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Evaluation of Incidental Findings on Abdominopelvic CT: Potential Benefit of Photon-counting Detector CT Over Conventional Single-energy CT

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Purpose: To assese of potential benefint of photon-counting detector CT (PCD-CT) over conventional single-energy CT (CSE-CT) on accurate diagnosis of incidental findings with high clinical significance (IFHCS).
Materials and methods: This retrospective study included 365 patients who initially underwent abdominopelvic contrast-enhanced CT (AP-CECT) without non-enhancement (PCD-CT: 187 and CSE-CT: 178). We selected IFHCS and evaluated their diagnosability using CE-CT alone. IFHCSs that could not be diagnosed with only CE-CT were evaluated using additional PCD-CT postprocessing techniques, including virtual non-contrast image, low keV image, and iodine map. A PCD-CT scanner (NAEOTOM Alpha, Siemens Healthineer, Erlangen, Germany) was used.
Results: Thirty-nine IFHCSs (PCD-CT: 22 and CSE-CT: 17) were determined in this study. Seven IFHCSs in each group were able to diagnose with only CE-CT. Fifteen IFHCSs were able to diagnose using the additional PCD-CT postprocessing technique, which was useful for detecting and accurately diagnosing 68.2% (15/22) of lesions and 65% (13/20) of patients. All IFHCSs were accurately diagonosed with PCD-CT.
Conclusion: PCD-CT was useful for characterizing IFHCSs that are indeterminate at CSE-CT. PCD-CT offered potential benefit of PCD-CT over conventional single-energy CT on evaluation of IFHCS on only abdominopelvic CT.

Key words: photon-counting detector CT, incidental findings, single-energy CT

INTRODUCTIONS

Photon-counting detector computed tomography (PCD-CT) is a novel CT that solves many of the limitations of conventional energy-integrated detectors [1-7]. It uses semiconductor materials to generate electronic signals from incident X-ray photons. The beneficial characteristics of PCDs included the absence of electronic noise, increased iodine signal-to-noise ratio, improved spatial resolution, and full-time multi-energy imaging [1-8]. Promising PCD-CT applications involve anatomical imaging, where exquisite spatial resolution adds clinical value and applications require multi-energy data simultaneously with high spatial and/or temporal resolution [1-8]. The first approved PCD-CT system for clinical use was released in 2021 (NAEOTOM Alpha, Siemens Healthineers, Erlangen, Germany) [4]. Some studies reported the clinical use of PCD-CT in the abdomen [5, 7-11]. PCD-CT can be used for abdominal imaging, especially for diseases with very small structures [7, 10]. An example is peritoneal carcinomatosis detection where the use of PCD-CT enhanced the visualization of small peritoneal serosal deposits [7, 10].

Incidental findings (IFs), where lesions are detected during an imaging study for an unrelated reason, are extremely prominent in routine abdominal CT [12-15]. IFs frequently have a great cost to the patient and the health care system, when detected but incompletely characterized, because they warrant follow-up imaging, thereby increasing patient anxiety, radiation dose, resource utilization, and health care expenses [12, 15]. When CE-CT revealed an enhanced adrenal nodule without fat in patients with cancer, further imaging, such as magnetic resonance imaging (MRI), is needed for differential diagnosis of metastasis and adenoma. PCD-CT may help characterize many incidental IFs that would be indeterminate at conventional single-energy CT (CSE-CT), thereby eliminating the need for further workup. The PCD-CT can provide full-time multi-energy data. This study aimed to evaluate IFs of high clinical significance (IFHCS) using PCD-CT and CSE-CT, and assess the use of additional PCD-CT postprocessing techniques in evaluating abdominal IFHCS. We assessed of potential benefint of PCD-CT over CSE-CT on acculate diagnosis of IFHCS.

