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Non-Hodgkin's gastrointestinal lymphoma presenting as acute abdomen

Linfoma no Hodgkin gastrointestinal presentándose como abdomen agudo

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Palabras clave:
Linfoma, intestino delgado, hemorragia, abdomen agudo.

ABSTRACT

Non-Hodgkin lymphoma is an uncommon cancer, but when it is a primary lymphoma, the gastrointestinal tract is the most commonly involved and one of the most common extra-nodal sites. Multiple risk factors have been associated. However, its etiology is still unknown. Nowadays there exist histochemical markers to distinguish different cell types, criteria, and scales to differentiate between primary and secondary intestinal lymphomas. The definitive diagnosis is obtained with a histopathologic and immunohistochemical study of the extracted surgical piece. Some studies such as endoscopy, CAT scan or capsule endoscopy and double balloon enteroscopy have gained importance in the diagnosis and treatment. Video endoscopy and endoscopic ultrasound have been useful to assist major complications, and the endoscopic ultrasound-guided fine-needle aspiration has been of high impact. Its presentation as an acute surgical abdominal syndrome is rare and commonly denotes an advanced stage and poor prognosis, depending on the structures involved. Treatment depends on the stage in which the patient is found, and in the majority of cases occurs in advanced stages, when the symptoms and complications are evident. We report the case of a 57- year-old male patient, who underwent surgery after presenting with an acute abdomen secondary to rupture of a small intestine lymphoma that caused an intra-abdominal hemorrhage.

RESUMEN

El linfoma no Hodgkin es una neoplasia poco común, pero cuando se trata de un linfoma primario, el tracto gastrointestinal es el sitio más comúnmente implicado y una de las presentaciones extranodales más frecuentes. Se han asociado múltiples factores de riesgo; sin embargo, aún se desconoce su etiología. Actualmente existen marcadores histoquímicos que permiten diferenciar los distintos tipos celulares así como los criterios y escalas para distinguir entre linfomas intestinales primarios y secundarios. El diagnóstico definitivo se logra con el estudio histopatológico e inmunohistoquímico de la pieza extraída quirúrgica o endoscópicamente. Estudios como la tomografía axial computarizada, o más recientemente la cápsula endoscópica y la enteroscopia con doble balón, han cobrado importancia en el diagnóstico y tratamiento de esta entidad, de tal manera que la videoendoscopia y el ultrasonido endoscópico son útiles en el tratamiento de las principales complicaciones como la hemorragia oculta y el uso de la biopsia por aspiración con aguja fina guiada por ultrasonido endoscópico para conseguir mayor impacto en el diagnóstico. Su presentación como abdomen agudo quirúrgico es poco frecuente y comúnmente denota un estadio avanzado y de mal pronóstico, dependiendo de las estructuras involucradas. El tratamiento depende del estadio en el que se encuentra el paciente, el cual en la mayoría de las veces se presenta en estadios avanzados cuando la sintomatología y las complicaciones son evidentes, abarcando desde resección quirúrgica en estadios tempranos hasta quimioterapia y radioterapia en estadios avanzados. Se presenta el caso de un paciente de 57 años de edad, quien fue intervenido quirúrgicamente por padecer de abdomen agudo secundario a ruptura de linfoma dependiente de intestino delgado, que provocó abdomen agudo de origen hemorrágico.

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INTRODUCTION

Primary gastrointestinal lymphoma (PGIL) is a rare disease that occurs in the gastrointestinal tract, with the extra-nodal site being most commonly affected.[1] About 5-20% of extra-nodal lymphomas occur in the gastrointestinal (GI) tract; however, PGIL accounts for only 1-4% of all GI tumors.[2] PGIL can occur anywhere in the GI tract, but the most common sites are the stomach, small intestine, ileocecal region, and colorectal.[3,4] Its etiology is not yet known, but several factors have been linked to its pathogenesis, including infection with *Helicobacter pylori*, human immunodeficiency virus, celiac disease, *Campylobacter jejuni*, Epstein-Barr virus, hepatitis B virus, inflammatory bowel disease, and immunosuppression.[5-8]

