recently found an improved surgical access based on CMA, which we named as “page-turning” approach(CMAPA). It is conducted in a “bottom-to-top” and “inside-to-outside” direction, which adopted the strategy of “point-to-line” and “line-to-plane”. Point: taking the ileocolic vessels as a dissection trigger; Line: dissecting the vessels along the superior mesenteric vessel(SMV); Plane: extending the surgical plane by the “page-turning” approach, which was formed by Told’s fascia. We suppose this approach is technically feasible and complies more with the principle of tumor radical surgery.

 However，CMA and HMA both emphasize the accurate recognition of anatomical plane, especially the transverse retrocolic space (TRCS) which can extends to intermesenteric space (IMS) and right retrocolic space (RRCS) to completely mobilize the right colon. Consequently, without a better understanding of the exact mesocolon, no surgeons can conduct perfect CME.

**Conclusion**

 Just as the TME for rectal cancer, the CME follows the principle of embryology and anatomy: sharply dissecting the surgical plane between the visceral and parital fascia to get an integrated mesocolon; ligation at the root of the central vessel and clear more lymphonodus, which leads to a better survival. But there is not an efficient evaluation for CME, instead of grading system by West[[[27]](#endnote-27)]: muscularis proria plane(poor plane) if little mesocolon excised with incision down to the muscularis proria; intramesocolic plane(moderate plane) if partial mesocolon excised with irregular shape but not down to the muscularis proria; mesocolic plane(good plane) if intact mesocolon excised without defections on it and high ligation of the supply vessels. He further demonstrated a 15% increase of overall survival in the “mesocolic plane” group compared to “non-comparable ” group. Even though the surgeons memorize the concept by heart, there haven’t reach a global consensus about the accurate configuration of the mesocolon with related attachments, meantime, various words and terminologies are used in the CME, which makes people confused, especially the young. Besides, the reason why we describe CME as a better approach instead of a successful one, or why we think it has the potential to be the standardization for colon caner, relates to that it has not been accepted universally, and there are still some debates. Some studies showed that extensive lymphadenectomy by CME failed to increase the survival[[[28]](#endnote-28),[[29]](#endnote-29),[[30]](#endnote-30),[[31]](#endnote-31)] while CME emphasized the necessity to remove more lymphonodus, which can lead to a better survival. Besides, the operation time for CME was longer as the procedure was more technically challenging and complex, which may lead to more complications, such vessel bleeding, genitourinary dysfunction, or chyle leakage[[[32]](#endnote-32),[[33]](#endnote-33)]. What’s more, Culligan[18] first discovered abundant lymphatic vessels within Toldt’s fasica as well as mesocolon, which meant it was possible that there were communications between them, for example, causing the tumor cell spread, and if that happens, there is little need to conduct CME. Further studies are needed to confirm that though.

 The most data we get belongs to the single-center, retrospective study, not being convincing enough for surgeons to accept CME as a standardization for colon cancer. So it is the time and it is essential for us to regularize the procedure of CME and conduct completely randomized and multi-center prospective study to provide with excellent proofs. At that time we'll have great confidence to decide whether CME is the standardization for colon cancer or not.

