Mucosa-associated lymphoid tissue lymphoma with unusual ¹⁸F-FDG hypermetabolism arising at the colorectal anastomosis

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Mucosa-associated lymphoid tissue (MALT) lymphoma usually originates from the stomach and presents with low ¹⁸F-fluorodeoxyglucose (FDG) avidity with average maximum standard uptake value of 3.6. Colorectal MALT lymphoma is a rare entity that contributes to 1.6% of all MALT lymphomas and < 0.2% of large intestinal malignancies. The case reported herein firstly revealed stage ⅡE MALT lymphoma with unexpected higher ¹⁸F-FDG avidity of 18.9 arising at the colorectal anastomosis in a patient with a surgical history for sigmoid adenocarcinoma, which was strongly suspected as local recurrence before histopathological and immunohistochemical examinations. After accurate diagnosis, the patient received four cycles of standard R-CVP regimen (rituximab, cyclophosphamide, vincristine and prednisone), combined target therapy and chemotherapy, instead of radiotherapy recommended by National Comprehensive Cancer Network guidelines. He tolerated the treatment well and reached complete remission.

Key words: Colorectal anastomosis; Mucosa-associated lymphoid tissue lymphoma; Etiopathogenesis; Unusual ¹⁸F-FDG hypermetabolism; ¹⁸F-FDG-PET/CT imaging; Patient-tailored treatment

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The colonoscopy revealed an elevated lesion of approximately 5 cm × 6 cm at the colorectal anastomotic site. The lesion with a centric ulceration was ill defined and irregular in shape.

INTRODUCTION

In 1983, Isaacson and Wright first described extranodal marginal zone B-cell lymphoma of mucosa-associated lymphoid tissue (MALT), most of which occurred in the stomach (> 50%) followed by parotid and salivary glands, skin, conjunctiva, head and neck, lung, thyroid and breast [1,2]. By contrast, colorectal MALT lymphoma only contributes to 1.6% of all MALT lymphomas [3], and total colorectal lymphomas only account for 0.2% of large intestinal malignancies, with an annual incidence of 1.6 per million [4]. These results indicate the low incidence of colorectal MALT lymphoma, as well as MALT lymphoma arising at the colorectal anastomosis. Here, we report a case of colorectal MALT lymphoma with unexpected high 18F-fluorodeoxyglucose (FDG) avidity, arising at the colorectal anastomosis in a patient treated surgically for sigmoid adenocarcinoma. Based on this case, we discuss the possible etiopathogenesis, 18F-FDG-positron emission tomography (PET)/computed tomography (CT) imaging and treatment strategy for colorectal MALT lymphoma.

CASE REPORT

A 75-year-old man underwent radical surgery for sigmoid colon cancer in 2013. During that operation, the sigmoid colon was completely removed and the colorectal anastomosis was stitched at 16 cm cranial to the anal verge. Pathological diagnosis presented moderately differentiated ulcerative sigmoid adenocarcinoma of T3N0M0 stage without any high-risk factors. As a consequence, the patient was released from our hospital, eschewing adjuvant radiochemotherapy. Two years later, the patient was admitted for a 2-mo history of abdominal pain, alternate episodes of diarrhea and constipation, and tenesmus. There were no purulent or bloody stools. The results of laboratory tests including tumor markers, complete blood count and lactate dehydrogenase were normal. Hepatitis B surface antigen and hepatitis B core antibody were positive, which indicated previous infection with hepatitis B virus. Hepatitis C virus (HCV) infection was excluded. Colonoscopy revealed an elevated lesion of approximately 5 cm × 6 cm at the colorectal anastomosis (Figure 1). The lesion with central ulceration was ill defined and irregular in shape. Multiple random biopsies were taken. Given the possibility of anastomotic recurrence, 18F-FDG-PET/CT was performed to assess the metabolism of the lesion and the extent of involvement. The images presented FDG hypermetabolism at the anastomotic site and paracolic lymph nodes, with higher maximum standard uptake value (SUVmax) of 18.9 and 6.8, respectively (Figure 2). One week later, histopathological examination of biopsy specimens showed infiltration of morphologically heterogeneous small B cells, including centrocyte-like cells with irregular nuclei and less cytoplasm (Figure 3A). As the hallmark of MALT lymphoma, lymphoepithelial lesions were observed with sheets of small to medium-sized, irregular, neoplastic lymphoid cells effacing the glandular architecture (Figure 3B). The infiltrating cells were immunohistochemically positive for CD20, CD79a, CD43, BCL-2 (Figure 4) and Ki-67, but negative for CD5, CD10 and cyclin D1 (Figure 5).