Most PGIL are non-Hodgkin's lymphomas (NHL),[4] with Hodgkin's lymphoma (NHL) being extremely rare in the GI tract.[9] Histologically, PGIL is primarily a diffuse type of giant B cell (DGB) and mucosal-associated lymphoid tissue lymphoma.[10,11] The geographic distribution of PGIL is variable, with B cell predominant in Western countries and T cell predominant in Eastern countries.[12,13] Prognosis of PGIL depends on the genus, histologic subtype, tumor stage, and treatment with radical surgery.[14-16]

PRESENTATION OF THE CASE

We present the case of a male 57-year-old patient, with a history of weight loss of 10 kg in the last two months and recurrent diarrhea. He came to the emergency department with severe abdominal pain of 72 hours of evolution, colic-type pain of insidious onset in the middle abdomen. Nausea and vomiting of gastrointestinal contents on multiple occasions, ensued 36 hours later, with fever of up to 39 °C and hyporexia, so he self-medicated with unspecified antibiotics and analgesics without clinical improvement. On admission blood samples and vertical and decubitus abdominal x-rays were taken. On physical examination he had a heart rate of 105 BPM, respiratory rate 22 per minute, BP 90/60 mmHg, temperature 36.9 °C. He presented with dehydration, cachectic appearance, a flat abdomen, no peristalsis, involuntary muscular resistance, painful to deep palpation in the four quadrants, and frank signs of peritoneal irritation. Laboratory tests showed a leukocyte count of 9.8 × 10^3/L, neutrophilia of 85%, hemoglobin of 13.1 g/dl, INR of 1.09. Simple abdominal films showed only fixed segmental loops *(Figure 1)*. After establishing the diagnosis of acute surgical abdomen, an exploratory laparotomy was performed on the infra-umbilical midline (15 cm). Transoperative findings were a hemoperitoneum of 350 cm^3

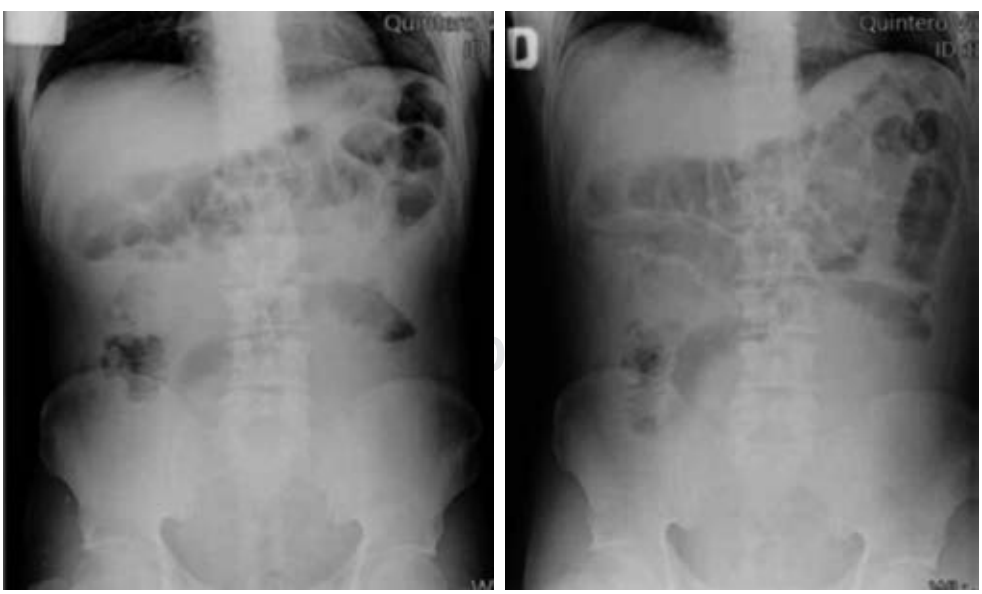

Figure 1:

Abdominal X-ray, standing and decubitus projections.

and multiple encapsulated tumors on the mesentery and small intestine, ranging from 4 to 14 cm at 90, 130, 150, and 160 cm from the Treitz's ligament, with multiple peritoneal implants smaller than 1 cm. A 14 cm diameter tumor, found on the antimesenteric border of the jejunum at a 130 cm distance from the ileocecal valve. It was resected without further need of intestinal resection. The other multiple lesions described along the intestinal border were not resected *(Figures 2 and 3)*. Three larger lesions accessible during laparotomy were also resected. The patient evolved well, started feedings per os on the third day after surgery and was transferred to an oncology center on the sixth day to continue with management. Histological and immunohistochemical analysis revealed a diffuse giant B cell lymphoma *(Figure 4 and Table 1)*.