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Table 1 Demographic data of patients and number of incidental findings

	PCD-CT	CSE-CT	Total
Initial AP-CECT without non-enhancement	187 Pts (100 M, 87 F, MA: 67.2y)	178 Pts (99 M, 79 F, MA: 65.6y)	365 Pts (199 M, 166 F, MA: 66.1y)
IFHCS	22 IFs (20 Pts,12 M, 8 F, MA: 70.1y)	17 IFs (15 Pts, 9M, 6F, MA: 71y)	39 IFs (35 Pts, 21 M, 14 F, MA: 69y)
Undeterminable final diagnosis of IFHCS on CE-CT alone	15 IFs (13 Pts, 10 M, 3 F, MA: 72.8y)	10 IFs (8 Pts, 5 M, 3 F, MA: 73.1y)	25 IFs (21 Pts, 15 M, 6 F, MA: 72.9y)

PCD-CT. photon-counting detector CT, CSE-CT. conventional single-energy CT, AP-CECT. Abdominopelvic contrast enhanced CT, IFHCS. Incidental finding high clinical significance, Pts. Patients, M. male, F. Female, MA. Mean age, Y. years

MATERIALS AND METHODS

Study design

The institutional ethics committee approved this retrospective study and granted a waiver for the informed consent requirement.

Patient characteristics

Our study included 18,865 patients who underwent abdominopelvic CE-CT (AP-CECT) from August 2022 to June 2023. We used PCD-CT (NAEOTOM Alpha, Siemens Healthineer, Erlangen, Germany) and CSE-CT (SOMATOM Force, SOMATOM X. cite, SOMATOM Definition Edge, Siemens Healthineer, Erlangen, Germany). The Radiology Information System was used to select patients who underwent initial AP-CECT without non-enhancement.

CT protocol

The tube voltage was 120 kVp and the detector configuration was 144 × 0.4 mm with automatic tube modulation on PCD-CT. Scans were performed at an IQ level of 180 (quality reference mAs), pitch range of 0.8–2, and iterative reconstruction strength of 2. On CSE-CTT using a 64 to 128-slice scanner, the tube voltage was 60–120 kVp and the detector configuration was 128–102 × 0.6 mm with automatic tube modulation, a helical pitch was 0.7, and a rotation time was 0.5 s. We used auto exposure control with 230 mA as a reference.

AP-CECT examinations were performed by injecting 2 mL/kg of non-ionic contrast material with a scanning delay of 120 s.

Subjective analysis

An IF is any incidentally discovered mass or lesion unrelated to the primary lesion. IFs were categorized based on their clinical significance as low, moderate, or high. We used a similar system of IF categorization as previously published in studies on the prevalence of IFs in different imaging scenarios [11–14]. Additionally, the American College of Radiology (ACR) IFs white papers provided further guidance [16–18]. IFHCS was defined as requiring prompt medical or surgical intervention or further workup [12]. IFs can cause adverse health effects if left untreated. Examples included indeterminate adrenal nodules, non-regional lymphadenopathy of > 1.5 cm in short axis, and aneurysms. Two radiologists with > 20 years of experience individually selected IFs under IF categorization as previously published in studies and the ACR IFs white papers [12, 16–18]. The radiologists individually reviewed CT images of initial AP-CECT without non-enhancement using a 5-mm axial image on both PCD-CT and CSE-CT groups and selected IFHCS. IFHCS diagnosis was graded as 5 (possible to diagnose), 4 (likely to be diagnosed), 3 (diagnosis is uncertain), 2 (unlikely to be diagnosed), and 1 (impossible to diagnose). The lesion was recognized as IFHCS when either one or the other radiologist selected grade 5. Two radiologists individually evaluated IFHCS, as well as whether the final IFHCS diagnosis can be confirmed on only CE-CT , graded as 5 (possible to diagnose), 4: (likely to be diagnosed), 3 (diagnosis is uncertain), 2 (unlikely to be diagnosed), 1 (impossible to diagnose). IIFHCSs with grades 1 and 2 were defined as IFHCS that are impossible to be diagnosed on only CE-CT. The cause of the diagnostic difficulty of IFHCSs with grades 1 and 2 in the CSE-CT group was evaluated. An additional PCD-CT postprocessing technique (virtual non-contrast [VNC] image, low keV image, and iodine map) was used to evaluate IFHCSs with grades 1 and 2 in the PCD-CT group. We used low keV images of 40 keV. The initial axial image of a 5-mm slice thickness was used, and additional images with postprocessing techniques were evaluated by 0.4- or 1-mm slice thickness on PCD-CT. PCD-CT datasets were retrospectively analyzed using a manufacture-specific spectral workstation (Syngo. Via, VB60A version, Siemens Healthineers, Erlangen, Germany).

