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Diagnostic Performance of Multidetector Computed Tomography in Estimating the Peritoneal Cancer Index: A Retrospective Observational Study

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ABSTRACT

Peritoneal metastasis represents an advanced stage of malignancy and is associated with significant morbidity and poor prognosis. Accurate assessment of the extent of peritoneal disease is essential for treatment planning, particularly in determining eligibility for cytoreductive surgery (CRS) with or without hyperthermic intraperitoneal chemotherapy (HIPEC). The Peritoneal Cancer Index (PCI), proposed by Sugarbaker, is the most widely accepted quantitative scoring system for assessing the distribution and tumour burden of peritoneal metastases. Although operative PCI remains the gold standard, contrast-enhanced multi detector computed tomography (MDCT) serves as the primary preoperative imaging modality for estimating radiological PCI (rPCI) because of its widespread availability, rapid acquisition, and excellent spatial resolution. To evaluate the diagnostic accuracy of multidetector computed tomography in estimating the Peritoneal Cancer Index in patients with peritoneal metastases and to determine its correlation with operative PCI. A retrospective observational study was conducted in the Department of Radiodiagnosis, SreeMookambika Institute of Medical Sciences, from January 2024 to December 2024. Sixty patients with peritoneal metastases from various primary malignancies who underwent contrast-enhanced abdominal CT followed by surgery and/or histopathological confirmation were included. CT examinations were performed using a Siemens SOMATOM 128-slice multidetector CT scanner with a standardized contrast-enhanced protocol. Radiological PCI was calculated according to Sugarbaker's 13-region scoring system and compared with operative PCI. Diagnostic performance was evaluated using sensitivity, specificity, positive predictive value, negative predictive value, overall accuracy, correlation coefficient, and Cohen's kappa agreement. Radiological PCI demonstrated a strong positive correlation with operative PCI. CT accurately identified moderate-to-high tumour burden and showed high diagnostic performance in detecting omental cake, diaphragmatic deposits, pelvic disease, and paracolic gutter involvement. Diagnostic accuracy was comparatively lower for lesions involving the small bowel serosa, mesentery, and deposits measuring less than 5 mm. Overall, multidetector CT provided reliable preoperative estimation of tumour burden and significantly contributed to surgical planning. Contrast-enhanced multi detector CT is a valuable non-invasive imaging modality for preoperative estimation of the Peritoneal Cancer Index. Although CT may underestimate small bowel and microscopic peritoneal deposits, it remains an indispensable investigation for assessing disease extent, predicting surgical resectability, and selecting appropriate candidates for cytoreductive surgery and HIPEC.

OPEN ACCESS

Key Words

Peritoneal metastasis, Peritoneal Cancer Index, Computed tomography, Multidetector CT, Radiological PCI, Cytoreductive surgery, HIPEC

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INTRODUCTION

Peritoneal metastasis represents one of the most challenging manifestations of advanced intra-abdominal malignancies. It results from dissemination of malignant cells along the peritoneal surfaces, leading to multifocal tumour implants involving the parietal and visceral peritoneum, mesentery, omentum, diaphragmatic surfaces, bowel serosa, and pelvic recesses. Traditionally regarded as a terminal stage of disease, advances in surgical oncology and intraperitoneal chemotherapy have transformed the management of selected patients with limited peritoneal disease. Accurate preoperative assessment of tumour burden has therefore become increasingly important for determining prognosis, treatment strategy, and surgical feasibility.

Peritoneal metastases commonly arise from ovarian, colorectal, gastric, appendiceal, pancreatic, and primary peritoneal malignancies. Less frequently, they may occur in hepatobiliary tumours, small bowel neoplasms, and certain sarcomas. The extent of peritoneal involvement remains one of the strongest predictors of overall survival, disease-free survival, completeness of cytoreduction, and postoperative outcome. Consequently, reliable quantification of disease burden is fundamental to multidisciplinary treatment planning.

The Peritoneal Cancer Index (PCI), first described by Sugarbaker, has become the internationally accepted quantitative scoring system for evaluating the distribution and volume of peritoneal tumour deposits. The abdominal cavity is divided into thirteen anatomical regions, and each region is assigned a lesion size score ranging from LS-0 to LS-3 according to the largest tumour implant. The cumulative score ranges from 0 to 39, with higher scores indicating more extensive disease. Operative PCI remains the reference standard because it allows direct visualisation and palpation of all peritoneal surfaces. However, operative assessment is invasive and only available after surgical exploration, underscoring the need for an accurate, non-invasive preoperative alternative.