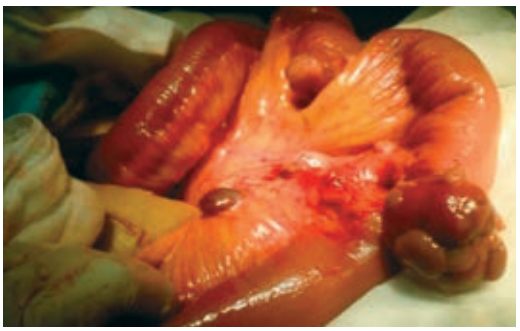

Figure 2: *Mesentery and small bowel dependent tumors.*

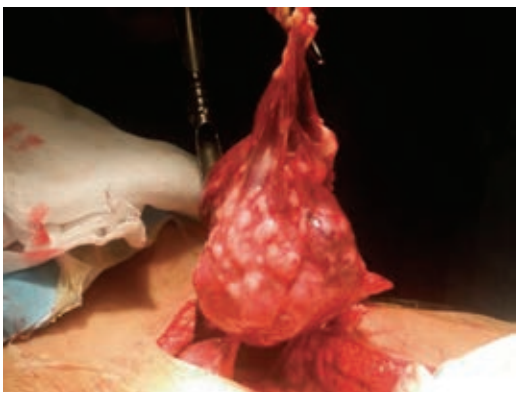

Figure 3: *Mesentery-dependent tumor.*

DISCUSSION

In the clinical setting, it is difficult to differentiate between extra-nodal PGIL and primary disseminated nodal lymphomas, so Dawson's criteria are used to distinguish between these two entities[17] *(Table 2)*. Ann Arbor's classification modified by Musshoff is used to classify primary gastrointestinal lymphomas[17] *(Table 3)*. Primary small bowel tumors account for 2% of malignant GI tumors. Lymphoma constitutes 15-20% of small bowel neoplasms and accounts for 20-30% of primary GI tumors. The ileum is the most affected site (60-65%), followed by the jejunum (20-25%), and finally the duodenum

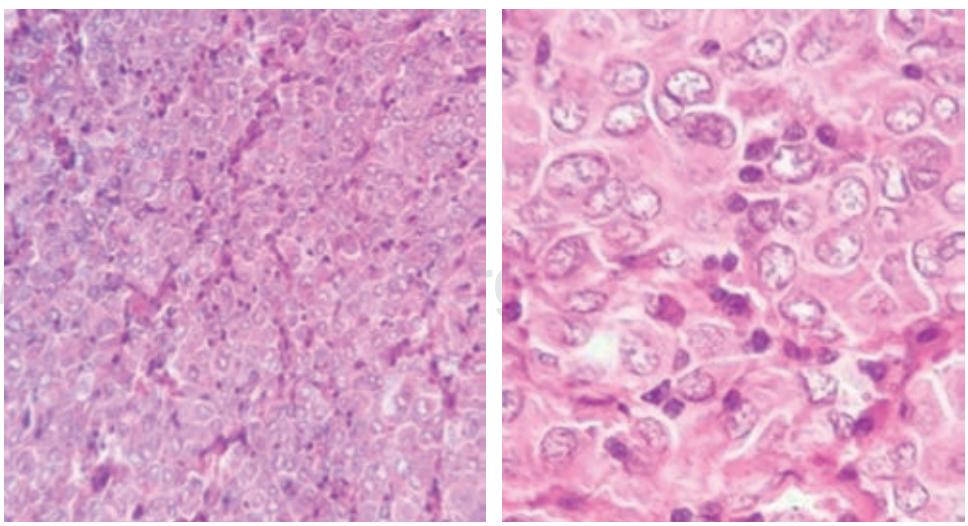

Figure 4:

