**Name of journal: World Journal of Gastroenterology**

**ESPS Manuscript NO: 7955**

**Columns:** **CASE REPORT**

**Laparoscopic segmental colectomy for colonic lymphangiomas: A definitive, minimally invasive surgical option**

Zhuo CH *et al*. Laparoscopic Resection for Colonic Cystic Lymphangiomas

Chang-Hua Zhuo, De-Bing Shi, Min-Gang Ying, Yu-Fan Cheng, Yu-Wei Wang, Wen-Ming Zhang, San-Jun Cai, Xin-Xiang Li

**Chang-Hua Zhuo, De-Bing Shi, Yu-Wei Wang, San-Jun Cai, Xin-Xiang Li,** Department of Colorectal Surgery, Fudan University Shanghai Cancer Center, and Department of Oncology, Shanghai Medical College, Fudan University, Shanghai 200032, China

**Yu-Fan Cheng,** Department of Pathology, Fudan University Shanghai Cancer Center, and Department of Oncology, Shanghai Medical College, Fudan University, Shanghai 200032, China

**Wen-Ming Zhang,** Department of Endoscopy, Fudan University Shanghai Cancer Center, and Department of Oncology, Shanghai Medical College, Fudan University, Shanghai 200032, China

**Chang-Hua Zhuo, Min-Gang Ying,** Department of Surgical Oncology, Fujian Provincial Cancer Hospital, Teaching Hospital of Fujian Medical University, Fuzhou 350001, Fujian Province, China

**Author contributions:** Zhuo CH and Shi DB conceived and drafted the manuscript; Li XX, Shi DB and Cai SJ performed the operation; Li XX, Ying MG, Shi DB and Wang YW assisted in reviewing the literature and drafting the manuscript; Cheng YF made the histopathological diagnosis; Zhang WM reviewed the endoscopic diagnosis; Li XX, Ying MG and Cai SJ made critical revisions to the manuscript and edited the final version of the manuscript; all authors read and approved the final manuscript.

**Supported by** National Natural Science Foundation of China No. 51377024; and the Basic Research Project of Shanghai Science and Technology Commission No.13JC1407202

**Correspondence to: Xin-Xiang Li, MD,** Department of Colorectal Surgery, Fudan University Shanghai Cancer Center, 270 Dong-an Road, Xu-Hui District, Shanghai 200032, China. lxx1149@163.com

**Telephone:** +86-21-64175590 **Fax:** +86-21-64035387

**Received:** December 8, 2013 **Revised:** January 29, 2014

**Accepted:**

**Published online:**

**Abstract**

Colonic lymphangioma is an unusual benign malformation. We herein describe two cases. A 36-year-old woman was admitted with one year of intermittent abdominal pain; colonoscopy, abdominopelvic computed tomography and endoscopic ultrasonography (EUS) revealed enlarged cystic masses at the ascending colon. In another 40-year-old man, colonoscopy and EUS revealed an asymptomatic lobulated cystic mass with four small sessile polyps at the sigmoid colon. Both patients underwent laparoscopic segmental colectomy. Both masses were histologically confirmed as cystic lymphangiomas, and the patients were discharged without complications. The management of colonic lymphangioma depends on the individual situation; close surveillance or endoscopic therapy may be appropriate for asymptomatic lesions smaller than 2.5 cm in diameter. Surgical intervention can be considered for larger lesions or in patients who develop complication risks. Laparoscopic segmental colon resection may be recommended to excise relatively large submucosal lesions because it is a definitive, minimally invasive intervention with a fast postoperative recovery.

© 2014 Baishideng Publishing Group Co., Limited. All rights reserved.

**Key words:** Cystic lymphangioma; Colon neoplasm; Laparoscopic surgery; **Colectomy**; Segmental resection

**Core tip:** We herein present two unusual cases of colonic cystic lymphangiomas that required surgical intervention. Both patients underwent laparoscopic segmental colectomy and had uneventful postoperative recoveries with confirmed histopathological diagnoses. This minimally invasive approach is an attractive alternative for rare benign malformation cases.