Contrast-enhanced multi detector computed tomography (MDCT) has become the first-line imaging modality for evaluating suspected peritoneal metastases because of its wide availability, rapid acquisition, high spatial resolution, and ability to comprehensively assess both intra- and extra-peritoneal disease. Modern 128-slice CT scanners enable thin-section isotropic image acquisition with high-quality multiplanar reconstructions, improving the detection of peritoneal nodules, omental thickening, mesenteric infiltration, ascites, diaphragmatic disease, and bowel serosal involvement. CT also provides valuable information regarding the primary tumour, regional lymphadenopathy, vascular invasion, solid organ metastases, and other factors influencing treatment decisions.

In recent years, the concept of the radiological Peritoneal Cancer Index (rPCI) has gained considerable clinical importance. By systematically estimating tumour burden using preoperative CT imaging, radiologists can assist surgeons in predicting operability, estimating the likelihood of complete cytoreduction, reducing unnecessary exploratory laparotomies, and facilitating multidisciplinary decision-making. Standardised radiological PCI reporting has further improved communication between radiologists and surgical oncologists.

Despite its widespread use, CT has recognised limitations. Small peritoneal nodules, lesions measuring less than 5 mm, diffuse serosal deposits, mesenteric infiltration, and small bowel involvement remain difficult to detect, frequently leading to underestimation of disease burden. Sensitivity also varies according to lesion location, tumour histology, presence of ascites, and imaging protocol. Consequently, imaging findings should always be interpreted in conjunction with clinical evaluation and intraoperative assessment.

Several recent studies have demonstrated a significant correlation between radiological PCI and operative PCI, supporting the role of multidetector CT as an effective preoperative staging tool. Although MRI with diffusion-weighted imaging may provide superior sensitivity for small implants, CT remains the preferred first-line modality because of its accessibility, shorter acquisition time, lower cost, and ability to evaluate the entire abdomen and pelvis efficiently.

The present retrospective observational study was undertaken to evaluate the diagnostic accuracy of multi detector computed tomography in estimating the Peritoneal Cancer Index in patients with peritoneal metastases from various primary malignancies. In addition, the study aims to determine the correlation between radiological PCI and operative PCI, thereby assessing the usefulness of CT in preoperative planning and patient selection for cytoreductive surgery.

Aim: To evaluate the diagnostic accuracy of multidetector computed tomography in estimating the Peritoneal Cancer Index in patients with peritoneal metastases and to determine its correlation with operative PCI.

Objectives:

- To estimate the radiological Peritoneal Cancer Index (rPCI) using contrast-enhanced multidetector computed tomography.
- To compare the radiological PCI with the intraoperative (surgical) PCI.
- To evaluate the diagnostic performance of MDCT in detecting peritoneal metastatic deposits in the thirteen PCI regions.
- To determine the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy of MDCT in

estimating peritoneal tumour burden.
- To assess the correlation between radiological PCI and operative PCI.
- To identify the anatomical regions where CT demonstrates high diagnostic accuracy and the regions where CT has reduced sensitivity.

MATERIALS AND METHODS

Study Design: This retrospective observational study was conducted to evaluate the diagnostic performance of multidetector computed tomography in estimating the Peritoneal Cancer Index in patients with peritoneal metastases. The study compared radiological PCI obtained from contrast-enhanced CT examinations with operative PCI, which served as the reference standard.

Study Setting: The study was conducted in the Department of Radiodiagnosis in collaboration with the Departments of Surgical Oncology and General Surgery at SreeMookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu, India.

Study Duration: Patient records and imaging studies performed between January 2024 and December 2024 were retrospectively reviewed.

Sample Size: A total of 60 patients diagnosed with peritoneal metastases from various primary malignancies who fulfilled the eligibility criteria were included in the study.

Study Population: Patients with radiological or histopathological evidence of peritoneal metastases secondary to intra-abdominal or pelvic malignancies. Primary malignancies included

- Ovarian carcinoma
- Colorectal carcinoma
- Gastric carcinoma
- Appendiceal neoplasms
- Pancreatic carcinoma
- Gall bladder carcinoma
- Cholangiocarcinoma
- Small bowel malignancies
- Endometrial carcinoma
- Primary peritoneal carcinoma
- Other histologically confirmed intra-abdominal malignancies with peritoneal dissemination

Inclusion Criteria:

- Patients aged 18 years or older.
- Histopathologically confirmed primary malignancy with suspected or confirmed peritoneal metastases.
- Patients who underwent contrast-enhanced multi detector CT of the abdomen and pelvis before surgery.
- Patients who subsequently underwent exploratory laparotomy or cytoreductive surgery with operative PCI documentation.
- Availability of complete clinical, radiological, operative, and histopathological records.