Staining and histological view of B-cell lymphoma

(6.8%).[18] The age of presentation varies depending on the histologic subtype, with presentation most common being between the sixth and seventh decades of life.[19] Microscopically, diffuse giant B-cell lymphoma shows cleft, non-cleft, and immunoblastic cells. Its cell lineage is demonstrated to be antigen-positive on immunohistochemical tests such as CD 20, CD 22, CD 19, CD 70A, and BSAP/PAX5, and very rarely positive for germinal cell markers (BCL6 and CD 10).[20] Symptoms are usually nonspecific, and patients typically suffer from abdominal pain (65%), with bloody stools (27%), abdominal mass (20%), nausea, vomiting, fatigue, weight loss, symptoms of bowel obstruction, changes in bowel habit, and rarely bowel perforation.[21-24] Men are more likely to have an intestinal perforation in this type of tumor than women. Some reports show that the rate of perforation is lower with B-cell lymphomas, as compared to T-cell lymphomas.[25] The radiological findings are nonspecific. CT scans may show intra-abdominal masses, thickening of the bowel wall, displacement of adjacent organs, or luminal obstruction. Multifocal lesions occur in 10-25% of patients. An endoscopic or CT-guided biopsy may help in the definitive diagnosis. The introduction of the endoscopic capsule and double-balloon enteroscopy has allowed to avoid major surgical interventions.[26] The best diagnostic method is video endoscopy and/or endoscopic ultrasound.

What is the role of each of these techniques in the diagnosis and treatment of some complications such as gastrointestinal bleeding?

Endoscopic techniques have contributed to the diagnosis and treatment of complications such as GI bleeding, which in 5% of cases is present in the small intestine. In older adults its origin is usually related to other tumors gastrointestinal stromal, carcinoid, lymphomas, adenocarcinomas, etc.[27,28]

In patients with anatomy modified by previous surgery, especially in patients undergoing bariatric surgery or Roux-en-Y referrals, where the endoscopic capsule has no range, the use of single or double-balloon devipce-assisted enteroscopy is preferred; however, its use is usually limited to intermittent bleeding or recurrent bleeding.[29] Trans-surgical enteroscopy during laparotomy or laparoscopy is typically used as a last resort in patients with recurrent bleeding, or bleeding not revealed during previous techniques.[30] What are the roles of endoscopic ultrasound in the characterization of gastrointestinal wall depth, of suspicious lymph nodes and the modified Ann Arbor classification?

Table 1: Immunohistochemical study.

INHIBINE	Negative	Chromogranine	Negative
CK BPM	Negative	CD 20	Positive
CK APM	Negative	CD 99	Positive
DESMINe	Negative	Enolasae	Negative
CK	Negative		

Table 2: Dawson's criteria.[17]

1. Absence of peripheral lymphadenopathies
2. Absence of mediastinal lymphadenopathies in chest radiography
3. Normal peripheral blood smea
4. During laparotomy, the involvement is only esophageal, stomach and intestine or only of regional nodes
5. Absence of liver and spleen involvement, except for direct dissemination of the disease from an adjacent outbreak

Table 3: Musshoff's modified Ann Arbor stage classification system for primary gastrointestinal lymphomas.[17]

EI:	Affection detected in one or more gastrointestinal locations on one side of the diaphragm without lymph node infiltration • EI1 Lymphoma limited to mucosa and submucosa or early lymphoma • EI2 Lymphoma spread through the submucosa
EII:	Involvement of one or more gastrointestinal locations on one side of the diaphragm with lymph node infiltration, regardless of the degree of wall depth infiltration • EII1 Regional node infiltration • EII2 Lymph node infiltration around the regional area
EIII:	Involvement of the gastrointestinal tract and/or lymph nodes on either side of the diaphragm
EIV:	Lymphoid mass with or without lymph node infiltrations and diffuse involvement of non-gastrointestinal organs and tissues