These results supported a final pathological diagnosis of MALT lymphoma. After diagnosis, a urea breath test was performed, which excluded Helicobacter pylori (H. pylori) infection. Bone marrow infiltration was not detected. According to Ann Arbor staging, the MALT lymphoma was classified as IIE. The patient received four cycles of immunochemotherapy with standard R-CVP regimen (rituximab 700 mg d0,
cyclophosphamide 1.2 g d1, vincristine 2 mg d1 and prednisone 100 mg d1-5, q3w). Treatment was well tolerated. After four cycles of treatment, the patient was asymptomatic and the therapeutic evaluation reached complete remission (Figures 6 and 7).

**DISCUSSION**

Extranodal marginal zone B-cell lymphoma of MALT is a distinct clinical entity that can originate from a wide variety of organs. The stomach is the most frequent site for MALT lymphoma and has been extensively studied in many aspects, including etiopathogenesis, PET/CT characteristics, and antibiotic treatment of patients with *H. pylori* infection. Due to the rarity of the disease, MALT lymphoma arising at the colorectal anastomosis has not been thoroughly investigated. However, considering its origin, colorectal MALT lymphoma may have its own unique characteristics, which should be discussed in detail.

**Etiopathogenesis for anastomotic MALT lymphoma**

To adapt to the postoperative changes and promote the incision healing, the colonic anastomosis is...
B. burgdorferi, C. jejuni, C. psittaci and HCV, that triggers a chronic antigenic stimulus harboring dense clonal B-cell proliferation is the formal initiation of MALT lymphomagenesis\cite{5}. The proliferative B cells capable of proliferative instability and enhanced immunologic reaction to antigen, which makes it as a potentially fertile field for lymphomagenesis. While, persistent pathogen infection, such as H. pylori, B. burgdorferi, C. jejuni, C. psittaci and HCV, that triggers a chronic antigenic stimulus harboring dense clonal B-cell proliferation is the formal initiation of MALT lymphomagenesis\cite{5}. The proliferative B cells
Highly expressed, which presented a suspicion that the apoptosis inhibitor BCL2 was required for non-gastric MALT lymphoma. However, the apoptosis inhibitor BCL2 was highly expressed, which presented a suspicion that the MALT lymphoma might be caused by chromosomal translocation t(11;18)(q21;q21) through BCR-independent NF-κB pathway.

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\[\text{FDG-PET/CT imaging for MALT lymphoma}\]

Due to a partial mucosal immunity linking various organs involved in mucosal immunity, a third of patients present with disseminated MALT lymphoma at diagnosis\[13\]. Therefore, visual diagnostic imaging of MALT lymphoma is important for staging, determining the optimal therapeutic strategy and evaluating post-treatment response. Although controversy still exists for variable FDG avidity of MALT lymphoma, \[16\]FDG-PET/CT has gradually emerged as an important imaging modality for management of MALT lymphoma\[14\].

