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Differentiation between pancreatic metastases from renal cell carcinoma and hypervascular neuroendocrine tumour: Use of relative percentage washout value and its clinical implication

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ABSTRACT

Purpose: To compare computed tomography (CT) findings in patients with pancreatic metastasis from renal cell carcinoma (pRCC) and patients with hypervascular pancreatic neuroendocrine tumour (pNET) with a focus on the relative percentage washout (RPW).
Methods: We evaluated 16 patients with 37 pRCCs and 28 patients with 31 hypervascular pNETs using a protocol consisting of arterial and portal phase CT. Imaging findings were analyzed for comparison between the two groups. The RPW of each tumour using biphasic CT was obtained by two observers for evaluation of diagnostic performance. Interobserver agreement of each value and optimal cut-off level of RPW for discrimination between groups were evaluated.
Results: Tumour multiplicity showed significant difference in both groups. The mean RPW of the pRCC group (observer 1, 27.0%; observer 2, 29.4%) was significantly higher than that of the pNET group (observer 1, 0.5%; observer 2, 3.2%) ($p < 0.001$ for each observer). Interobserver agreement for both attenuation values and RPWs was excellent. A RPW value of 19% was selected as the optimal cut-off for pRCC determination, and showed good performance (accuracy 83.8%, sensitivity 83.8%, and specificity 83.9%).
Conclusion: With multiplicity, RPW of the tumour on CT could be helpful for differentiating pRCCs from hypervascular pNETs.

1. Introduction

Pancreatic metastases are most frequently derived from renal cell carcinoma and lung cancer, followed by breast cancer, colorectal cancer, and melanoma [1–3]. Among these, pancreatic metastasis from renal cell carcinoma (pRCC) has several peculiar features. First, most pancreatic metastases occur within a few years after initial presentation, whereas metastasis to the pancreas from RCC occurs after the greatest disease-free interval [4]. Most studies have reported mean time intervals greater than 10 years [4–6]. Second, isolated pRCC can develop, especially from the clear cell type of primary tumour [5,7,8].

Recently, advances in diagnostic imaging and its increasing accessibility have led to an increase in the incidental detection of pancreatic neuroendocrine tumour (pNET) [9]. Their typical features are relatively well defined, and are characterized by hypervascularity and conspicuity on arterial phase images [10]. However, pRCC also shows a hypervascular discrete mass [11] and there is considerable overlap in terms of imaging findings of these two entities [2,10]. From a clinical aspect, in particular regarding periodic computed tomography (CT) in the long-term follow up of patients who undergo nephrectomy for RCC, the considerable disease-free interval can make proper diagnosis based on the onset of pancreatic tumour difficult.

However, it is clinically important to differentiate pRCC from hypervascular pNET before treatment, since the therapeutic options and prognoses differ. Although surgical resection is a

Abbreviations: AUC, area under curve; CI, confidence interval; CT, computed tomography; GEE, generalized estimating equations; HU, hounsfield unit; ICC, intraclass correlation coefficient; MRI, magnetic resonance imaging; PACS, picture archiving and communication system; pNET, pancreatic neuroendocrine tumour; pRCC, pancreatic renal cell carcinoma; ROC, receiver operating characteristic; ROI, region of interest; RPW, relative percentage washout.