Endoscopy alone is not capable of detecting neoplastic lesions, as these may present between deep layers of the gastrointestinal wall. However, when combined with multiple biopsies from different sites, it improves diagnostic accuracy.[31] Consequently, endosonographic features initially invisible or diffuse within the intestinal walls may be crucial for early detection and differentiation of various tumors.[32] Suekane et al. showed that superficial infiltrates or diffuse lesions detected by endoscopic ultrasound were associated with MALT-type lymphoma, while solid formations with B-cells were associated with gastrointestinal lymphomas.[33] Currently, endoscopic ultrasound (EUS) is considered the method of choice for the staging of primary gastric lymphomas, including the detection of involved lymph nodes, compared to tomography.[34] This is due to the detection of lymph nodes and the differentiation of the gastric layers involved. The differentiation of nodes that may be affected or not by lymphoma is based on ultrasonographic criteria of malignancy (hypoechoic structure, irregular and demarcated borders, rounded contour, and size greater than 1 cm).[35] Since 1990, the accuracy of EUS for the detection of primary gastric lymphoma for T and N stages of 90 and 80%, has been determined in the literature.[36,37] However, in 2002, a multicenter study incorporating data from 34 centers (including 70 patients) showed an overall accuracy of EUS in staging (according to the modified Ann Arbor classification) of 53%, although most of the evaluating centers were not experienced in the use of EUS in staging, as shown by the fact that only five of the 34 centers recruited more than two patients. Although this study may underestimate the role of EUS in gastrointestinal lymphoma staging, the influence of operator experience in this procedure is remarkable.[38]

With the advent of Endoscopic Ultrasound-Guided Fine Needle Aspiration (EUS-FNA) biopsy, the possibility of collecting transmural tissue samples was found, allowing cytological evaluation of the sample for cytological diagnosis, unlike the endoscopic biopsy used for histological diagnosis;[39] however, it is not useful for staging the disease. Current studies have shown an improvement in diagnostic accuracy with the use of EUS-FNA when combined with flow cytometry and immunocytochemistry, but the evidence is still limited to retrospective and small patient studies.[40]

Does the histological degree play an important role in treatment?

Approximately 5% of lymphomas occur in the GI tract, with the stomach being the most common, followed by the small intestine and colon. The parameters that determine treatment are histology and extension of the disease. As for the histological grade (unlike follicular lymphoma) it does not play an important role in the treatment

Table 4: REAL/WHO classification of lymphoproliferative neoplasms (Revised European-American Lymphoma/World Health Organization).[43]

B-cell neoplasms
I. B-cell precursor neoplasm
Leukemia/lymphoblastic lymphoma B precursor
II. Mature (peripheral) B-cell neoplasia
Chronic B-cell leukemia/small lymphocytic lymphoma
B-cell prolymphocytic leukemia
Lymphoplasmacytic Lymphoma
B-cell lymphoma of the splenic margin (± hairy lymphocytes)
Hairy Cell Leukemia
Plasma cell myeloma/plasmacytoma
B-cell lymphoma of the extranodal marginal area of mucosal-associated lymphoid tissue type
Nodal margin lymphoma (± B-cells monocytoids)
Follicular Center Lymphoma
Mantle cell lymphoma
Diffuse large B-cell lymphoma
Mediastinal large B-cell lymphoma
Primary effusion lymphoma
Burkitt's Lymphoma/Burkitt's Cell Leukemia
T-cell and NK cell neoplasms
I. T-Cell Precursor Neoplasia
Leukemia/precursor T-lymphoblastic lymphoma
II. Mature (peripheral) T-cell neoplasia
T-cell prolymphocytic leukemia
T-cell lymphocytic-granular leukemia
Aggressive NK cell leukemia
Adult T-cell leukemia/lymphoma
Extranodal NK/T cell lymphoma, nasal type
Enteropathic T-cell lymphoma
Gamma/delta T-cell hepatosplenic lymphoma
Subcutaneous lymphoma similar to T-cell panniculitis
Sezary syndrome/mycosis fungoides
Anaplastic large cell lymphoma, primary skin type
Peripheral T-cell lymphoma, nonspecific
Angioimmunoblastic T-cell lymphoma
Anaplastic large cell lymphoma, primary systemic type
Hodgkin's disease/lymphoma
I. Predominantly lymphocytic
II. Nodular Sclerosis
III. Mixed cells
IV. Lymphocytic depletion
V. Lymphocyte-rich classic