Zhuo CH, Shi DB, Ying MG, Cheng YF, Wang YW, Zhang WM, Cai SJ, Li XX. Laparoscopic segmental colectomy for colonic lymphangiomas: A definitive, minimally invasive surgical option.

*World J Gastroenterol* 2014;

**INTRODUCTION**

Cystic lymphangiomas occur most often in the head, neck, trunk and extremities of children and young adults. Intra-abdominal lymphangiomas, which mostly originate from the mesentery and retroperitoneum, are rare and account for fewer than 5% of all lymphangiomas[[1-3](#_ENREF_1)]. The actual incidence of lymphangiomas in the colon or rectum is unclear. Stout[[4](#_ENREF_4)] reported 4 lymphangiomas among 292 (1.4%) colorectal neoplasms, but as endoscopic examination has become more widespread, colonic lymphangiomas have been reported more frequently[[5](#_ENREF_5)]. Most colonic lymphangiomas are asymptomatic and do not require treatment, but resection is necessary in some specific situations. We herein describe two cases of colonic lymphangiomas treated using laparoscopic segmental bowel resection and we review the relevant medical literature.

**CASE REPORT**

***First case:******laparoscopic segmental resection of the ascending colon for a cystic lesion with a fast growth speed***

A 36-year-old female patient visited our department with a one-year history of mild intermittent abdominal pain at the right lower quadrant. Five years prior, she had been examined at a local hospital with a complaint of chronic constipation; at the time, colonoscopy revealed a 1.5 cm × 1.0 cm submucosal cystic mass at the ascending colon. The patient received conservative management coupled with endoscopic yearly follow-up, and the cystic lesion had recently become enlarged. There was no significant family history or other medical history. The patient was 170 cm in height and weighed 65 kg (BMI, 22 Kg/m2); the ASA grade was 1. She appeared well, and physical examination revealed no remarkable abdominal abnormalities. Laboratory tests, including those measuring tumour markers (CEA, CA125 and AFP), were all within normal limits. Radiographies of the chest and abdomen were normal. Colonoscopy revealed a round, semi-transparent submucosal lesion with a gentle slope and smooth surface at the middle ascending colon (Figure 1A). An abdominopelvic computed tomography (CT) scan showed a 4x4 cm sized, low-density, non-enhancing cystic mass located submucosally at the ascending colon (Figure 2). Endoscopic ultrasonography (EUS) (EUS2000, Olympus, Japan) revealed a 3.9 cm × 3.5 cm lesion visible as an echo-free cyst in the third (submucosal) layer without blood flow. The lesion had a positive cushion (pillow) sign (Figure 3A). The patient underwent laparoscopic segmental resection of the ascending colon.

In brief, five ports were made, with two 12 mm and three 5 mm cannulas placed as previously described[[6](#_ENREF_6)]. The ascending mesocolon was mobilised using a lateral-to-medial approach. The ileocolic pedicle was resected, and the right flexure taken down. The ascending colon was freed and the specimen was extracted through an incision extended from the supraumbilical port site. A segment of involved colon approximately 6-7 cm in length was resected and an side-to-side anastomosis was accomplished extracorporeally using a linear-cutter (Proximate®, Ethicon Endo-Surgery, Cincinnati, OH, United States). The patient had an uneventful recovery and was discharged seven days post-operation. Pathological analysis identified the mass as a submucosal macrocystic lymphangioma (Figure 4A). Annual endoscopic follow-up for 3 years was recommended for the patient.