The cause of the diagnostic difficulty of IFHCSs with grades 1and 2 in the CSE-CT group and the PCD-CT group, and solution to the diagnostic difficulty using an additional PCD-CT postprocessing technique were evaluated by two radiologists individually. Disagreements were resolved through discussion to reach a consensus.

Fig. 1 shows the flow chart of inclusion and exclusion criteria in selecting IFHSC in the abdomen.

Statistical analysis

The chi-square test was used to compare the demographic data of patients who underwent initial AP-CECT in the PCD-CT and CSE-CT groups.

A Cohen k analysis was used to evaluate interobserver differences in the diagnosability of IFHCS on only CE-CT in both groups (k values of 0–0.20 indicated poor agreement; 0.21–0.40 fair agreement; 0.41–0.60 moderate agreement; 0.61–0.80 substantial agreement; and 0.81–1.0 nearly perfect agreement). We compared the diagnosability of IFHCS on only CE-CT in the PCD-CT and CSE-CT groups using a chi-square test.

Statistical analysis was performed using Statistical

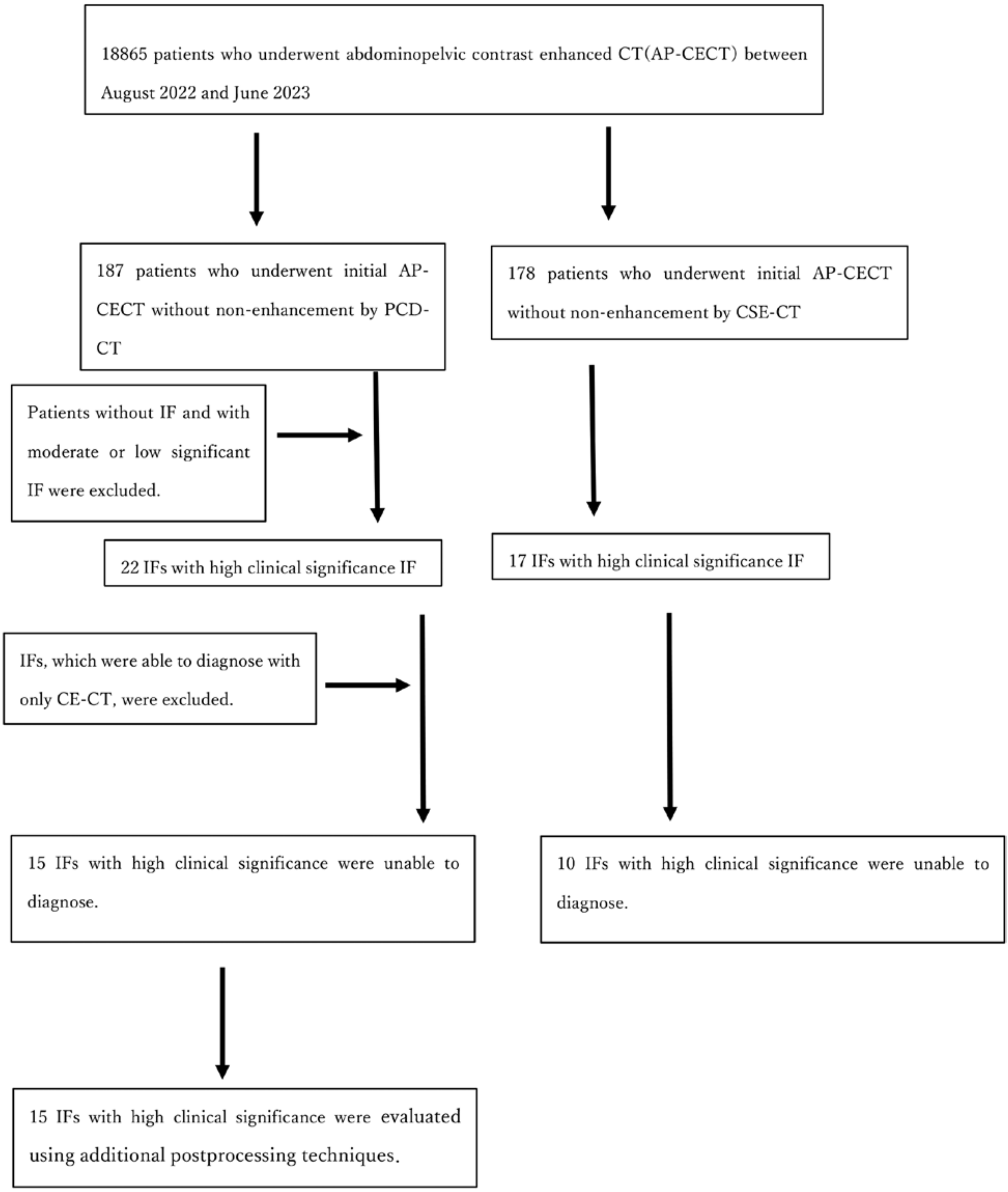


Fig. 1 Flow chart of inclusion and exclusion criteria in incidental finding selection.