**REFERENCES**

1. 1 **Heald RJ,** Husband EM, Ryall RD. The mesorectum in rectal cancer surgery--the clue to pelvic recurrence? Br J Surg 1982; 69: 613-616 [PMID: 6751457 DOI: 10.1002/bjs.1800691019] [↑](#endnote-ref-1)
2. 2 **Liang JT,** Lai HS, Huang J, Sun CT. Long-term oncologic results of laparoscopic D3 lymphadenectomy with complete mesocolic excision for right-sided colon cancer with clinically positive lymph nodes. Surg Endosc. 2014 Nov 11 [PMID: 25384361 DOI: 10.1007/s00464-014-3940-9] [↑](#endnote-ref-2)
3. 3 **Siegel R,** Naishadham D, Jemal A. Cancer Statistics, 2012. CA Cancer J Clin. 2012; 62(1):10-29 [PMID: 22237781 DOI: 10.3322/caac.20138] [↑](#endnote-ref-3)
4. 4 **Han DP,** Lu AG, Feng H, Wang PX, Cao QF, Zong YP, Feng B, Zheng MH. Long-term results of laparoscopy-assisted radical right hemicolectomy with D3 lymphadenectomy: clinical analysis with 177 cases. Int J Colorectal Dis 2013; 28: 623-629 [PMID: 23117628 DOI:10.1007/s00384-012-1605-5] [↑](#endnote-ref-4)
5. 5 **Hohenberger W,** Weber K, Matzel K, Papadopoulos T, Merkel S. Standardized surgery for colonic cancer: complete mesocolic excision and central ligation—technical notes and outcome. Colorectal Dis 2009; 11: 354–364 [PMID: 19016817 DOI: 10.1111/j.1463-1318.2008.01735.x] [↑](#endnote-ref-5)
6. **Heald RJ.** The ‘Holy Plane’ of rectal surgery. J R Soc Med 1988; 81(9): 503-508.[ PMID: 3184105] [↑](#endnote-ref-6)
7. **Killeen S,** Mannion M, Devaney A,Winter DC. Complete mesocolic resection and extended lymphadenectomy for colon cancer: a systematic review. Colorectal Dis 2014; 16:577–594.[ PMID: 24655722 DOI: 10.1111/codi.12616] [↑](#endnote-ref-7)
8. **Liang J,** Fazio V, Lavery I, Remzi F, Hull T, Strong S, Church J. Primacy of surgery for colorectal cancer outcomes. Br J Surg 2015; 102:847-852 [PMID: 25832316 DOI: 10.1002/bjs.9805] [↑](#endnote-ref-8)
9. **Bertelsen CA,** Neuenschwander AU, Jansen JE, Wilhelmsen M, Kirkegaard-Klitbo A, Tenma JR, Bols B, Ingeholm P, Rasmussen LA, Jepsen LV, Iversen ER, Kristensen B, Gögenur I; Danish Colorectal Cancer Group. Disease-free survival after complete mesocolic excision compared with conventional colon cancer surgery: a retrospective, population-based study. Lancet Oncol 2015; 16(2): 161-168.[ PMID: 25555421 DOI: 10.1016/S1470-2045(14)71168-4] [↑](#endnote-ref-9)
10. **Galizia G,** Lieto E, De Vita F, Ferraraccio F, Zamboli A, Mabilia A, Auricchio A, Castellano P, Napolitano V, Orditura M. Is complete mesocolic excision with central vascular ligation safe and effective in the surgical treatment of right-sided colon cancers? A prospective study. Int J Colorectal Dis 2014;29: 89–97.[PMID: 23982425 DOI: 10.1007/s00384-013-1766-x] [↑](#endnote-ref-10)
11. **Culligan K,** Coffey JC, Kiran RP, Kalady M, Lavery IC, Remzi FH. The mesocolon: a prospective observational study. Colorectal Dis 2012; 14(4):421-428. [PMID: 22230129 DOI: 10.1111/j.1463-1318.2012.02935.x] [↑](#endnote-ref-11)
12. **Treves SF.** Lectures on the anatomy of the intestinal canal and peritoneum in man. Br Med J 1885; 1: 580-583 [PMID: 20751205 DOI: 10.1136/bmj.1.1264.580] [↑](#endnote-ref-12)
13. **Adams A**, McConnell T. Abnormalities of fixation of the ascending colon: the relation of symptoms to anatomical findings. Br J Surg 1923; 10: 532–57.[ DOI: 10.1002/bjs.1800104014] [↑](#endnote-ref-13)
14. **Toldt C.** Splanchology – general considerations. In Toldt C and Della Rossa A. An Atlas of Human Anatomy for Students and Physicians. New York: Rebman Company, 1919:408. [↑](#endnote-ref-14)
15. **McMinn RH.** The gastrointestinal tract. In McMinn RH. Last’s Anatomy: Regional and Applied. 9th ed. London: Langman Group Ltd; 1994:331-42. [↑](#endnote-ref-15)
16. **Standring S.** Large intestine. In: Standring S. Gray’s anatomy: The Anatomical Basis of Clinical Practice. 40th ed. London: Churchill Livingstone. 2008:1137. [↑](#endnote-ref-16)
17. **Culligan K,** Walsh S, Dunne C, Walsh M, Ryan S, Quondamatteo F, Dockery P, Coffey JC. The mesocolon – a histological and electron microscopic characterisation of the mesenteric attachment of the colon prior to and after surgical mobilisation. Ann Surg 2014; 260:1048-56[PMID: 24441808 DOI:10.1097/SLA.0000000000000323] [↑](#endnote-ref-17)
18. **Culligan K,** Sehgal R, Mulligan D, Dunne C, Walsh S, Quondamatteo F, Dockery P, Coffey JC. A detailed appraisal of mesocolic lymphangiology--an immunohistochemical and stereological analysis. J Anat. 2014; 225(4): 463-72 [PMID: 25040735 DOI: 10.1111/joa.12219] [↑](#endnote-ref-18)