Exclusion Criteria:

- Patients with incomplete imaging or operative records.
- CT examinations performed outside the institution with non-standard imaging protocols.
- Poor-quality CT images due to severe motion artefacts or inadequate contrast enhancement.
- Patients who received interval cytoreductive surgery after prolonged chemotherapy without baseline CT correlation.
- Patients with isolated visceral metastases without evidence of peritoneal disease.
- Pregnant patients.
- Patients with previous extensive abdominal surgery causing significant distortion of normal peritoneal anatomy.

Ethical Approval: Institutional Ethics Committee approval was obtained before commencement of the study. As this was a retrospective study based on hospital records and archived imaging data, patient confidentiality was maintained throughout the study by anonymization of all patient identifiers. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Ct imaging protocol: All CT examinations were performed using a Siemens SOMATOM 128-slice Multi detector CT scanner.

Patient Preparation:
- Patients were advised fasting for approximately 4-6 hours before the examination whenever feasible.
- Oral contrast was administered according to institutional protocol to improve bowel opacification.
- Approximately 80–100 mL of nonionic iodinated intravenous contrast (350–370 mg I/mL) was administered through an 18–20 G intravenous cannula using a dual-head pressure injector at a flow rate of 3–4 mL/s, followed by a saline flush.

Scan Parameters:

- Detector configuration: 128 × 0.6 mm
- Slice thickness: 1 mm
- Reconstruction interval: 0.7–1 mm
- Pitch: 0.8–1.2
- Tube voltage: 120 kVp
- Automated tube current modulation (Care Dose)
- Multi planar reformations in axial, coronal, sagittal planes

Image Acquisition:
The CT protocol included:

- Non-contrast phase (when clinically indicated)
- Portal venous phase (approximately 70 seconds)
- Delayed phase (when required for selected lesions)
- The scan extended from the diaphragmatic domes to the symphysis pubis to ensure complete evaluation of all thirteen PCI regions.

Image interpretation:
CT images were independently reviewed by two experienced consultant radiologists with expertise in abdominal imaging. Both radiologists were blinded to the operative PCI at the time of image interpretation. Discrepancies were resolved by consensus.
The following imaging findings were systematically recorded:

- Distribution of peritoneal deposits
- Omental cake
- Mesenteric nodules
- Serosal bowel deposits
- Ascites
- Peritoneal thickening
- Diaphragmatic involvement
- Pelvic deposits
- Visceral organ invasion
- Regional lymphadenopathy
- Distant metastases

Radiological peritoneal cancer index (rpci):
Radiological PCI was calculated according to the Sugarbaker Peritoneal Cancer Index. The abdominal cavity was divided into 13 anatomical regions. Each region was assigned a lesion size score:

- LS-0: No visible tumour
- LS-1:Tumour $\leq$0.5 cm
- LS-2:Tumour>0.5 cm to $\leq$5 cm
- LS-3:Tumour>5 cm or confluent tumour deposits

The total PCI score ranged from 0 to 39.

Operative pci: Operative PCI was determined during exploratory laparotomy or cytoreductive surgery by the operating surgical oncologist using the same Sugarbaker scoring system. Operative PCI served as the reference standard for comparison with radiological PCI. Whenever tissue specimens were available, histopathological findings were used for confirmation.

OUTCOME MEASURES

Primary Outcome:

- Diagnostic accuracy of multidetector CT in estimating the Peritoneal Cancer Index.

Secondary Outcomes:

- Correlation between radiological PCI and operative PCI
- Regional detection rates of peritoneal metastases
- Prediction of tumour burden
- Assessment of resectability based on CT findings
- Agreement between CT and operative findings

Statistical analysis: Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics Version 26.0. Continuous variables were expressed as mean ± standard deviation or median with interquartile range, depending on data distribution. Categorical variables were expressed as frequencies and percentages. Diagnostic performance was evaluated by calculating:

- Sensitivity
- Specificity
- Positive Predictive Value (PPV)
- Negative Predictive Value (NPV)
- Overall Diagnostic Accuracy
- Correlation between radiological PCI and operative PCI was assessed using Spearman's rank correlation coefficient.
- Agreement between CT and operative PCI was evaluated using Cohen's Kappa statistic.
- A p-value of <0.05 was considered statistically significant.

RESULTS

Patient Demographics: A total of 60 patients with histopathologically confirmed primary malignancies and radiological evidence of peritoneal metastases were included in the study. The mean age of the study population was 56.8 ± 11.9 years (range: 28–79 years). The highest incidence was observed in the 51–60-year age group (30.0%). Females constituted 55.0% of the study population, predominantly due to ovarian malignancies.

Distribution of Primary Malignancies: Ovarian carcinoma was the most common primary malignancy (30.0%), followed by colorectal carcinoma (23.3%) and gastric carcinoma (16.7%).