PCD-CT: photon counting detector-CT, CSE-CT: conventional single-energy CT, IF: incidental finding

Package for the Social Sciences version 23 software. P-values if < 0.05 values indicated statistical significance.

RESULTS

Of the patients who underwent initial AP-CECT without non-enhancement, this study revealed 187 patients (100 males and 87 females, mean age: 67.2 years) on PCD-CT and 178 patients (99 males and 79 females, mean age: 65.6 years) on CSE-CT. The two groups demonstrated no significant differences in demographic data (age, $p = 0.47$; sex, $p = 0.38$). Mena volume CT dose indexes was 7.8 ± 1.7 (4.9−12.8) mGy on PCD-CT vursus 10.2 ± 1.6 (7.7−14.2) mGy on CSE-CT. Table 1 shows numbers of patients and IFHCS. The overall incidence of IFHCS per patient was 9.6% (PCD-CT: 10.7% and CSE-CT: 8.4%). A total of 39 IFHCSs (PCD-CT: 22 IFHCSs on 20 patients; CSE-CT: 17 IFHCSs on 15 patients) were selected with no interobserver differences of diagnosability (PCD-CT: $\kappa = 0.784$ and SE-CT: $\kappa = 0.904$). The diagnosability of IFHCS on only CE-CT was not significantly different

Table 2 Computed tomography and clinical findings in patients with incidental findings of high clinical significance