Although two early retrospective studies of Hoffmann et al\[15,16\] reported absence of \[16\]FDG avidity in total 24 patients with MALT lymphoma, increasing data indicated that imaging with \[16\]FDG PET is useful for lesion detection. In the consensus of the International Conference on Malignant Lymphomas Imaging Working Group, the \[16\]FDG avidity of MALT lymphoma varied from 54% to 81% before treatment\[17\]. Beal et al\[18\] retrospectively reviewed 42 patients with MALT lymphoma and reported that 81% of the lesions demonstrated \[16\]FDG avidity with a median SUV\text{\textsubscript{max}} of 5.5. Karam et al\[19\] compared the sensitivity of PET and CT. PET outperformed CT in the depiction of MALT lymphoma with sensitivity of 85% vs 57%. Based on the theory that integrating the PET scanner and helical CT provides more sensitive and specific images\[20\], Carrillo-Cruz et al\[21\] analyzed PET/CT images of 40 patients with marginal zone B-cell lymphoma and found that PET/CT had a significant advantage in detecting more involved lesions through abnormal FDG avidity. The sensitivity of PET/CT was as high as 95.5% for extranodal lesions, while the sensitivity of CT was only 67%. Apart from the...
important roles in discovering lesions and staging, the exceptionally high FDG avidity before treatment can also present suspicion of DLBCL transformation and help to determine the repeat biopsy site [22]. In the retrospective study of Carrillo-Cruz et al [21], there was a case of MALT lymphoma showing DLBCL transformation with $SUV_{\text{max}}$ as 37. Karam et al [19] reported that the mean $SUV_{\text{max}}$ was 11.2 in large B-cell transformed MALT lymphoma, while for non-transformed MALT lymphoma, the mean $SUV_{\text{max}}$ was 3.7.

$^{18}$F-FDG / PET is essential for initial staging of MALT lymphoma, while studies have presented that the even more clinically important role is its ability to evaluate response to treatment through FDG avidity changes and direct subsequent clinical decision-making. In the research of Mayerhoefer et al [23], it showed that interim $^{18}$F-FDG-PET can predict the end-of-treatment outcome after three cycles of rituximab-based therapy in patients with MALT lymphoma, the mean $SUV_{\text{max}}$ was 3.7.

$^{18}$F-FDG / PET is essential for initial staging of MALT lymphoma, while studies have presented that the even more clinically important role is its ability to evaluate response to treatment through FDG avidity changes and direct subsequent clinical decision-making. In the research of Mayerhoefer et al [23], it showed that interim $^{18}$F-FDG-PET can predict the end-of-treatment outcome after three cycles of rituximab-based therapy in patients with MALT lymphoma. Lesion-based cut-off value for separation of complete remission from other outcomes (i.e., CR vs PR + SD) was -11.74% for $\Delta S U V_{\text{max}}$, which meant that patients with a $S U V_{\text{max}}$ reduction more than 11.74% would have a better prognosis [23]. In the series of Beal et al [18], eight patients with MALT lymphoma accepted a PET/CT examination after first-line treatment. Among them, 3 patients attained a complete remission with no focal or diffuse FDG avidity above background in a location incompatible with normal anatomy/physiology, and 2 patients reached a partial response without relapse after 6 and 18 mo. Carrillo-Cruz et al [21] evaluated patients’ post-treatment response with PET/CT, which revealed 10 of 15 patients had a negative PET/CT. Remarkably, none of them relapsed, and the 3-year OS reached 100%, reflecting a negative predictive value of 100%. Perry et al [24] followed up 12 patients with MALT lymphoma using PET/CT [median follow up 21 mo (6-48 mo)]. PET/CT showed subsequent biopsy proven relapse in three patients and disease progression in another patient [24].

In our case, the PET/CT was also successfully used in the management of MALT lymphoma, including lesions detection and response evaluation. Although larger-scale clinical trials are required to further confirm these data, we can conclude that PET/CT is a valuable imaging tool for both staging and response assessment in patients with MALT lymphoma.

**Patient-tailored treatment**

NCCN guidelines (version 1.2016) recommend involved-site radiotherapy (24-30 Gy) for patients with stage I / II non-gastric MALT lymphomas. For our case, with specific disadvantages and technical limitations in irradiating the bowel, the radiation regimen may not be suitable and patient-tailored treatment strategy should be made. First of all, the peristalsis of the colon could lead to the movement of irradiated target volume, which results in the incompatibility between the radiation field and the target tumor volume. Second, the small intestine adjacent to the lesion is...
easily injured during radiotherapy. Radiation toxicity of the small intestine can be induced even at doses as low as 1-2 Gy\(^\text{25}\). Acute adverse events during or following radiotherapy include pain, bloating, nausea, diarrhea, tenesmus, and intestinal ulcer or perforation, which largely compromise patients' quality of life. Chronic complications mainly manifest as intestinal obstruction and vascular sclerosis\(^\text{26}\).