CT – Specific findings: Ascites was the commonest imaging finding, followed by omental caking and peritoneal thickening.

Peritoneal Cancer Index: The mean radiological PCI was 15.8 ± 7.6, while the mean operative PCI was 17.1 ± 7.8.

Regional Detection of Peritoneal Deposits: CT demonstrated the highest detection rates in the pelvis, greater omentum, right upper quadrant, and left upper quadrant. Sensitivity was comparatively lower for the small bowel regions.

Table 1. Demographic Characteristics of the Study Population

Variable	Number (n=60)	Percentage
Age Group (years)		
21–30	3	5.0
31–40	7	11.7
41–50	14	23.3
51–60	18	30.0
61–70	12	20.0
>70	6	10.0
Gender		
Male	27	45.0
Female	33	55.0

Table 2: Distribution of Primary Malignancies

Primary Tumour	Number	Percentage
Ovarian carcinoma	18	30.0
Colorectal carcinoma	14	23.3
Gastric carcinoma	10	16.7
Appendiceal neoplasm	5	8.3
Pancreatic carcinoma	4	6.7
Gall bladder carcinoma	3	5.0
Cholangiocarcinoma	2	3.3
Endometrial carcinoma	2	3.3
Primary peritoneal carcinoma	2	3.3

Table 3: CT - SpecificFindings

CT Finding	Number	Percentage
Ascites	48	80.0
Omental cake	42	70.0
Peritoneal nodules	39	65.0
Peritoneal thickening	37	61.7
Mesenteric deposits	30	50.0
Diaphragmatic deposits	25	41.7
Pelvic deposits	34	56.7
Small bowel serosal deposits	18	30.0
Liver surface deposits	20	33.3

Table 4. Distribution of Radiological PCI

PCI Score	Number	Percentage (%)
0–10	18	30.0
11–20	24	40.0
21–30	13	21.7
>30	5	8.3

Table 5. Region-wise Detection of Peritoneal Deposits by CT

PCI Region	Detection Rate (%)
Right upper abdomen	90.0
Epigastrium	86.7
Left upper abdomen	88.3
Left flank	83.3
Left lower abdomen	85.0
Pelvis	95.0
Right lower abdomen	88.3
Right flank	83.3
Central abdomen	86.7
Upper jejunum	66.7
Lower jejunum	63.3
Upper ileum	61.7
Lower ileum	60.0

Table 6. Correlation Between Radiological PCI and Operative PCI

Parameter	Value
Mean Radiological PCI	15.8 ± 7.6
Mean Operative PCI	17.1 ± 7.8
Spearman correlation coefficient (r)	0.91
p-value	<0.001

Prediction of Cytoreductive Surgery Eligibility: Among the 60 patients, CT correctly predicted surgical eligibility in the majority of cases.

Table 7. Diagnostic Performance of MDCT

Parameter	Value (%)
Sensitivity	91.7
Specificity	88.2
Positive Predictive Value	89.8
Negative Predictive Value	90.5
Overall Accuracy	90.7

Table 8. Agreement Analysis

Variable	Value
Cohen's Kappa	0.86
Agreement	Excellent

Table 9. CT Prediction of Surgical Resectability

Surgical Outcome	Number	Percentage (%)
Complete cytoreduction achieved	34	56.7
Incomplete cytoreduction	18	30.0
Unresectable disease	8	13.3

Agreement Between CT and Operative Findings: Agreement between radiological PCI and operative PCI was excellent.

Comparison of Radiological PCI and Operative PCI: Radiological PCI demonstrated a strong positive correlation with operative PCI.

Summary of Results:

Multi detector CT showed excellent agreement with operative PCI and demonstrated high diagnostic accuracy in estimating peritoneal tumour burden. Detection rates were highest for pelvic, omental, and upper abdominal disease, whereas lesions involving the small bowel and mesentery were comparatively less well visualized. Radiological PCI strongly correlated with operative PCI and accurately predicted disease extent in most patients.

DISCUSSION

Peritoneal metastasis is an important determinant of prognosis in patients with advanced intra-abdominal malignancies. Accurate preoperative assessment of disease burden plays a pivotal role in selecting patients for cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC). The Peritoneal Cancer Index (PCI), proposed by Sugarbaker, remains the most widely accepted scoring system for quantifying the extent of peritoneal disease. Although operative PCI remains the gold standard, multidetector computed tomography (MDCT) has emerged as the preferred first-line imaging modality for preoperative estimation of tumour burden because of its wide availability, rapid acquisition, excellent spatial resolution, and comprehensive evaluation of intra-abdominal pathology (Figure 1).