***Second case:******laparoscopic segmental sigmoidectomy for the cystic mass with concurrent polyps***

A 50-year-old male patient with a history of type 2 diabetes mellitus was admitted for an incidental finding of a lobulated cystic mass at the sigmoid colon. The patient had a history of colorectal polyps and had undergone endoscopic polypectomy 2 years prior. He was asymptomatic and appeared well with a BMI of 22 Kg/m2 and ASA grade 2. Blood chemistry and normal tumour maker (CEA, AFP, CA50 and CA125) tests were normal. Abdominal CT did not show significant abnormality due to bowel flatulence. Colonoscopy revealed that in addition to four sessile polyps ranging from 0.3 to 0.5 cm in diameter, the patient had an extra 3.0 cm × 3.5 cm lobular submucosal lesion located 20-25 cm above the anal verge. The lesion colour did not differ from that of the surrounding normal mucosa, and there were no ulcerations or erosions on the smooth surface (Figure 1B). Endoscopic ultrasonography (EUS2000, Olympus, Japan) revealed multiple internal submucosal septa (Figure 3B). In order to remove the section affected by the cystic lesion and polyps, the patient underwent laparoscopic segmental sigmoidectomy. In brief, five ports were made with two 12 mm and three 5 mm cannulas placed as previously described[[7](#_ENREF_7)]. The inferior mesenteric artery was identified and resected. The descending and sigmoid mesocolon was mobilised, and the specimen was extracted through an incision extending from the suprapubic port. A segment of sigmoid colon, approximately 8 cm in length, was resected extracorporeally. The distal colon was reintroduced into the abdominal cavity after the anvil of the circular stapler was introduced and fixed inside. Pneumoperitoneum was reestablished and a double-stapled anastomosis between the distal colon and the proximal rectal stump was accomplished intra-abdominally. An uncomplicated postoperative recovery was achieved, and the patient was discharged at the sixth day post-operation. The pathologic features were diagnostic of macrocystic lymphangioma (Figure 4B). Annual endoscopic follow-up for at least 3 years was recommended.

**DISCUSSION**

Lymphangioma may be developmentally malformed or malpositioned lymphatic tissue, and, though its exact aetiology remains unclear, genetic abnormalities might also play a role[[8](#_ENREF_8)]. We herein discuss the pathology, diagnostic modality and treatment options for this unusual lymphatic malformation of the colon based on the cases described above.

Macroscopically, colonic lymphangiomas can be classified as one of the following three types: simple (capillary), cavernous and cystic. The cystic type is the most frequently reported[[5](#_ENREF_5)]. Cystic lymphangiomas are yellow, greyish, or yellow-pink in colour, and they often appear as multiple cysts or spongy masses with cavities containing watery or milky fluids[[9](#_ENREF_9)]. Cystic lymphangiomas may be classified into microcystic, macrocystic, and mixed subtypes according to the cyst volume (2 cm3 is used as the cutoff value)[[10](#_ENREF_10)]. Both of our cases were classified as colonic macrocystic lymphangioma. Microscopically, as shown in Figure 4, the macrocystic mass is characterised by thin-walled spaces, which are frequently surrounded by lymph and/or lymphocytes, and is lined by flattened endothelium. The mass is also situated in close proximity to collagenous elastic tissue and smooth muscle[[11](#_ENREF_11)].

Colonic lymphangiomas usually present as submucosal polypoid lesions without any symptomatic presentation. Some patients may experience episodic constipation with vague abdominal distress, diarrhea or other nonspecific symptoms[[9](#_ENREF_9),[12](#_ENREF_12)]. Haemorrhage or anaemia[[13](#_ENREF_13),[14](#_ENREF_14)] and protein-losing enteropathy[[5](#_ENREF_5),[15](#_ENREF_15)] are always associated with surface ulceration or erosion. Acute abdomen obstruction of the volvulus, intussusceptions and bowel may occur when a mass is sufficiently enlarged[[16-18](#_ENREF_16)]. Abdominal pain may mimic acute appendicitis[[12](#_ENREF_12),[19](#_ENREF_19)].