In addition, patients with older age, low body mass index, and previous abdominal or pelvic surgery are at higher risk of small intestinal injury, due to the decreased blood flow to the bowel wall\(^\text{27}\). Taking all these factors into consideration, this patient with older age and previous radical surgery for sigmoid colon cancer was not suitable for radiotherapy. As an alternative, surgical excision may achieve favorable local control for stage I / II MALT lymphoma located in the lung, colon and small intestine. However, it is more traumatic for an older patient to undergo a second operation. Furthermore, there are often adhesions after the previous surgery and the new lesion located at the anastomosis may be difficult to handle\(^\text{28}\). Recommended by the newest guidelines in ESMO consensus conference, systemic chemotherapy such as a CVP regimen or immunotherapy, or their combination, can be effective for MALT lymphoma in all stages and achieve a better 5-year event-free survival\(^\text{29,30}\). In this specific case, the patient received four cycles of immunochemotherapy with standard R-CVP regimen and reached complete remission.
Zhang NS et al. MALT lymphoma arising at colorectal anastomosis indicates that treatment strategy should be tailored to each specific site, considering that MALT lymphoma originates from a wide variety of organs.

The present case highlights the possibility of development of metachronous neoplasms at the colorectal anastomosis, especially rare MALT lymphoma with unusual 18F-FDG hypermetabolism. Chromosomal translocation leading to the activation of the NF-κB pathway in proliferative B cells stimulated by pathogens may explain the etiopathogenesis of MALT lymphoma. Despite being indolent, MALT lymphoma can be successfully imaged by 18F-FDG-PET/CT and show high 18F-FDG avidity, which indicates that PET/CT imaging should be added as an essential examination to the workup of MALT lymphoma. Furthermore, considering that MALT lymphoma originates from a wide variety of organs, patient-tailored treatment strategies, including radiotherapy, chemotherapy and immunotherapy, are necessary.

Case characteristics
The patient had an elevated lesion with unexpected higher 18F-fluorodeoxyglucose (FDG) avidity of 18.9 arising at the colorectal anastomosis.

Clinical diagnosis
A mass at the colorectal anastomosis.

Differential diagnosis
The differential diagnosis includes local recurrence and other lymphomas, such as mantle cell lymphoma and follicular lymphoma, which can be differentiated by histopathological and immunohistochemical examination.

Laboratory diagnosis
All laboratory values were within normal limits.

Imaging diagnosis
Colonoscopy revealed an elevated lesion of approximately 5 cm × 6 cm in size at the colorectal anastomosis and 18F-FDG-positron emission tomography/computed tomography images presented with FDG hypermetabolism at the anastomotic site and paracolic lymph nodes, with much higher maximum standard uptake value of 18.9 and 6.8, respectively.

Pathological diagnosis
Histopathological and immunohistochemical examination indicated mucosa-associated lymphoid tissue (MALT) lymphoma.

Treatment
The patient received four cycles of immunochemotherapy with standard R-CVP regimen (rituximab 700 mg d0, cyclophosphamide 1.2 g d1, vincristine 2 mg d1 and prednisone 100 mg d1-5, q3w).

Related reports
MALT lymphoma arising at the colorectal anastomosis is rare.

Term explanation
MALT lymphoma is a B-cell malignancy that originates from B lymphocytes that are normally present in the marginal zone of lymphoid follicles that can be found in the mucosal lymphoid tissues.

Experiences and lessons
This case highlighted the possibility of development of metachronous neoplasms at the colorectal anastomosis, especially rare MALT lymphoma with unusual 18F-FDG hypermetabolism.