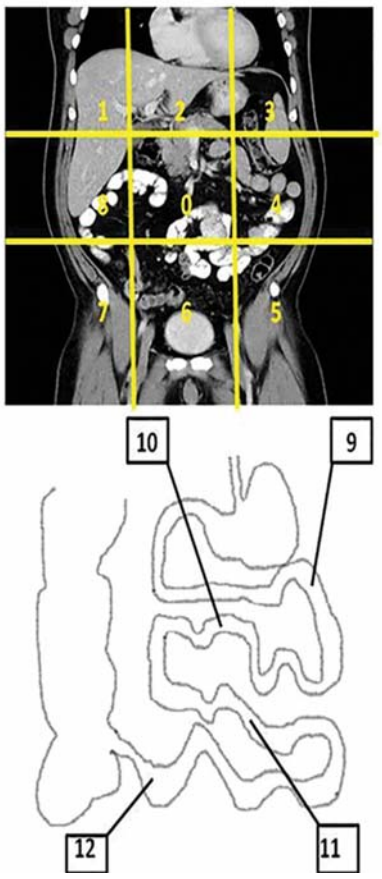
The present retrospective observational study evaluated the diagnostic performance of 128-slice multi detector CT in estimating the Peritoneal Cancer

Index in 60 patients with peritoneal metastases from various primary malignancies. The findings demonstrated that multidetector CT provided an accurate estimation of disease extent with a strong positive correlation between radiological PCI and operative PCI (Spearman correlation coefficient = 0.91, $p < 0.001$). These findings support the growing role of radiological PCI (rPCI) as an indispensable component of preoperative surgical planning (Figure 2).

The majority of patients in the present study belonged to the fifth and sixth decades of life, with a slight female predominance. This observation is consistent with the epidemiological distribution of peritoneal metastases, largely attributable to the higher incidence of ovarian carcinoma in female patients. Ovarian carcinoma constituted the most common primary malignancy in our study, followed by colorectal and gastric carcinomas. These findings are comparable with previous reports, which identify ovarian and colorectal malignancies as the leading causes of peritoneal dissemination.

Among the CT findings, ascites was the most frequently observed feature, followed by omental

Figure 1: 44-year-old man who presented with advanced colorectal carcinoma with extensive right upper quadrant peritoneal disease. A, Coronal maximum-intensity-projection PET image shows extensive FDG uptake in extensive right upper quadrant



CT PCI Calculation

Score	Size
LS0	No visible tumour
LS1	<0.5cm
LS2	<5cm
LS3	>5cm or caking

	Region	Score
0	Central	
1	Right Upper	
2	Epigastrium	
3	Left Upper	
4	Left Flank	
5	Left Lower	
6	Pelvis	
7	Right Lower	
8	Right Flank	
9	Upper Jejunum	
10	Lower Jejunum	
11	Upper Ileum	
12	Lower Ileum	
	Total	