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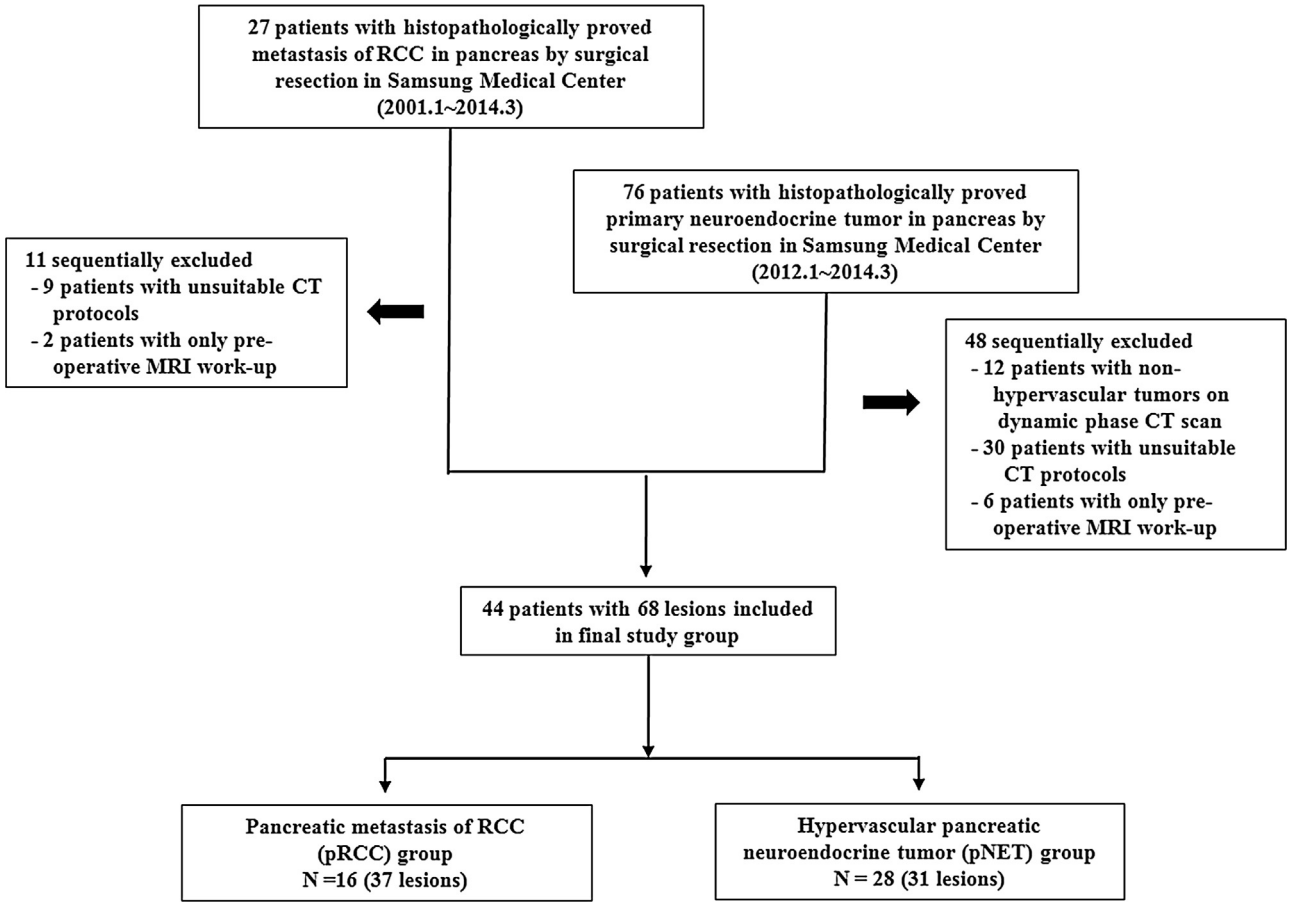

Fig. 1. Flow diagram for our study.

well-established method for the treatment of pNET, treatment recommendations for pRCC including immunotherapy [12], selective multitarget receptor tyrosine-kinase inhibitors like sunitinib and sorafenib [13], and surgical resection [14] remain controversial. In the view of prognosis, metastasis of pancreas indicates advanced disease, resulting in poor overall survival even after surgical resection [15], whereas pNET has an indolent clinical course with better overall survival [16]. These disparities in disease management and prognosis underline the importance of accurate characterization of these lesions by preoperative imaging to allow appropriate therapeutic planning. However, there has been no study to investigate the differential imaging features of pRCC compared with pNET prior to treatment. We hypothesized that pRCC may exhibit a high relative percentage washout (RPW) value compared to pNET when using contrast material-enhanced dynamic CT based on previous studies, which reported rapid washout of contrast enhancement for adrenal or pancreas metastasis from RCC [17,18].

Thus, the purpose of our study was to retrospectively compare CT findings and RPW of pancreatic metastases in patients with RCC to those in patients with hypervascular pNET, and to assess the diagnostic performance of RPW values for identification of pRCC.

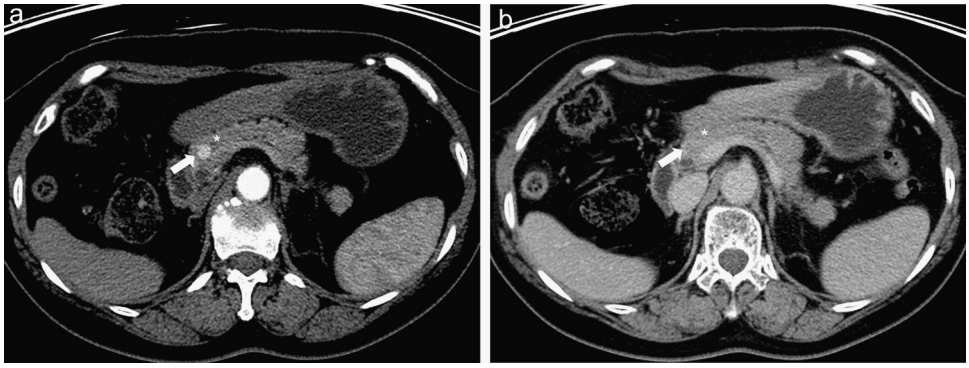

Fig. 2. Axial dynamic CT scan in a 69-year-old female with pRCC.
(a) The patient underwent partial nephrectomy for RCC 7 years previously. Contrast-enhanced CT scan obtained during arterial phase shows a 1-cm well-defined hyperdense mass (white arrow) in the head of the pancreas (asterisk). Measured mean attenuation value of tumour by both observers was 144.0 HU on arterial phase.
(b) CT obtained during portal phase shows a marked decrease in enhancement of the tumour (white arrow) compared to adjacent compressed pancreas parenchyma (asterisk). Measured corresponding value of tumour is 75.5 HU on portal phase. The calculated mean RPW value of the tumour is 47.5%.