 Most colonic lymphangiomas are preoperatively diagnosed as submucosal tumours using colonoscopy, which is the most commonly used diagnostic modality. Lymphangioma appears as a well-defined, submucosal cystic lesion, typically with a smooth, pinkish, translucent surface[[20](#_ENREF_20)]. Endoscopic ultrasonography is useful for diagnosing colonic lymphangioma. When using EUS, the characteristic features of colonic lymphangioma are lesions localised at the submucosal layer with a homogenous echo pattern and multilocular cysts that are echo-free or contain septal structures[[21](#_ENREF_21)]. Endoscopic aspiration for cytology evaluation or biopsy often has no diagnostic value and may result in an efflux of lymphatic fluid[[20](#_ENREF_20)] or even local infection[[22](#_ENREF_22)]. Abdominal CT may detect non-enhancing submucosal cystic masses and can be recommended to rule out coexisting intraperitoneal co-morbid lesions[[5](#_ENREF_5)]. Both of the cases described here underwent these routine diagnostic modalities, which revealed the characteristic features mentioned above.

Management of colonic lymphangiomas is dependent on their size, growth speed, symptoms and degree of suspected malignancy[[17](#_ENREF_17)]. Malignant transformation of colonic lymphangiomas does not occur[[11](#_ENREF_11)]. Therefore, close endoscopic surveillance can be considered and spontaneous resolution may occur[[13](#_ENREF_13),[23](#_ENREF_23)]. With respect to sclerotherapy for lymphangiomas, agents such as Bleomycin, sodium tetradecyl sulphate, or OK-432 (lyophilised incubation mixture of group A streptococcus pyogenes of human origin) are routinely used. Macrocystic lesions, but not microcystic lesions, respond well to OK-432 injections[[24](#_ENREF_24)]. Most of the reported cases of lymphangioma have occurred in the head and neck of children[[1](#_ENREF_1),[25-27](#_ENREF_25)]. To the best of our knowledge, the use of endoscopic sclerotherapy to treat colonic lesions has not previously been reported. The complications resulting from the use of this therapy, which include local infection, perforation and bleeding, should be considered[[28](#_ENREF_28)]. Other non-surgical therapy, including steroids, fibrin glue, or Ethibloc, has not been established as superior to surgery[[29](#_ENREF_29),[30](#_ENREF_30)].

Colonic lymphangioma can be complicated by concurrent colon cancer or adenoma[[12](#_ENREF_12)]. The mass might form secondarily as a result of lymphatic obstruction and inflammatory processes due to various causes[[13](#_ENREF_13),[30-32](#_ENREF_30)]. Additionally, the potential to grow and invade adjacent structures introduce risks of life-threatening complications[[17](#_ENREF_17)], and, as a result, surgical interventions may be required. In the current cases, they were implicated to surgical intervention for the reason of relatively large and fast growing lesion or lesion with concurrent polyps.

 Endoscopic resection has been recommended for intraluminal tumours with a maximum diameter 2.5 cm or smaller[[12](#_ENREF_12), [21](#_ENREF_21)]. Matsuda *et al*[[12](#_ENREF_12)] reviewed 279 Japanese cases of colorectal lymphangiomas. Of them, 104 (37.4%) patients underwent endoscopic resection. Removing the entire lesion as completely as possible, rather than using mere puncture and drainage, was the most important factor for reducing the risk of recurrence[[20](#_ENREF_20), [33-35](#_ENREF_33)].

In 1996, Kenney *et al*[[36](#_ENREF_36)] reported the first case of laparoscopic excision of a cystic lymphangioma from the mesentery of the proximal jejunum. Ryu *et al*[[37](#_ENREF_37)] reported two cases of huge mesenteric cystic lymphangioma (13 and 11 cm in diameter), both of which were treated laparoscopically, with partial aspiration of the cysts using a spinal needle. Hoffmann *et al.*[[38](#_ENREF_38)] reported a 4.5 cm cystic lesion in the cecal region. The cyst, including its base and a portion of the colon, was resected laparoscopically. However, these cases were all lymphangiomas originating from the mesentery, which is the most commonly involved intra-abdominal site[[20](#_ENREF_20)].