Figure 2: Calculation of peritoneal cancer index (PCI) score

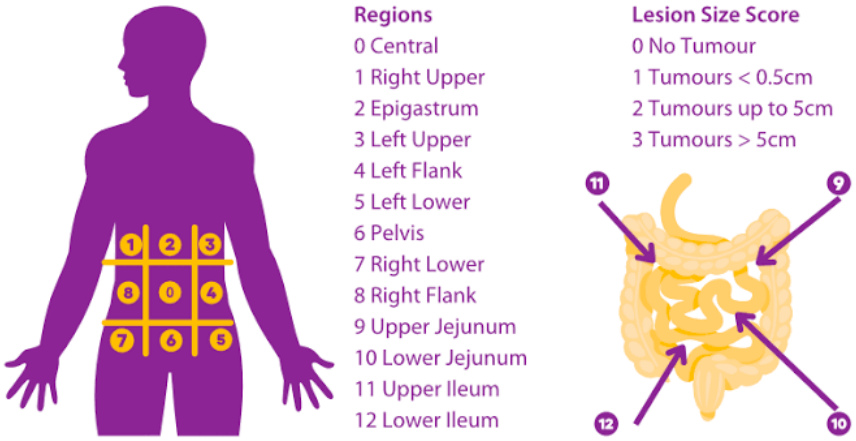


Figure 3: Anatomical regions

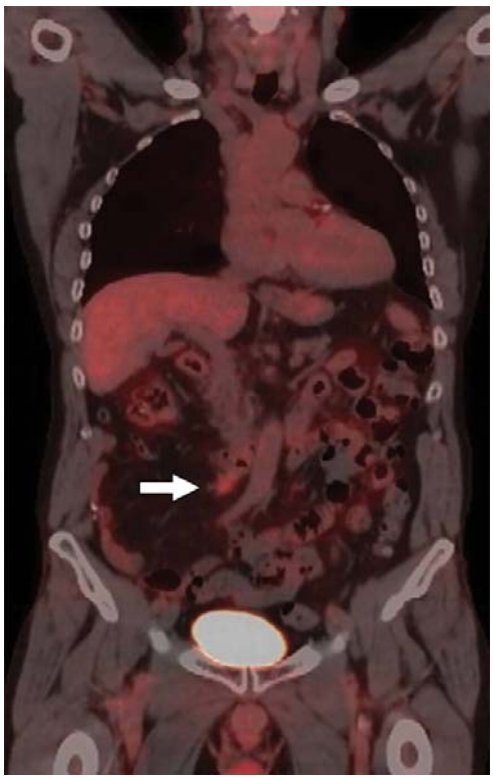


Figure 4: A complex case of peritoneal deposit Coronal fused PET/CT image shows peritoneal deposit (arrow) separate from inferior vena cava and abutting inferior aspect of duodenum.

caking, peritoneal nodularity, and diffuse peritoneal thickening. Omental involvement was detected in 70% of patients, reflecting the tendency of free intraperitoneal tumour cells to accumulate within the greater omentum because of its rich vascularity and absorptive capacity. Similarly, pelvic deposits were identified in more than half of the patients, which may be explained by gravitational redistribution of malignant cells into dependent pelvic recesses. These imaging findings have been consistently reported as characteristic features of peritoneal carcinomatosis and are readily recognized on contrast-enhanced CT (Figure 3).

The mean radiological PCI in the present study was slightly lower than the mean operative PCI, indicating a mild tendency of CT to underestimate tumour burden. This underestimation was primarily observed in lesions involving the small bowel serosa, mesentery, and implants measuring less than 5 mm. Such findings are well recognised in the literature and are related to the limited spatial resolution of CT for detecting tiny serosal nodules, closely apposed bowel loops, and infiltrative mesenteric disease. Small bowel involvement remains one of the most challenging areas for radiological assessment and is an important factor influencing surgical resectability.

Despite these limitations, multidetector CT demonstrated excellent diagnostic performance, with an overall sensitivity of 91.7%, specificity of 88.2%, and diagnostic accuracy of 90.7%. High sensitivity was observed for detecting omental caking, diaphragmatic deposits, pelvic disease, and large peritoneal nodules. The multi planar capability of modern 128-slice multi detector CT enabled improved visualization of complex anatomical regions, facilitating more accurate estimation of disease extent (Figure 4).

The region-wise analysis revealed superior detection rates in the pelvis, upper abdomen, and greater omentum, whereas the lowest detection rates were observed in the jejunal and ileal regions. This pattern is consistent with previous studies reporting reduced sensitivity of CT for bowel serosal disease because of collapsed bowel loops, respiratory motion, partial volume averaging, and the small size of metastatic implants. Nevertheless, CT remains highly

Figure 5: CT S-PCI score: anatomic regions

effective in identifying disease patterns that directly influence operability, including diffuse omental caking, mesenteric root infiltration, extensive diaphragmatic disease, and massive ascites (Figure 5).

One of the major strengths of this study is the use of operative PCI as the reference standard. Surgical assessment provides direct visualization of all peritoneal surfaces and therefore represents the most accurate method for quantifying disease burden. The excellent agreement between radiological and operative PCI (Cohen's kappa = 0.86) observed in the present study highlights the reliability of multidetector CT in routine clinical practice.

Although diffusion-weighted MRI and PET/CT have demonstrated improved sensitivity for selected surgical planning, patient counselling, and optimization of healthcare resources. peritoneal lesions, multi detector CT continues to be the primary imaging modality because of its accessibility, shorter examination time, lower cost, and ability to evaluate omental caking, mesenteric root infiltration, extensive diaphragmatic disease, and massive ascites.

The findings of this study have important clinical implications. Accurate preoperative estimation of PCI

