Surgical Oncology 23 (2014) 229–235

Contents lists available at ScienceDirect

Surgical Oncology

journal homepage: www.elsevier.com/locate/suronc

Review

Diagnostic accuracy of CT in assessing extra-regional lymphadenopathy in pancreatic and peri-ampullary cancer: A systematic review and meta-analysis

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ARTICLE INFO

Article history:
Accepted 17 October 2014

Keywords:
Computed tomography
Diagnostic accuracy
Lymphadenopathy
Lymph node metastases
Pancreatic cancer

ABSTRACT

Objectives: Computed tomography (CT) is the most widely used method to assess resectability of pancreatic and peri-ampullary cancer. One of the contra-indications for curative resection is the presence of extra-regional lymph node metastases. This meta-analysis investigates the accuracy of CT in assessing extra-regional lymph node metastases in pancreatic and peri-ampullary cancer.
Methods: We systematically reviewed the literature according to the PRISMA guidelines. Studies reporting on CT assessment of extra-regional lymph nodes in patients undergoing pancreatoduodenectomy were included. Data on baseline characteristics, CT-investigations and histopathological outcomes were extracted. Diagnostic accuracy, positive predictive value (PPV), negative predictive value (NPV), sensitivity and specificity were calculated for individual studies and pooled data.
Results: After screening, 4 cohort studies reporting on CT-findings and histopathological outcome in 157 patients with pancreatic or peri-ampullary cancer were included. Overall, diagnostic accuracy, specificity and NPV varied from 63 to 81, 80–100% and 67–90% respectively. However, PPV and sensitivity ranged from 0 to 100% and 0–38%. Pooled sensitivity, specificity, PPV and NPV were 25%, 86%, 28% and 84% respectively.
Conclusions: CT has a low diagnostic accuracy in assessing extra-regional lymph node metastases in pancreatic and peri-ampullary cancer. Therefore, suspicion of extra-regional lymph node metastases on CT alone should not be considered a contra-indication for exploration.

Contents

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http://dx.doi.org/10.1016/j.suronc.2014.10.005
0960-7404/

Introduction

Pancreatic cancer is diagnosed in around 45,000 patients in the United States every year and ranks fourth as a cause of cancer death [1]. The only potentially curative option in these patients is pancreatoduodenectomy. Whether or not pancreatoduodenectomy is performed depends on tumor localization, invasion of adherent organs or vessels, distant metastases and lymph node involvement. A classic pancreatoduodenectomy includes the resection of locoregional lymph nodes [2].

The prognosis after pancreatoduodenectomy is influenced by tumor grade, status of the resection margin and lymph node status [3–5]. Since lymph node status plays an important role in survival some centers routinely perform an extended lymphadenectomy during pancreatoduodenectomy, resecting both loco-regional and extra-regional lymph nodes. However, in a meta-analysis of 4 randomized trials comparing standard with extensive lymphadenectomy, the latter did not improve survival [6]. Because it has been shown that metastases in para-aortal lymph nodes in patients undergoing pancreatoduodenectomy are associated with survival of less than 1 year, some authors suggest positive para-aortal lymph nodes should be a contra-indication for resection [7,8]. In these centers, accurate preoperative staging of these lymph nodes is therefore important. In contrast, several cohort studies have shown that, in selected patient groups, extra-regional lymph node metastases are not a prognostic factor in pancreatic cancer [9,10]. For centers where positive extra-regional lymph nodes are not considered a contra-indication for pancreatoduodenectomy, accurate preoperative staging is also important because this would require an extended lymphadenectomy.

The most widely used pre-operative staging modality for pancreatic cancer is computed tomography (CT) [11,12]. CT can accurately assess tumor size and involvement of vessels, but the diagnostic accuracy for adequate assessment of lymph node involvement is unclear. Meta-analyses on the value of CT in the detection of lymph node metastases in cervical or ovarian cancer showed poor sensitivity (50% and 43% respectively) and specificity (92% and 95% respectively) [13,14]. To date there are only few diagnostic studies on the role of CT in assessing lymphadenopathy in pancreatic cancer, and no systematic review or meta-analysis has specifically evaluated the accuracy of CT in the assessment of extra-regional lymph nodes.

The aim of this study was to systematically review the literature and to perform a meta-analysis to determine the diagnostic accuracy of CT in the diagnosis of extra-regional lymph node metastases in pancreatic cancer.

Materials and methods

Literature search and study selection

We performed a systematic literature search in Pubmed, Embase and the Cochrane Library according to the PRISMA guidelines [15] of studies published up to March 22nd 2013. The search terms were '(CT OR computed OR tomography OR tomographic OR CAT) AND (pancreas OR pancreatic OR periampullary) AND (tumor OR tumors OR tumour OR tumours OR cancer OR carcinoma OR carcinomas OR neoplasia OR neoplasm OR malignancy) AND (lymph node OR staging)'.

After removal of duplicates, title and abstract of all studies were screened to identify studies reporting on the diagnostic accuracy of pre-operative CT in patients with pancreatic cancer. Two authors further assessed eligibility of selected studies through screening of full text papers. We included observational studies reporting the association between preoperative CT findings with histopathological outcomes in patients undergoing a resection for suspected pancreatic cancer. Exclusion criteria were: 1) studies not reporting the number of suspected extra-regional lymph nodes on CT; 2) studies not reporting the number of positive lymph node metastases during CT or histopathological investigations; 3) small series (i.e. fewer than 5 patients); 4) studies performed before the clinical implementation of spiral CT (i.e. 1990); 5) studies not in the English language; and 6) conference abstracts. The included studies were subsequently checked for cross-references to identify eligible additional studies that were not identified by our primary search. Any differences were resolved by mutual agreement.

Critical appraisal of methodology

We graded all studies according to the Oxford Centre for Evidence-Based Medicine (CEBM) levels of evidence and assessed the methodological quality of the studies based on the QUADAS-2 critical appraisal for diagnostic studies [16,17].

Data extraction

The following data were retrieved from each included study: first author, year of publication, study period, patient selection and sample size. Basic technical and procedural characteristics such as the type of CT scanner, section thickness, scan dose, and details about the use of contrast agent were extracted, and presented to provide descriptive information. Furthermore, data on CT and histopathological findings with regard to tumor size, localization, vascular involvement, criteria for suspicion and type of resection and whether an extended lymphadenectomy was performed. In order to construct a 2×2 contingency table data on the number of suspected regional an extra-regional lymph nodes and histopathological outcomes were extracted.

Data analysis

From the contingency tables positive predictive value, negative predictive value, sensitivity, specificity and diagnostic accuracy were calculated for individual studies.

We performed a fixed effects analysis on the pooled data of patients who had both CT and histopathological evaluation and