Modified from: Görgün AE, Borowitz MJ. A clinician's guide to the updated REAL/WHO classification of non-Hodgkin's lymphoma: part I (indolent lymphomas). Turkish Journal of Cancer. 2000; 30: 5-14.

and prognosis of the disease. Most primary gastrointestinal lymphomas are of diffuse and aggressive types, especially diffuse large B-cell lymphoma, mantle cell lymphoma, and intestinal T-cell lymphoma. Only a majority of patients with aggressive type non-Hodgkin's lymphoma have localized disease at diagnosis, and therapeutic benefits between stages III and IV (Ann Arbor) are minimal. It is for this reason that staging in non-Hodgkin's lymphoma has less impact than in Hodgkin's lymphoma. Staging in non-Hodgkin's lymphoma identifies only a minority of patients who can be treated with local or combination therapy, and identification of the histologic type allows us to determine the prognosis and evaluate the impact that treatment will have.[41] This is why there is a strong emphasis on establishing an appropriate histologic classification for the histologic type. In 2001, the World Health Organization (WHO) classification applied the principles of the Revised European-American Lymphoma (REAL) classification, the first consensus on the hematological classification of neoplasms. The REAL/WHO classification of non-Hodgkin's lymphoma includes many entities not recognized by the International Working Formulation (IWF), it considers cellular origin, and subdivides lymphomas into their lymphocytic precursors. Besides, the classification is based on immune-phenotype, genetics, and clinical characteristics. These considerations help to define a specific treatment for each type of lymphoma *(Table 4)*.

Treatment of localized lymphoma (stages IE and IIE) involves resection of the affected segment and its adjacent mesentery. Stages III E and IV E are treated with chemotherapy. The use of adjuvant chemotherapy is controversial. A five-year survival in patients with resectable lymphoma approaches 80%.[42] Surgery has limited application in the case of diffuse lymphoma. The use of radiation therapy has been reported to be beneficial as adjuvant or palliative treatment. Common complications of gastrointestinal lymphomas are intestinal perforation and peritonitis. The highest percentage occurs in the small intestine (59%), compared to the stomach (16%) and colon (22%).

CONCLUSION

There is no adequate information in the Latin American population and, given the relevance of this pathology, it is difficult to suspect the diagnosis in a timely manner, more so when it presents in a complicated way. The diagnosis, treatment, and prognosis of the patient with primary gastrointestinal lymphoma are seriously modified when presented as acute abdomen secondary to tumor rupture, as it happened in this patient.

REFERENCES

1. Freeman C, Berg JW, Cutler SJ. Occurrence and prognosis of extranodal lymphomas. Cancer. 1992; 29: 252-260.
2. Gurney KA, Cartwright RA. Increasing incidence and descriptive epidemiology of extranodal non-Hodgkin lymphoma in parts of England and Wales. Hematol J. 2002; 3: 95-104.
3. Herrmann R, Panahon AM, Barcos MP, Walsh D, Stutzman L. Gastrointestinal involvement in non-Hodgkin's lymphoma. Cancer. 1980; 46: 215-222.
4. Ghimire P, Wu GY, Zhu L. Primary gastrointestinal lymphoma. World J Gastroenterol. 2011; 17: 697-707.
5. Müller AM, Ihorst G, Mertelsmann R, Engelhardt M. Epidemiology of non-Hodgkin's lymphoma (NHL): trends, geographic distribution, and etiology. Ann Hematol. 2005; 84: 1-12.
6. Lewin KJ, Ranchod M, Dorfman RF. Lymphomas of the gastrointestinal tract: a study of 117 cases presenting with gastrointestinal disease. Cancer. 1978; 42: 693-707.
7. Rostami NM, Aldulaimi D, Ishaq S, Javad EM, Reza ZM, Malekzadeh R, et al. Geographic trends and risk of gastrointestinal cancer among patients with celiac disease in Europe and Asian-Pacific region. Gastroenterol Hepatol Bed Bench. 2013; 6: 170-177.
8. Engels EA. Infectious agents as causes of non-Hodgkin lymphoma. Cancer Epidemiol Biomarkers Prev. 2007; 16: 401-404.
9. Devaney K, Jaffe ES. The surgical pathology of gastrointestinal Hodgkin's disease. Am J Clin Pathol. 1991; 95: 794-801.
10. Howell JM, Auer-Grzesiak I, Zhang J, Andrews CN, Stewart D, Urbanski SJ. Increasing incidence rates, distribution and histological characteristics of primary gastrointestinal non-Hodgkin lymphoma in a North American population. Can J Gastroenterol. 2012; 26: 452-456.
11. Nakamura S, Matsumoto T, Iida M, Yao T, Tsuneyoshi M. Primary gastrointestinal lymphoma in Japan: a clinic pathologic analysis of 455 patients with special reference to its time trends. Cancer. 2003; 97: 2462-2473.

