

Multiplanar Reformation of CT Scan for Preoperative Staging of Gastric Cancer

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Recent progress on CT such as multi-detector row CT, oral contrast agents and multiplanar reconstruction have markedly improved the image quality as well as diagnostic performance of gastric cancer. Multiplanar reformatted images at predetermined orientations can be easily performed and embedded into routine CT protocol without increasing medical expense or labor. Currently, many institutions have adopted routine multiplanar reformatted protocols and therefore knowledge on them can improve the diagnostic accuracy of gastric cancer.

Key Words Stomach cancer · CT · Multiplanar reformation.

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Introduction

Gastric cancer is a major cause of death worldwide. Accurate preoperative T-stage assessment is essential to establish an optimal treatment plan (1). Computed tomography (CT) is essential for initial assessment of gastric cancer, as it provides with information on the stomach itself as well as distant lesions such as the para-aortic lymphadenopathy and metastasis at organs in the abdomen and pelvis. Although other modalities including but not limited to endoscopic ultrasonography has been increasingly used for its capability to perform imaging assessment of the tumor location, horizontal extent, and depth of mural invasion in detail, yet no modality has been able to replace the role of CT for tumor staging (2). In this article, we describe the clinical applications of two-dimensional multiplanar reformatted images which currently is a widely used technique that improves the accuracy of local gastric cancer staging (3).

Case Report

Recent progress on CT has pushed forward the clinical potential for imaging assessment of various gastric disorders, partic-

ularly in the domains of gastric cancer preoperative staging. Multi-detector row CT enabled thinner collimation and faster scanning, which markedly improved z-axis resolution (3). In turn, the superior z-axis resolution established an environment that provoked radiologists to more frequently generate multiplanar reformation images.

Even without interactive multiplanar reformation (which process is time consuming and considerably increases labor), protocolized two dimensional multiplanar reformation at predetermined orientations can be embedded into routine CT protocol to improve the diagnostic performance of T staging assessment. This is particularly helpful for the assessment of subtle findings that are extremely vulnerable to partial volume artifacts on axial images, for instance tumor serosal exposure (Fig. 1). In addition, multiplanar reformatted images can aid the preoperative prediction of tumor invasion into adjacent organs (which influence resectability). In this sense, the transverse colon (Fig. 2) and pancreas (Fig. 3) are organs that deserve extra-caution, of which coronal reformation images can be particularly helpful. Multiplanar reformatted images can provide with multi-orientation evaluation, which is also useful to decrease the chance of false positive assessment resulting in T stage over-



Fig. 1. Routine sagittal reformatted image of the primary gastric cancer at the posterior aspect of the middle body, which is contiguous to the posterior wall serosa (arrows), therefore suggesting this tumor to be T4a.

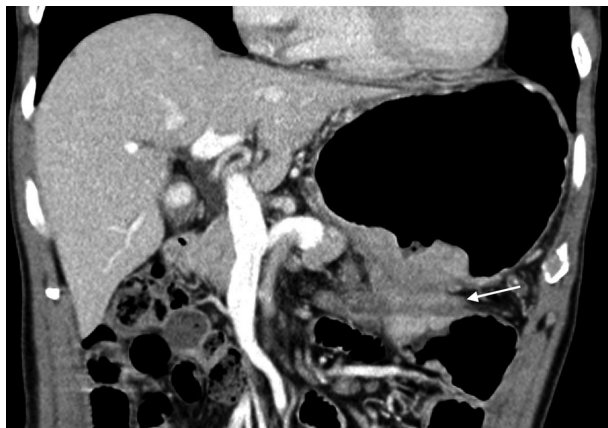


Fig. 2. Routine coronal reconstruction image demonstrating the greater curvature side stomach cancer lesion extending along the transverse mesocolon (arrows).

estimation (Fig. 4).

Discussion

The improved performance of CT has sparked renewed interest in using CT for gastric cancer preoperative staging. The state of art CT techniques such as CT gastroscopy and interactive multiplanar reformation are probably the most optimal procedures, however they are time-consuming and usually can be performed only at specialized centers. Meanwhile, CT protocols such as oral contrast agent administration and routine multiplanar reformation can be easily adopted with minimal additional expenses (4).

Multiplanar reformatted images enhance diagnostic performance of lesion detection and staging of both early and advanced tumors (5-7). Currently, many institutions routinely perform multiplanar reformation during preoperative CT scan. This process improves the diagnostic performance of T staging assess-

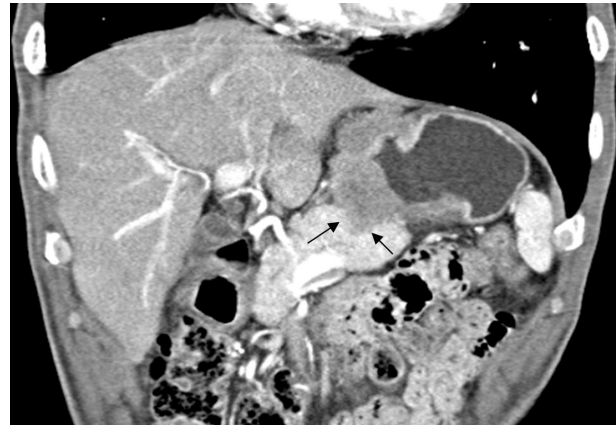


Fig. 3. Routine coronal reformatted image clearly demonstrating the circumferential stomach cancer to be extending inferiorly and directly invading pancreas body portion (arrows), therefore this lesion is T4b.



Fig. 4. A patient with stomach cancer located at middle body posterior wall. On axial images the mass demonstrates close contact with the pancreas (black arrows) while the fat plane lying between the stomach and pancreas seems to be obliterated. Interpretation solely based on these findings probably will determine the tumor to have invaded the pancreas. Meanwhile sagittal reformation image suggests that pancreas invasion probably did not take place as the posterior contour of the stomach is maintained and the fat plane is relatively intact (white arrows). After surgery, pathological examination revealed this patient as T2.

ment. The combination of axial images along with multiplanar reformatted images can improve the diagnostic accuracy of preoperative gastric cancer assessment without additional expenses.

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