In both of our cases, it was difficult to find the masses laparoscopically because they were located at the submucosal layer. Additionally, both masses were relatively large and could not be removed either laparoscopically or endoscopically while preserving the involved colon. It is critical to preoperatively identify and locate masses using endoscopic staining[[39](#_ENREF_39)]. According to our experience, neither technique makes it challenging nor time consuming to remove the specimen and facilitate anastomosis with a small incision (approximately 4 cm in length). Compared to traditional open approaches, laparoscopic surgery has various advantages, including less intraoperative blood loss, decreased postoperative pain, a shorter hospital stay, minimal scarring, and a faster return to normal activities[[40](#_ENREF_40)].

**AcknowledgementS**

The authors thank Associate Professor Andy Tsun, PhD, from the Unit of Molecular Immunology, Institut Pasteur of Shanghai, Chinese Academy of Sciences, for his help with editing this manuscript.

**COMMENTS**

***Case characteristics***

A 36-year-old female (Case 1) and another 40-year-old male (Case 2) presented with mild intermittent abdominal pain and without specific symptoms, respectively; initially, cystic lesions at the colon were accidentally found using colonoscopy.

***Clinical diagnosis***

An enlarged submucosal cystic mass at the middle ascending colon for Case 1 and a lobular submucosal lesion coupled with four polyps located at the sigmoid colon for Case 2.

***Differential diagnosis***

Other submucosal tumours, such as leiomyoma, lipoma or other cystic lesions, such as enteric duplication cysts and colitis cystica profunda as well as carcinoid tumours or mucocele, should be considered as the differential diagnoses.

***Laboratory diagnosis***

In both cases, the blood chemistry and tumour marker level tests were all within normal limits.

***Imaging diagnosis***

In Case 1, colonoscopy revealed a round semi-transparent submucosal lesion (4 cm × 4 cm), abdominal CT revealed a non-enhancing submucosal cystic mass and EUS revealed an echo-free cyst in the third layer without blood flow. In Case 2, colonoscopy revealed a lobular submucosal lesion (3.0 cm × 3.5 cm) coupled with four polyps (0.3-0.5 cm in diameter) at 20-25 cm above the anal verge; EUS revealed multiple submucosal internal septa.

***Pathological diagnosis***

Pathological analysis revealed the colonic masses in both cases to be macrocystic lymphangiomas.

***Treatment***

Laparoscopic segmental ascending colectomy and sigmoidectomy were performed on Case 1 and Case 2, respectively.

***Related reports***

Both cases had uneventful postoperative recoveries.

***Term explanation***

A laparoscopic segmental colectomy is a minimally invasive procedure that involves removing a portion or segment of the colon.

***Experiences and lessons***

This report not only represents two unusual cases of colonic cystic lymphangiomas, it also suggests that surgical intervention is required in some situations and that the laparoscopic approach is an attractive option for this rare benign malformation.

***Peer review***

This article describes a minimally invasive surgical alternative for managing an unusual condition compared to an endoscopic approach or open surgery. This definitive surgical resection offers more success than endoscopic excision in terms of the relapse rate.

**REFERENCES**

1 **Alqahtani A**, Nguyen LT, Flageole H, Shaw K, Laberge JM. 25 years' experience with lymphangiomas in children. *J Pediatr Surg* 1999; **34**: 1164-1168 [PMID: 10442614]

2 **Bill AH**, Sumner DS. A unified concept of lymphangioma and cystic hygroma. *Surg Gynecol Obstet* 1965; **120**: 79-86 [PMID: 14259790]

3 **Roisman I**, Manny J, Fields S, Shiloni E. Intra-abdominal lymphangioma. *Br J Surg* 1989; **76**: 485-489 [PMID: 2660949]

4 **STOUT AP**. Tumors of the colon and rectum (excluding carcinoma and adenoma). *Surg Clin North Am* 1955; 1283-1288 [PMID: 13267706]

**Kim J**, Han D, Hong CH, Lee HL, Kim JP, Sohn JH, Hahm JS. Colonic lymphangiomatosis associated with protein-losing enteropathy. *Dig Dis Sci* 2005; **50**: 1747-1753 [PMID: 16133983 DOI: 10.1007/s10620-005-2929-6]

6 **Junji O,** Nobuhiko T. Right Colectomy. In: Milsom JW, Bohm B, Nakajima K, Tonohira Y. ed. Laparoscopic Colorectal Surgery, 2nd ed.Springer-Verlag: New York. 2006. pp 128-144.

