Signs in Imaging

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The Sandwich Sign[1]

APPEARANCE

The sandwich sign refers to the cross-sectional imaging appearance of mesenteric fat and tubular structures as the sandwich filling and the homogeneous soft-tissue masses as the two halves of a sandwich bun (Fig 1) (1,2).

EXPLANATION

The CT appearance of the mesenteric fat and vessels resembles sandwich filling, while the soft-tissue adenopathy represents the bun. With administration of intravenous and oral contrast material, the mesenteric tubular structures will enhance relative to the fat, thus enhancing the appearance of layers within the sandwich filling. As the adenopathy enlarges it may compress the mesenteric vessels, partially obstructing venous return. This obstruction may result in engorgement of the enhanced mesenteric veins, making these veins more prominent within the filling of the sandwich.

Ultrasonography (US) can also be used to diagnose bulky mesenteric adenopathy. The sandwich sign has a strikingly similar appearance at US (1).

DISCUSSION

There are numerous causes of mesenteric adenopathy. Lymphoma, carcinoma, sarcoma, carcinoid tumor, lymphadenopathy syndrome associated with acquired immunodeficiency syndrome (AIDS), tuberculosis, Whipple disease, and inflammatory bowel disease are among the most common causes. These diseases, however, do not produce the large bulky adenopathy that results in the sandwich sign.

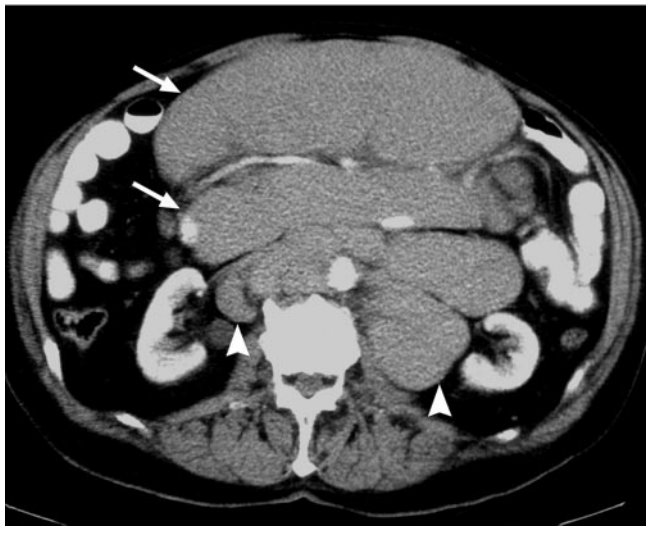

Figure 1. Transverse computed tomographic (CT) image obtained with oral and intravenous contrast material in a patient with mesenteric non-Hodgkin lymphoma (NHL). Image shows two large mesenteric lymphoma masses, which represent the halves of the sandwich bun (arrows), enveloping mesenteric fat and enhanced vessels. Note that the enhanced small bowel lies outside of the sandwich. Extensive retroperitoneal lymphadenopathy (arrowheads) is present, as well.

Carcinomas, sarcomas, and carcinoid tumors all originate within the small bowel and then spread to the mesenteric nodes. These neoplasms quickly invade the bowel wall, causing perforation, hemorrhage, and widespread disease (3,4). Infectious and inflammatory disorders are not known to cause the large nodal masses needed to produce the sandwich sign. If they do, there is often necrosis or rim enhancement involved, as seen in tuberculosis (4). Therefore these neoplasms, infections, and inflammatory disorders do not produce a sandwich sign.

This sign is specific to mesenteric lymphomas. Mesenteric lymphomas are unique because they can grow to a large size and can envelop fat, bowel, and vessels without causing clinical symptoms. Mesenteric lymphomas occasionally invade

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serosa and muscularis propria (5). They occasionally cause hemorrhage of the small bowel but rarely cause free perforation. Retroperitoneal adenopathy can also occur with mesenteric lymphomas (Figs 1, 2).

Most mesenteric lymphomas are NHLs (1–5). In the past, mesenteric involvement by NHL was usually clinically unapparent. Now with modern imaging technology and more frequent scanning, mesenteric involvement by NHL and its sandwich sign are identified more often.