Peer-review
The authors described an interesting and rare case of colonic MALT lymphoma arising from the anastomotic site after a sigmoidectomy for malignancy.

REFERENCES
1. Isaacson P, Wright DH. Malignant lymphoma of mucosa-associated lymphoid tissue. A distinctive type of B-cell lymphoma. Cancer 1983; 52: 1410-1416 [PMID: 6938585]
2. Olszewski AJ, Castillo JJ. Survival of patients with marginal zone lymphoma: analysis of the Surveillance, Epidemiology, and End Results database. Cancer 2013; 119: 629-638 [PMID: 22893605 DOI: 10.1002/cncr.27773]
3. Hahn JS, Kim YS, Lee YC, Yang WI, Lee SY, Suh CO. Eleven-year experience of low grade lymphoma in Korea (based on REAL classification). Jonsei Med J 2003; 44: 757-770 [PMID: 14584090 DOI: 10.3340/ynmj.2003.44.5.757]
4. Fan CW, Changehien CR, Wang JY, Chen JS, Hsu KC, Tang R, Chiang JM. Primary colorectal lymphoma. Dis Colon Rectum 2000; 43: 1277-1282 [PMID: 11005497]
5. Guidoboni M, Ferreri AJ, Ponzoni M, Doglioni C, Dolcetti R. Infectious agents in mucosa-associated lymphoid tissue-type lymphomas: pathogenic role and therapeutic perspectives. Clin Lymphoma Myeloma 2006; 6: 289-300 [PMID: 16507206 DOI: 10.3816/CLM.2006.n.003]
6. Young RM, Shaffer AL, Phelan JD, Staudt LM. B-cell receptor signaling in diffuse large B-cell lymphoma. Semin Hematol 2015; 52: 77-85 [PMID: 25805587 DOI: 10.1053/j.seminhematol.2015.01.008]
7. Zhang Y, Wei Z, Li J, Liu P. Molecular pathogenesis of lymphomas of mucosa-associated lymphoid tissue—from (auto)antigen driven selection to the activation of NF-κB signaling. Sci China Life Sci 2015; 58: 1246-1255 [PMID: 26612043 DOI: 10.1007/s11427-015-4977-2]
8. Streubel B, Simonitsch-Klupp I, Müllauer L, Lamprecht A, Haber D, Siebert R, Stolte M, Trautung F, Lukas J, Püspök A, Formanek M, Assanasen T, Müller-Hermelink HK, Cerroni L, Raderer M, Chott A. Variable frequencies of MALT lymphoma-associated genetic aberrations in MALT lymphomas of different sites. Leukemia 2004; 18: 1722-1726 [PMID: 15356642 DOI: 10.1038/sj.leu.2403501]
9. Lucas PC, Yonezumi M, Inohara N, McAllister-Lucas LM, Abazeed ME, Chen FF, Yamaoka S, Seto M, Nunez G. Bcl10 and MALT1, independent targets of chromosomal translocation in MALT lymphoma, cooperate in a novel NF-κB signaling pathway. J Biol Chem 2001; 276: 19012-19019 [PMID: 11262391 DOI: 10.1074/jbc.M009984200]
10. Streubel B, Lamprecht A, Dierlamm J, Cerroni L, Stolte M, Ott G, Raderer M, Chott A. T(14; 18)(q32; q21) involving IGH and MALT1 is a frequent chromosomal aberration in MALT lymphoma. Blood 2003; 101: 2335-2339 [PMID: 12406890 DOI: 11.1122/blood-2002-09-2963]
11. Sanchez-Izquierdo D, Buchonnet G, Siebert R, Gascoyne RD, Climente J, Karran L, Marin M, Blesa D, Horsman D, Rosenwald A, Staudt LM, Albertson DG, Du MQ, Ye H, Marynen P, Garcia-Conde J, Pinkel D, Dyer MJ, Martinez-Climent JA. MALT1 is deregulated by both chromosomal translocation and amplification in B-cell non-Hodgkin lymphoma. Blood 2003; 101: 4539-4546 [PMID: 12560219 DOI: 10.1182/blood-2002-10-3236]
12. Bhattacharyya S, Borthakur A, Tyagi S, Gill R, Chen ML, Dudeja PK, Tobinm SJ, B-cell CLL/lymphoma 10 (BCL10) is required for NF-kappaB production by both canonical and
noncanonical pathways and for NF-kappaB-inducing kinase (NIK) phosphorylation. J Biol Chem 2010; 285: 522-530 [PMID: 19897484 DOI: 10.1074/jbc.M109.050815]