7 **Joel L**, Margaret H, RubinoFrancesco, Jacques M. Sigmoidectomy. In: Milsom JW, ed. Laparoscopic Colorectal Surgery, 2nd Edition 2006. pp145-169

8 **Wiegand S**, Eivazi B, Barth PJ, von Rautenfeld DB, Folz BJ, Mandic R, Werner JA. Pathogenesis of lymphangiomas. *Virchows Arch* 2008; **453**: 1-8 [PMID: 18500536 DOI: 10.1007/s00428-008-0611-z]

9 **ARNETT NL**, FRIEDMAN PS. Lymphangioma of the colon: roentgen aspects; a case report. *Radiology* 1956; **67**: 882-885 [PMID: 13379644]

10 **Giguère CM**, Bauman NM, Smith RJ. New treatment options for lymphangioma in infants and children. *Ann Otol Rhinol Laryngol* 2002; **111**: 1066-1075 [PMID: 12498366]

11 **Beham A**. Lymphangioma. In: Fletcher CDM, Bridge JA, Hogendoorn P, Mertens F. ed. WHO classification of tumours of soft tissue and bone, 4th ed. IARC: Lyon 2013, PP 144-5

12 **Matsuda T**, Matsutani T, Tsuchiya Y, Okihama Y, Egami K, Yoshioka M, Maeda S, Onda M. A clinical evaluation of lymphangioma of the large intestine: a case presentation of lymphangioma of the descending colon and a review of 279 Japanese cases. *J Nippon Med Sch* 2001; **68**: 262-265 [PMID: 11404774]

13 **Joo SH**, Kim MJ, Kim KW, Lee WJ, Park MS, Lim JS. Spontaneous regression of a cystic tumor in a postpartum woman; is it a cystic lymphangioma? *Yonsei Med J* 2007; **48**: 715-718 [PMID: 17722248]

14 **Chung WC**, Kim HK, Yoo JY, Lee JR, Lee KM, Paik CN, Jang UI, Yang JM. Colonic lymphangiomatosis associated with anemia. *World J Gastroenterol* 2008; **14**: 5760-5762 [PMID: 18837097]

15 **Fujitani M**, Kogo H. [Multiple protrusions on the colonic surface associated with hypoproteinemia]. *Nihon Shokakibyo Gakkai Zasshi* 2009; **106**: 1086-107, 1089 [PMID: 19731469]

16 **Losanoff JE**, Kjossev KT. Mesenteric cystic lymphangioma: unusual cause of intra-abdominal catastrophe in an adult. *Int J Clin Pract* 2005; **59**: 986-987 [PMID: 16033626 DOI: 10.1111/j.1368-5031.2005.00554.x]

17 **Siddique K**, Bhandari S, Basu S. Giant mesenteric lymphangioma: a rare cause of a life-threatening complication in an adult. *BMJ Case Rep* 2010; **2010**: [PMID: 22778193 DOI: 10.1136/bcr.04.2010.2896]

18 **Kim TO**, Lee JH, Kim GH, Heo J, Kang DH, Song GA, Cho M. Adult intussusception caused by cystic lymphangioma of the colon: a rare case report. *World J Gastroenterol* 2006; **12**: 2130-2132 [PMID: 16610070]

19 **Yagci MA**, Sezer A, Yeldan E, Coskun I, Hatipoglu AR, Altaner S, Umit H. Lymphangiomatosis of the colon mimicking acute appendicitis. *Indian J Cancer* 2011; **48**: 139-140 [PMID: 21330770 DOI: 10.4103/0019-509x.76651]