12. Anderson JR, Armitage JO, Weisenburger DD. Epidemiology of the non-Hodgkin's lymphomas: distributions of the major subtypes differ by geographic locations. Non-Hodgkin's Lymphoma Classification Project. Ann Oncol. 1998; 9: 717-720.
13. Kim YH, Lee JH, Yang SK, Kim TI, Kim JS, Kim HJ, et al. Primary colon lymphoma in Korea: a KASID (Korean Association for the Study of Intestinal Diseases) Study. Dig Dis Sci. 2005; 50: 2243-2247.
14. Lee J, Kim WS, Kim K, Ko YH, Kim JJ, Kim YH, et al. Intestinal lymphoma: exploration of the prognostic factors and the optimal treatment. Leuk Lymphoma. 2004; 45: 339-344.
15. Papaxoinis G, Papageorgiou S, Rontogianni D, Kaloutsi V, Fountzilas G, Pavlidis N, et al. Primary gastrointestinal Non-Hodgkin's lymphoma: a clinic pathologic study of 128 cases in Greece. A Hellenic Cooperative Oncology Groupstudy (HeCOG). Leuk Lymphoma. 2006; 47: 2140-2146.
16. Gou HF, Zang J, Jiang M, Yang Y, Cao D, Chen XC. Clinical prognostic analysis of 116 patients with primary intestinal non Hodgkin lymphoma. Med Oncol. 2012; 29: 227-234.
17. Dawson IM, Cornes JS, Morson BC. Primary malignant lymphoid tumours of the intestinal tract. Report of 37 cases with a study of factors influencing prognosis. Br J Surg. 1961; 49: 80-89.
18. Schottenfeld D, Beebe-Dimmer JL, Vigneau FD. The epidemiology and pathogenesis of neoplasia in the small intestine. Ann Epidemiol. 2009; 19: 58-69.
19. Devesa SS, Fears T. Non-Hodgkin's lymphoma time trends: United States and international data. Cancer Res. 1992; 52: 5432s-5440s.
20. Boot H. Diagnosis and staging in gastrointestinal lymphoma. Best Pract Res Clin Gastroenterol. 2010; 24: 3-12.
21. Yoon SS, Coit DG, Portlock CS, Karpeh MS. The diminishing role of surgery in the treatment of gastric lymphoma. Ann Surg. 2004; 240: 28-37.
22. Li B, Shi YK, He XH, Zou SM, Zhou SY, Dong M, et al. Primary non-Hodgkin lymphomas in the small and large intestine: clinic pathological characteristics and management of 40 patients. Int J Hematol. 2008; 87: 375-381.
23. Vaidya R, Habermann TM, Donohue JH, Ristow KM, Maurer MJ, Macon WR, et al. Bowel perforation in intestinal lymphoma: incidence and clinical features: Ann Oncol. 2013; 24: 2439-2443.
24. Daum S, Ullrich R, Heise W, Dederke B, Foss HD, Stein H, et al. Intestinal non-Hodgkin's lymphoma: a multicenter prospective clinical study from the German Study Group on intestinal non-Hodgkin's lymphoma. J Clin Oncol. 2003; 21: 2740-2746.
25. Pennazio M. Small-intestinal pathology on capsule endoscopy: spectrum of vascular lesions. Endoscopy. 2005; 37: 864-869.
26. Charles JY, George DZ. Shackelford's surgery of the Alimentary tract. Ch 25, 6th ed. Saunders Elsevier; 2007. pp. 56-70.
27. Katz LB. The role of surgery in occult gastrointestinal bleeding. Semin Gastrointest Dis. 1999; 10: 78-81.
28. Cangemi DJ, Patel MK, Gomez V, Cangemi JR, Stark ME, Lukens FJ. Small bowel tumors discovered during double-balloon enteroscopy: analysis of a large prospectively collected single-center database. J Clin Gastroenterol. 2013; 47: 769-772.