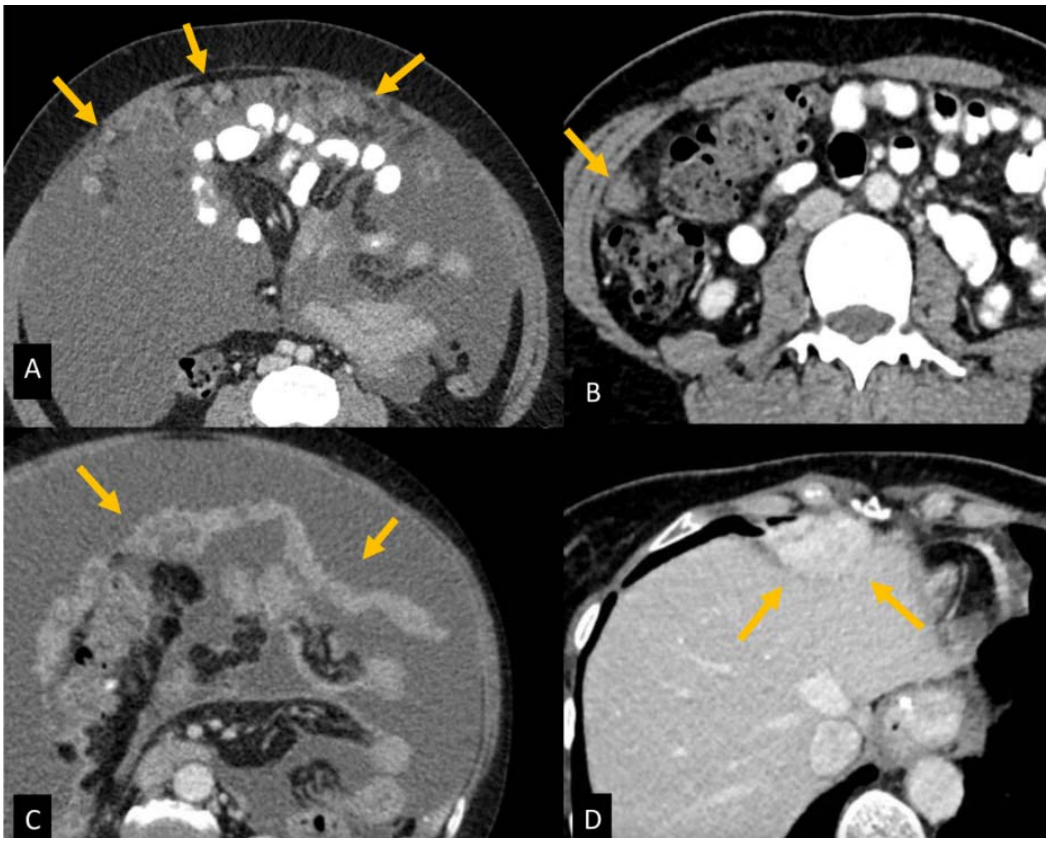


Figure 6: Examples of different types of peritoneal carcinomatosis involvement according to its morphology (abdominal CT images with intravenous and oral contrast in A and B).A) Multiple nodules in the greater omentum. B) Nodule in the right paracolic gutter. C) Plaque-like tumour deposits in the greater omentum and D) Plaque-like tumour deposits in the perihepatic region

allows surgeons to identify patients most likely to benefit from cytoreductive surgery while avoiding unnecessary exploratory laparotomy in those with extensive unresectable disease. Reliable CT assessment also facilitates multidisciplinary decision-making, surgical planning, patient counselling, and optimization of healthcare resources.

Although diffusion-weighted MRI and PET/CT have demonstrated improved sensitivity for selected peritoneal lesions, multidetector CT continues to be the primary imaging modality because of its accessibility, shorter examination time, lower cost, and ability to evaluate both intraperitoneal and extraperitoneal disease within a single examination. Consequently, CT remains the cornerstone of preoperative imaging in patients with suspected peritoneal metastases.

The present study supports the increasing adoption of standardized radiological PCI reporting in routine abdominal CT examinations. A structured region-by-region assessment based on the Sugarbaker scoring system enhances communication between radiologists and surgical oncologists, improves reproducibility, and contributes to better patient selection for CRS and HIPEC.

Strengths of the Study:

- Use of operative PCI as the reference standard.
- Evaluation performed using a modern 128-slice multidetector CT scanner.
- Inclusion of patients with peritoneal metastases from multiple primary malignancies, increasing the applicability of the findings.
- Structured radiological PCI assessment using the internationally accepted Sugarbaker scoring system.
- Assessment of multiple diagnostic performance parameters, including sensitivity, specificity, predictive values, diagnostic accuracy, correlation, and agreement.

Limitations: The retrospective design introduces the possibility of selection bias and limits control over imaging and clinical variables. The study was conducted at a single tertiary care institution with a relatively modest sample size of 60 patients, which may limit generalizability. Histopathological confirmation of every individual peritoneal implant was not feasible, and operative PCI served as the principal reference standard. In addition, CT has inherent limitations in detecting sub-centimeter peritoneal deposits, mesenteric root involvement, and diffuse small bowel serosal disease, which may result in underestimation of tumour burden.