20 **Huguet KL**, Metzger PP, Menke DM. Colorectal lymphangioma. *Am Surg* 2007; **73**: 414-416 [PMID: 17439042]

21 **Jung SW**, Cha JM, Lee JI, Joo KR, Choe JW, Shin HP, Kim KY. A case report with lymphangiomatosis of the colon. *J Korean Med Sci* 2010; **25**: 155-158 [PMID: 20052363 DOI: 10.3346/jkms.2010.25.1.155]

22 **Krishna SG**, Stroehlein JR, Foo WC, Suzuki R, Reddy SR, Bhutani MS. Iatrogenic infection of a colonic cystic lymphangioma following cold-forceps biopsy. *Endoscopy* 2012; **44** Suppl 2 UCTN: E104-E105 [PMID: 22477167 DOI: 10.1055/s-0031-1291568]

23 **Lee JM**, Chung WC, Lee KM, Paik CN, Kim YJ, Lee BI, Cho YS, Choi HJ. Spontaneous resolution of multiple lymphangiomas of the colon: a case report. *World J Gastroenterol* 2011; **17**: 1515-1518 [PMID: 21472113 DOI: 10.3748/wjg.v17.i11.1515]

24 **Banieghbal B**, Davies MR. Guidelines for the successful treatment of lymphangioma with OK-432. *Eur J Pediatr Surg* 2003; **13**: 103-107 [PMID: 12776241 DOI: 10.1055/s-2003-39581]

25 **Ogita S**, Tsuto T, Deguchi E, Tokiwa K, Yanagihara J, Iwai N. [Treatment of lymphangiomas arising around cervico-facial region: surgery, bleomycin therapy and OK-432 therapy]. *Nihon Geka Gakkai Zasshi* 1989; **90**: 1389-1391 [PMID: 2479816]

26 **Ogita S**, Tsuto T, Nakamura K, Deguchi E, Tokiwa K, Iwai N. OK-432 therapy for lymphangioma in children: why and how does it work? *J Pediatr Surg* 1996; **31**: 477-480 [PMID: 8801295]

27 **Wheeler JS**, Morreau P, Mahadevan M, Pease P. OK-432 and lymphatic malformations in children: the Starship Children's Hospital experience. *ANZ J Surg* 2004; **74**: 855-858 [PMID: 15456432 DOI: 10.1111/j.1445-1433.2004.03115.x]

28 **Kumar V**, Kumar P, Pandey A, Gupta DK, Shukla RC, Sharma SP, Gangopadhyay AN. Intralesional bleomycin in lymphangioma: an effective and safe non-operative modality of treatment. *J Cutan Aesthet Surg* 2012; **5**: 133-136 [PMID: 23060708 DOI: 10.4103/0974-2077.99456]

29 **Steyaert H**, Guitard J, Moscovici J, Juricic M, Vaysse P, Juskiewenski S. Abdominal cystic lymphangioma in children: benign lesions that can have a proliferative course. *J Pediatr Surg* 1996; **31**: 677-680 [PMID: 8861480]

30 **Losanoff JE**, Richman BW, El-Sherif A, Rider KD, Jones JW. Mesenteric cystic lymphangioma. *J Am Coll Surg* 2003; **196**: 598-603 [PMID: 12691938 DOI: 10.1016/s1072-7515(02)01755-6]

31 **Kim JH**, Ryu WS, Min BW, Song TJ, Son GS, Kim SJ, Kim YS, Um JW. Acquired omental cystic lymphangioma after subtotal gastrectomy: a case report. *J Korean Med Sci* 2009; **24**: 1212-1215 [PMID: 19949686 DOI: 10.3346/jkms.2009.24.6.1212]

32 **Kim KM**, Choi KY, Lee A, Kim BK. Lymphangioma of large intestine: report of ten cases with endoscopic and pathologic correlation. *Gastrointest Endosc* 2000; **52**: 255-259 [PMID: 10922105 DOI: 10.1067/mge.2000.107710]