13 Thieblemont C, Berger F, Dumontet C, Mouillet I, Bouafia F, Felman P, Salles G, Coiffier B. Mucosa-associated lymphoid tissue lymphoma is a disseminated disease in one third of 158 patients analyzed. Blood 2000; 95: 802-806 [PMID: 10648389]

14 Zucca E, Conconi A, Pedrinis E, Cortelazzo S, Motta T, Gospodarowicz MK, Patterson BJ, Ferreri AJ, Ponzi M, Devizzi L, Giardini R, Pinotti G, Capella C, Zinzani PL, Pileri S, López-Guillermo A, Campo E, Ambrosetti A, Baldini L, Cavalli F; International Extranodal Lymphoma Study Group. Nongastric marginal zone B-cell lymphoma of mucosa-associated lymphoid tissue. Blood 2003; 101: 2489-2495 [PMID: 12456507 DOI: 10.1182/blood-2002-04-1279]

15 Hoffmann M, Kletter K, Dietmiling M, Becherer A, Pfeffel F, Petkov V, Chott A, Raderer M. Positron emission tomography with fluorine-18-2-fluoro-2-deoxy-D-glucose (F18-FDG) does not visualize extranodal B-cell lymphoma of the mucosa-associated lymphoid tissue (MALT)-type. Ann Oncol 1999; 10: 1185-1189 [PMID: 10586335]

16 Hoffmann M, Kletter K, Becherer A, Jäger U, Chott A, Raderer M. 18F-fluorodeoxyglucose positron emission tomography (18F-FDG-PET) for staging and follow-up of marginal zone B-cell lymphoma. Oncology 2003; 64: 336-340 [PMID: 12759529]

17 Barrington SF, Mikaelen NG, Kostokoglu L, Meignan M, Hutchings M, Müeller SP, Schwartz LH, Zucchi E, Fisher RJ, Trotman J, Hoeckstra OS, Hicks RJ, O’Doherty MJ, Hustinx R, Biggi A, Cheson BD. Role of imaging in the staging and response assessment of lymphoma: consensus of the International Conference on Malignant Lymphomas Imaging Working Group. J Clin Oncol 2014; 32: 3048-3058 [PMID: 25113771 DOI: 10.1200/JCO.2013.53.5229]

18 Beal KP, Yeung HW, Yahalom J. FDG-PET scanning for detection and staging of extranodal marginal zone lymphomas of the MALT type: a report of 42 cases. Ann Oncol 2005; 16: 473-480 [PMID: 15668266 DOI: 10.1093/annonc/mdi093]

19 Karam M, Novak L, Cyriac J, Ali A, Nazeer T, Ngiuri F. Role of fluorine-18 fluorodeoxyglucose positron emission tomography scan in the evaluation and follow-up of patients with low-grade lymphomas. Cancer 2006; 107: 175-183 [PMID: 16721817 DOI: 10.1002/cncr.21967]

20 Seam P, Juwheid ME, Cheson BD. The role of FDG-PET scans in patients with lymphoma. Blood 2007; 110: 3507-3516 [PMID: 17709603 DOI: 10.1182/blood-2007-06-097238]

21 Carrillo-Cruz E, Marín-Oyaga VA, de la Cruz Vicente F, Borrego-Dorado I, Ruiz Mercado M, Acevedo Báñez I, Solé Rodríguez M, Fernández López R, Pérez Vega H, Calderón-Cabrera C, Espigado Tocino I, Pérez-Simón JA, Vázquez-Albertino R. Role of 18F-FDG-PET/CT in the management of marginal zone B cell lymphoma. Hematol Oncol 2015; 33: 151-158 [PMID: 25407794 DOI: 10.1002/hon.2181]