Derangements in a patient's immune system status are risk factors for NHL. For example, patients with AIDS are at risk for developing NHL, which is a separate entity from AIDS lymphadenopathy syndrome (4). With the increasing number of people receiving solid organ and bone marrow transplants, there is a concomitant increase of PTLD. PTLD is an Epstein-Barr virus–driven B-cell lymphoproliferation in immunosuppressed patients who have undergone transplantation. Although morphologically indistinguishable from aggressive NHL, PTLD is considered a unique lymphoproliferative disease because its pathogenesis and management are substantially different. Gastrointestinal involvement and the absence of superficial nodal disease are frequent findings in PTLD (6,7). Figure 2 shows a sandwich sign with PTLD involvement of the mesentery in a patient within 6 months of a renal allograft transplantation. PTLD must be considered in any patient after transplantation whose cross-sectional images contain a sandwich sign.

In conclusion, the sandwich sign refers to the appearance of bulky mesenteric lymphadenopathy enveloping fat and tubular structures at cross-sectional imaging. In patients who have not undergone transplantation, NHL almost always causes this lymphadenopathy. In patients who have undergone transplantation, PTLD can also create a sandwich sign. With the increasing number of patients undergoing transplantation, this sign is likely to be a more common finding.

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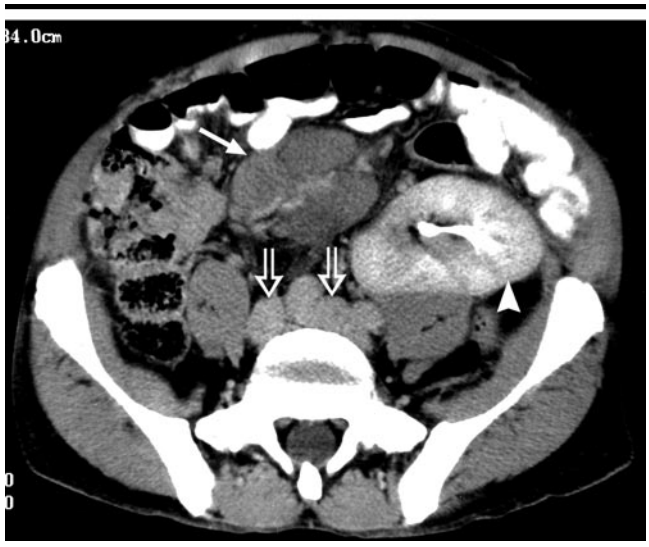

Figure 2. Transverse CT image obtained with oral and intravenous contrast material in a patient who underwent left pelvic renal allograft transplantation 6 months earlier and now has mesenteric posttransplantation lymphoproliferative disorder (PTLD). Mesenteric lymphoma mass (solid arrow) just to the right of the pelvic kidney (arrowhead) has produced a sandwich sign. Retroperitoneal lymphadenopathy (open arrows) is also seen.

References

1. Mueller PR, Ferrucci JT, Harbin WP, Kirkpatrick RH, Simeone JF, Wittenberg J. Appearance of lymphomatous involvement of the mesentery by ultrasonography and body computed tomography: the "sandwich sign." Radiology 1980; 134:467–473.
2. Brant WE. Mesenteric small bowel. In: Brant WE, Helms CA, eds. Fundamentals of diagnostic radiology. 2nd ed. Philadelphia, Pa: Williams & Wilkins, 1999; 740.
3. Maccioni F, Rossi P, Gourtsoyiannis N, Bezzi M, Di Nardo L, Broglia L. US and CT findings of small bowel neoplasms. Eur Radiol 1997; 7:1398–1409.
4. Silverman PM, Cooper C. Mesenteric and omental lesions. In: Gore RM, Levine MS, eds. Textbook of gastrointestinal radiology. 2nd ed. Philadelphia, Pa: Saunders, 2000; 1981–1986.
5. Rubensin SE, Gilchrist AM, Bronner M, et al. Non-Hodgkin lymphoma of the small intestine. RadioGraphics 1990; 10:985–998.
6. Swinnen LJ. Treatment of organ transplant-related lymphoma. Hematol Oncol Clin North Am 1997; 11:963–973.
7. Swinnen LJ. Overview of posttransplant B-cell lymphoproliferative disorders. Semin Oncol 1999; 26:21–25.