CONCLUSION

The present study demonstrates that contrast-enhanced 128-slice multi detector computed tomography is a reliable and effective imaging modality for the preoperative estimation of the Peritoneal Cancer Index (PCI) in patients with peritoneal metastases arising from various primary malignancies. Radiological PCI showed a strong positive correlation with operative PCI, confirming the value of CT in accurately assessing overall peritoneal tumour burden and facilitating appropriate patient selection for cytoreductive surgery.

Multi detector CT exhibited high diagnostic accuracy in identifying peritoneal deposits involving the omentum, pelvis, diaphragmatic surfaces, paracolic gutters, and upper abdominal compartments. However, consistent with previous studies, CT demonstrated reduced sensitivity for detecting sub-centimetre implants, mesenteric disease, and small bowel serosal metastases, resulting in occasional underestimation of the true disease extent.

Despite these limitations, multidetector CT remains the cornerstone of preoperative imaging because of its wide availability, rapid acquisition, comprehensive evaluation of intra- and extra-peritoneal disease, and ability to predict surgical resectability. Standardized radiological PCI reporting further enhances communication between radiologists and surgical oncologists, improves multidisciplinary decision-making, and contributes to optimal treatment planning.

In conclusion, multi detector CT should continue to be regarded as the first-line imaging modality for estimating the Peritoneal Cancer Index in routine clinical practice. Future multicentre prospective studies incorporating advanced imaging techniques, diffusion-weighted MRI, radiomics, and artificial intelligence may further improve the accuracy and reproducibility of non-invasive PCI assessment.

REFERENCES

1. Vandecaveye V, et al., 2025. Imaging of peritoneal metastases of ovarian and colorectal cancer: ESGAR–ESUR–PSOGI–EANM expert consensus recommendations. Eur. Radiol., 35: 1-10.0.
2. Fallon, E.A., M.O. Awiwi, N. Bhutiani, B. Helmink and C.P. Scally et al., 2024. Peritoneal Cancer Index Correlates with Radiographic Assessment of Colorectal Carcinomatosis. Ann. Surg. Oncol., 32: 1-10.0.
3. Reginelli, A., G. Giacobbe, M.T.D. Canto, M. Alessandrella and G. Balestrucci et al., 2023. Peritoneal Carcinosis: What the Radiologist Needs to Know. Diagnostics, Vol. 13 10.3390/ diagnostics13111974 1-10.0.

4. Guchelaar NAD, et al., 2023. Update on imaging and management of peritoneal surface malignancies. Cancers (Basel)., Vol. 130 .0 1-10.0.
5. Rijken A, et al., 2023. Imaging Evaluation of Peritoneal Metastasis: Current and Promising Techniques. AbdomRadiol. (NY)., Vol. 25 .10.3348/kjr.2023.0840 1-10.0.
6. Dohan A, et al., 2022. Diagnostic imaging of peritoneal metastases: current status and future directions Eur. J.Radiol., Vol. 35 .0 1-10.0.
7. Noiret B, et al., 2022. Current role of imaging in the management of peritoneal metastases. Eur. J. Surg. Oncol., Vol. 8 .0 1-10.0.
8. Van Oudheusden TR, et al., 2022. Radiologic assessment of peritoneal metastases before cytoreductive surgery and HIPEC. Ann. Surg. Oncol., Vol. 47 .0 1-10.0.
9. Hentzen JEKR, et al., 2021. Imaging strategies for evaluation of peritoneal metastases: an updated review. Clin. Radiol., Vol. 25 .0 1-10.0.
10. van't Sant I, et al., 2021. Preoperative imaging of peritoneal metastases: strengths and limitations of CT, MRI and PET/CT Eur. J Surg. Oncol., Vol. 11 .0 1-10.0.
11. Sugarbaker PH., 2021. Update on the Peritoneal Cancer Index and its role in cytoreductive surgery. Pleura Peritoneum., Vol. 17 .0 1-10.0.
12. Esquivel J, et al., 2021. Standardization of Peritoneal Cancer Index assessment and reporting in peritoneal surface malignancies. J. Surg. Oncol., Vol. 32 .0 1-10.0.
13. Tops-Welten, M.W., L.J.S. Ewals, I.E.G. van Hellemond, J.M.J. Piek and M.J. Lahaye et al., 2025. Defining region boundaries to assess the peritoneal cancer index on imaging: A Delphi study. Eur. Radiol., 35: 1-10.0.
14. Van Oudheusden T, and Gort PC et al., 2025. Structured radiological reporting of peritoneal metastases: current recommendations and future directions. AbdomRadiol. (NY)., Vol. 35 .0 1-10.0.
15. Ewals LJS, Gort PC and Tops-Welten MW, 2026. Deep learning-based segmentation of Peritoneal Cancer Index regions from CT imaging. arXiv., Vol. 30 .10.48550/arXiv.2604.27697 1-10.0.