22 Park SH, Lee JI, Kim HO, Lee DY, Suh C, Jung HY, Choi KD, Kim do H, Huh J, Ryu JS. 18F-Fluorodeoxyglucose (FDG)-positron emission tomography/computed tomography in mucosa-associated lymphoid tissue lymphoma: variation in 18F-FDG avidity according to site involvement. Leuk Lymphoma 2015; 56: 3288-3294 [PMID: 25804932 DOI: 10.1080/10428194.2015.1030640]

23 Mayerhofer ME, Karanakis G, Kletter K, Kiesewetter B, Weber M, Rausch I, Pones M, Simonitsch-Klupp I, MÜllauer L, Dolak W, Lukas J, Raderer M. Can Interim 18F-FDG PET or Diffusion-Weighted MRI Predict End-of-Treatment Outcome in FDG-Avid MALT Lymphoma After Rituximab-Based Therapy?: A Preliminary Study in 15 Patients. Clin Nucl Med 2016; 41: 837-845 [PMID: 27648705 DOI: 10.1097/RLU.0000000000000193]

24 Perry C, Herishanu Y, Metzer U, Bairey O, Ruchlemer R, Trejo L, Naparstek E, Sapir EE, Polliaic A. Diagnostic accuracy of PET/CT in patients with extranodal marginal zone MALT lymphoma. Eur J Haematol 2007; 79: 205-209 [PMID: 17662066 DOI: 10.1111/j.1600-0609.2007.00895.x]

25 Garg S, Zheng J, Wang J, Authier S, Pouliot M, Hauer-Jensen M. Segmental Differences in Radiation-Induced Alterations of Tight Junction-Related Proteins in Non-Human Primate Jejunum, Ileum and Colon. Radiat Res 2016; 185: 50-59 [PMID: 26720804 DOI: 10.1667/RR14157.1]

26 Andreyev HJ, Davidson SE, Gillespie C, Allum WH, Swarbrick E. Practice guidance on the management of acute and chronic gastrointestinal problems arising as a result of treatment for cancer. Gut 2012; 61: 179-192 [PMID: 22057051 DOI: 10.1136/gutjnl-2011-300563]

27 Hauer-Jensen M, Wang J, Donham JW. Bowel injury: current and evolving management strategies. Semin Radiat Oncol 2013; 13: 357-371 [PMID: 12903023]

28 Mazza P, Dimiglio A. Fractures of the lower end of the humerus in children: diagnosis, complications, treatment. Rev Prat 2001; 51: 1825-1831 [PMID: 11795130]

29 Zucca E, Conconi A, Laszlo D, López-Guillermo A, Bouabdallah R, Coiffier B, Sebban C, Jardin F, Vitolo U, Morschhauser F, Pileri SA, Copie-Bergman C, Campo E, Jack A, Floriani L, Johnson P, Martelli M, Cavalli F, Martinelli G, Thieblemont C. Addition of rituximab to chlorambucil produces superior event-free survival in the treatment of patients with extranodal marginal-zone B-cell lymphoma: 5-year analysis of the IELSG-19 Randomized Study. J Clin Oncol 2013; 31: 565-572 [PMID: 23295789 DOI: 10.1200/JCO.2011.40.6272]

30 Conconi A, Martinelli G, Thieblemont C, Ferreri AJ, Devizzi L, Peccatori F, Ponzi M, Pedrinis E, Dell’Oro S, Pruneri G, Filippazi V, Dietrich PY, Gianni AM, Coiffier B, Cavalli F, Zucchi E. Clinical activity of rituximab in extranodal marginal zone B-cell lymphoma of MALT type. Blood 2003; 102: 2741-2745 [PMID: 12842999 DOI: 10.1182/blood-2002-11-3496]