19. **Gao Z,** Ye Y, Zhang W, Shen D, Zhong Y, Jiang K, Yang X, Yin M, Liang B, Tian L, Wang S. An anatomical, histopathological, and molecular biological function study of the fascias posterior to the interperitoneal colon and its associated mesocolon: their relevance to colonic surgery. J Anat 2013; 223:123-32 [PMID: 23721400 DOI: 10.1111/joa.12066] [↑](#endnote-ref-19)
20. **Culligan K,** Remzi FH, Soop M, Coffey JC. Review of nomenclature in colonic surgery--proposal of a standardised nomenclature based on mesocolic anatomy. Surgeon 2013; 11: 1-5 [PMID: 22459667 DOI: 10.1016/j.surge.2012.01.006] [↑](#endnote-ref-20)
21. **Mike M,** Kano N. Laparoscopic surgery for colon cancer: a review of the fascial composition of the abdominal cavity. Surg Today. 2015; 45: 129-39.[ PMID: 24515451 DOI: 10.1007/s00595-014-0857-9] [↑](#endnote-ref-21)
22. **Sehgal R,** Coffey JC. Historical development of mesenteric anatomy provides a universally applicable anatomic paradigm for complete/total mesocolic excision. Gastroenterol Rep (Oxf) 2014; 2: 245-50 [PMID: 25035348 DOI: 10.1093/gastro/gou046] [↑](#endnote-ref-22)
23. **Feng B,** Sun J, Ling TL, Lu AG, Wang ML, Chen XY, Ma JJ, Li JW, Zang L, Han DP, Zheng MH. Laparoscopic complete mesocolic excision (CME) with medial access for right-hemi colon cancer: feasibility and technical strategies. Surg Endosc 2012; 26: 3669–75 [PMID: 22733200 DOI: 10.1007/s00464-012-2435-9] [↑](#endnote-ref-23)
24. **Storli KE,** Søndenaa K, Furnes B, Eide GE. Outcome after introduction of complete mesocolic excision for colon cancer is similar for open and laparoscopic surgical treatments. Dig Surg. 2013; 30: 317-27 [PMID: 24022524 DOI: 10.1159/000354580] [↑](#endnote-ref-24)
25. **Siani LM,** Pulica C. Laparoscopic Complete Mesocolic Excision with Central Vascular Ligation in right colon cancer: long-term oncologic outcome between mesocolic and non-mesocolic planes of surgery. Scand J Surg. 2014 Nov 12. [PMID: 25391978 DOI: 10.1177/1457496914557017]. [↑](#endnote-ref-25)
26. **Feng B,** Ling TL, Lu AG, Wang ML, Ma JJ, Li JW, Zang L, Sun J, Zheng MH. Completely medial versus hybrid medial approach for laparoscopic complete mesocolic excision in right hemicolon cancer. Surg Endosc 2014; 28: 477-483 [PMID: 24114515 DOI: 10.1007/s00464-013-3225-8] [↑](#endnote-ref-26)
27. **West NP,** Hohenberger W, Weber K, Perrakis A, Finan PJ, Quirke P. Complete mesocolic excision with central vascular ligation produces an oncologically superior specimen compared with standard surgery for carcinoma of the colon. J Clin Oncol 2010; 28: 272–278.[ PMID: 19949013 DOI: 10.1200/JCO.2009.24.1448] [↑](#endnote-ref-27)
28. **Willaert W,** Mareel M, Van De Putte D, Van Nieuwenhove Y, Pattyn P, Ceelen W. Lymphatic spread, nodal count and the extent of lymphadenectomy in cancer of the colon. Cancer Treat Rev 2014; 40: 405-413 [PMID: 24126120 DOI: 10.1016/j.ctrv.2013.09.013] [↑](#endnote-ref-28)
29. **Hashiguchi Y,** Hase K, Ueno H, Mochizuki H, Shinto E, Yamamoto J. Optimal margins and lymphadenectomy in colonic cancer surgery. Br J Surg 2011; 98: 1171-1178 [PMID: 21560120 DOI: 10.1002/bjs.7518] [↑](#endnote-ref-29)
30. **Cirocchi R,** Trastulli S, Farinella E, Desiderio J, Vettoretto N, Parisi A, Boselli C, Noya G. High tie versus low tie of the inferior mesenteric artery in colorectal cancer: a RCT is needed. Surg Oncol 2012; 21: e111-e123 [PMID: 22770982 DOI: 10.1016/j.suronc.2012.04.004] [↑](#endnote-ref-30)
31. **Willaert W,** Ceelen W. Extent of surgery in cancer of the colon: is more better? World J Gastroenterol 2015; 21: 132-138 [PMID: 25574086 DOI: 10.3748/wjg.v21.i1.132] [↑](#endnote-ref-31)
32. **Shin JW,** Amar AH, Kim SH, Kwak JM, Baek SJ, Cho JS, Kim J. Complete mesocolic excision with D3 lymph node dissection in laparoscopic colectomy for stages II and III colon cancer: long-term oncologic outcomes in 168 patients. Tech Coloproctol 2014; 18: 795-803 [PMID: 24633427 DOI: 10.1007/s10151-014-1134-z] [↑](#endnote-ref-32)
33. **Gouvas N,** Pechlivanides G, Zervakis N, Kafousi M, Xynos E. Complete mesocolic excision in colon cancer surgery: a comparison between open and laparoscopic approach. Colorectal Dis 2012; 14: 1357-1364 [PMID: 22390358 DOI: 10.1111/j.1463-1318.2012.03019.x] [↑](#endnote-ref-33)