29. Kim DH, Byeon JS, Lee SK, Choi KD, Ye BD, Yoon SM, et al. Usefulness of double balloon endoscopy in patients with surgically distorted intestinal anatomy. J Clin Gastroenterol. 2009; 43: 737-742.
30. Leighton JA, Goldstein J, Hirota W, Jacobson BC, Johanson JF, Mallery JS, et al. Obscure gastrointestinal bleeding. Gastrointest Endosc. 2003; 58: 650-655.
31. Fischbach W. Gastric MALT lymphoma-update on diagnosis and treatment. Best Pract Res Clin Gastroenterol. 2014; 28: 1069-1077.
32. Fusaroli P, Caletti G. EUS in the evaluation of gastric wall layer abnormalities non-Hodgkin lymphoma and other causes. In: Hawes RH, Fockens P. Endosonography. Saunders Elsevier, 2006. pp. 99-110.
33. Suekane H, Iida M, Yao T, Matsumoto T, Masuda Y, Fujishima M. Endoscopic ultrasonography in primary gastric lymphoma: correlation with endoscopic and histologic findings. Gastrointestinal Endoscopy. 1993; 39: 139-145.
34. Vetro C, Chiarenza A, Romano A, Amico I, Calafiore V, Di Raimondo C, et al. Prognostic assessment and treatment of primary gastric lymphomas: how endoscopic ultrasonography can help in tailoring patient management. Clin Lymphoma Myeloma Leuk. 2014; 14: 179-185.
35. Catalano MF, Sivak MV Jr., Rice T, Gragg LA, Van Dam J. Endosonographic features predictive of lymphnodemetastasis. Gastrointest Endosc. 1994; 40: 442-446.
36. Caletti G, Ferrari A, Brocchi E, Barbara L. Accuracy of endoscopic ultrasonography in the diagnosis and staging of gastric cancer and lymphoma. Surgery. 1993; 113: 14-27.
37. Palazzo L, Roseau G, Ruskone-Fourmestraux A, Rougier P, Chaussade S, Rambaud JC, et al. Endoscopic ultrasonography in the local staging of primary gastric lymphoma. Endoscopy. 1993; 25: 502-508.
38. Fischbach W, Goebeler-Kolve ME, Greiner A. Diagnostic accuracy of EUS in the local staging of primary gastric lymphoma: results of a prospective, multicenter study comparing EUS with histopathologic stage. Gastrointest Endosc. 2002; 56: 696-700.
39. Yasuda I, Tsurumi H, Omar S, Iwashita T, Kojima Y, Yamada T, et al. Endoscopic ultrasound- guided fine-needle aspiration biopsy for lymphadenopathy of unknown origin. Endoscopy. 2006; 38: 919-924.
40. Nakamura S, Matsumoto T, Suekane H, Takeshita M, Hizawa K, Kawasaki M, et al. Predictive value of endoscopic ultrasonography for regression of gastric low grade and high grade MALT lymphomas after eradication of Helicobacter pylori. Gut. 2001; 48: 454-460.
41. Freedman AS, Jacobson CA, Mauch P, Aster JC. Non-Hodgkin's lymphoma. In: De Vita, Vincent T Jr. Cancer: principles and practice of oncology. 10th Edition, Ed. Wolters Kluwer Health/Lippincott Williams &Wilkins, USA 2011. pp. 10298-10535.

42. Dickson BC, Serra S, Chetty R. Primary gastrointestinal tract lymphoma: diagnosis and management of common neoplasms. Expert Rev Anticancer Ther. 2006; 6: 1609-1628.
43. Görgün AE, Borowitz MJ. A clinician's guide to the updated REAL/WHO classification of non-Hodgkin's lymphoma: part I (indolent lymphomas). Turkish Journal of Cancer. 2000; 30: 5-14.

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