33 **Shimura H**, Ueda J, Ogawa Y, Ichimiya H, Tanaka M. Total excision of mesenteric cysts by laparoscopic surgery: report of two cases. *Surg Laparosc Endosc* 1997; **7**: 173-176 [PMID: 9109254]

34 **Vu JH**, Thomas EL, Spencer DD. Laparoscopic management of mesenteric cyst. *Am Surg* 1999; **65**: 264-265 [PMID: 10075306]

35 **Pickhardt PJ**, Kim DH, Menias CO, Gopal DV, Arluk GM, Heise CP. Evaluation of submucosal lesions of the large intestine: part 2. Nonneoplastic causes. *Radiographics* ; **27**: 1693-1703 [PMID: 18025512 DOI: 10.1148/rg.276075028]

36 **Kenney B**, Smith B, Bensoussan AL. Laparoscopic excision of a cystic lymphangioma. *J Laparoendosc Surg* 1996; **6** Suppl 1: S99-101 [PMID: 8832938]

37 **Ryu WS**, Kwak JM, Seo UH, Kim SH, Park SS, Kim CS, Lee CH, Mok YJ. Laparoscopic treatment of a huge cystic lymphangioma: partial aspiration technique with a spinal needle. *J Laparoendosc Adv Surg Tech A* 2008; **18**: 603-605 [PMID: 18721013 DOI: 10.1089/lap.2007.0145]

38 **Hoffmann J**, Kirschniak A, Scharf G, von Feilitzsch M, Königsrainer A, Zdichavsky M. Laparoscopic resection of a lymphangiomatous cyst of the colon: a case report. *J Med Case Rep* 2011; **5**: 431 [PMID: 21892928 DOI: 10.1186/1752-1947-5-431]

39 **Yeung JM**, Maxwell-Armstrong C, Acheson AG. Colonic tattooing in laparoscopic surgery-making the mark? *Colorectal Dis* 2009; **11**: 527-530 [PMID: 19175629 DOI: 10.1111/j.1463-1318.2008.01706.x]

40 **Schwenk W**, Haase O, Neudecker J, Müller JM. Short term benefits for laparoscopic colorectal resection. *Cochrane Database Syst Rev* 2005; (3): CD003145 [PMID: 16034888 DOI: 10.1002/14651858.CD003145.pub2]

**P-Reviewers:** Luigi A, Oliveira C **S-Editor:** Qi Y

**L-Editor: E-Editor:**

**Figure 1** **Endoscopic findings for the two cases. A round, semi-transparent and wide-based submucosal lesion at the ascending colon in Case 1 (A) and a sharply marginated, lobular submucosal lesion at the sigmoid colon in Case 2 (B) with gentle slopes and smooth surfaces are noted.** Left bottom of Figure 1A shows that when the patient's position was altered, the shape of the mass changed and was fluctuant on palpation.

**Figure 2** **Abdominopelvic computed tomography scan for Case 1 revealed a cystic mass (indicated by white arrow) located at the ascending colon, which was visible in a non-contrast scan (A) and was not enhanced after the arterial phase (B).**

**Figure 3** **Endoscopic ultrasonography images of the two cases obtained using a catheter EUS probe.** A: Elevated lesions as echo-free, homogenous cysts in Case 1 (frequency 6 MHz); B: Multiple septal walls (indicated by white arrow) in Case 2 (frequency 12 MHz); EUS revealed that both lesions were located in the third (submucosal) layer (indicated by white asterisk).

**Figure 4 Histopathological examination of the two cases after HE stain (at × 40 magnification for low power field images).** A: Case 1 revealed a dilated submucosal cyst lined with a single layer of endothelial cells (left bottom, HE stain, (× 200); B: Case 2 displayed lymphatic vessels of varied sizes, which were covered by a flattened layer of lymphatic epithelium. The smooth muscle layer of the vessels is also noted (right bottom, HE stain, × 400).