No	Age, sex	Clinical information	Conventional contrast enhanced CT findings	Evaluation of Additional technique	Diagnosis	Recommendation	Clinical follow up
1	85y. F	Esophageal Ca	Hyper attenuating nodule (1.5 cm) in Rt. Kidney	VNC image: hyper attenuation of 100HU LkeV image and iodine map: no enhancement	Complicated cyst: Bosniak II	Nothing	Nothing
2	84y. M	Oral Ca	Inhomogeneous hyper attenuating nodule (1.2 cm) in Rt. kidney	VNC image: hyper attenuating peripheal area of 60HU LkeV image: central area with enhancement	Complicated cyst: Bosniak IIF	Follow up	Nothing
3	74y. M	PO Cecal Ca	Inhomogeneous hyper attenuating nodule with calcification (1 cm) in Lt. Kidney	VNC image: inhomogeneous hyper attenuation LkeV image and iodine map: no enhancement	Complicated cyst: Bosniak II	Nothing	Nothing
4	67y. M	PO Maxillary Ca	Ring hyper attenuating nodule (1.8 cm) in Lt. kidney	VNC image: ring hyper attenuatin nodule LkeV. image and iodine map: no enhancement	Complicated cyst: Bosniak II	Nothing	Nothing
5	84y. M	Lip Ca	Inhomogeneous hyper attenuating nodule with calcification (2 cm) in Lt. kidney	VNC image: inhomogenous hyper attenuating nodule LkeV image and iodine map: with enhancement	Complicated cyst: Bosniak IV	Dynamic MRI	MRI diagnosis is same as CT
6	63y. M	PO Colon Ca	Mild hyper attenuating nodule with calcification (2 cm) in Lt. kidney	VNC image: hyper attenuating nodule LkeV image and iodain map: no enhancement	Complicated cyst: Bosniak II	Nothing	Nothing
7	71y. M	PO Lung Ca	hypo attenuating nodule without fat (1.7 cm) in left adrenal	VNC and LkeV. images: fat within nodule	Adrenal adenoma	Nothing	Nothing
8	58y. M	PO Colon Ca	Hyper attenuating nodule without fat (1 cm) in left adrenal	VNC and LkeV images: fat within nodule LkeV image and iodine map: Enhancement	Adrenal adenoma	Nothing	Nothing
9	72y. F	Urerine cervical Ca	Hyper attenuating nodule without fat (1 cm) in left adrenal	VNC and LkeV image: fat within nodule LkeV image and iodine map: Enhancement	Adrenal adenoma	Nothing	Nothing
10	75y. M	FUO	Hyper attenuating nodule without fat (1.5 cm) in left adrenal	VNC image: solid nodule of 45 HU withou fat LkeV image and iodine map: Enhancement	Metastasis >adenoma	Further examination	Lung cancer on chest CT FDG uptake on Left adrenal
11	63y. F	FUO	Calcified splenic aneurysm (1.2 cm) with minimum enhancement	VNC image:low central area of aneurysm LkeV image and iodine map: clear cenral enhancment	Enhanced splenic aneurysm	Follow up	Stable at 8months
12	63y. F	FUO	Intrapelvic solid mass with 59HU (3 cm)	VNC image:mass of 55 HU LkeV image and iodine map: non-ehancement	Benign solid mass such as fibroma	Follow up	Stable at 8months
13	77y. M	PO Gastric Ca	Intraluminal hyper attenuating around aortic endograft	VNC image: no intralumical hyper attenuation LkeV Image: enhanced area around endgraft from lumbar artery	Type 2 endoleak	Management by vascular surgery	Follow up
14	74y. M	PO Colon Ca	Inhomogeneous hyper attenuating nodule with calcification (1.2 cm) in Rt. kidney	VNC image: mild high density of 42HU LkeV. image and iodine map: nonenhancement	Complicated cyst: Bosniak II	Nothing	Nothing
15	74y. M	PO Colon Ca	Questionable tiny hyper attenuating at CBD Dilatation of intrahepatic bile duct	VNC image: clear high-density stone Iodine map: no enhancement	CBD stone	Follow up	Follow up

PO: postoperative, FUO: fever of unknown origin, M: male, F: Famele, VNC: virtual non contrast, FDG: fluorodeoxyglucose, LkeV: low keV, CBD: common bile duct

Table 3 Computed tomography and cause of diagnostic difficulty in patients using single energy CT

No.	Age(year), sex	Clinical information	Conventional contrast enhanced CT findings	Cause of diagnostic difficulty
1	65y, M	Early esophagiel Ca	Left renal inhomogeneous nodule of 46HU	Enhancement within nodule is uncertain.
2	79y, M	Skin Ca	Left renal inhomogeneous nodule of 55HU	Enhancement within nodule is uncertain.
3	65y, M	Early esophagiel Ca	Left renal inhomogeneous nodule of 84HU	Enhancement within nodule is uncertain.
4	62y, M	Oral Ca	Right renal homogeneous nodule of 36HU	Enhanced nodule or hemorrhagic cyst is uncertain.
5	97y, F	Oral Ca	Retroperitoneal homogeneous nodule of 50HU	Enhanced nodule or hemorrhagic cyst is uncertain.
6	75y, F	General fatiuge	Left adrenal nodule of 50HU without fat	Enhanced nodule or hemorrhagic cyst is uncertain.
7	70y, F	FOU	Left adrenal nodule of 40 HU without fat	Nodule is uneble to diagnose as adenoma.
8	76y, M	Lung Ca	Left adrenal nodule of 48 HU without fat	Nodule is unable to diagnose as adenoma.
9	65y, M	Early esophagiel Ca	Rectal homogenous mass of 96HU	Hyper attenuating mass with enhancement is uncertain.
10	65y, M	Early esophagiel Ca	Presacral inhomogenous nodule of 93HU	Hyper attenuating nodule with enhancement is uncertain.

Ca. carcinoma, FOU. fever of unknown origin

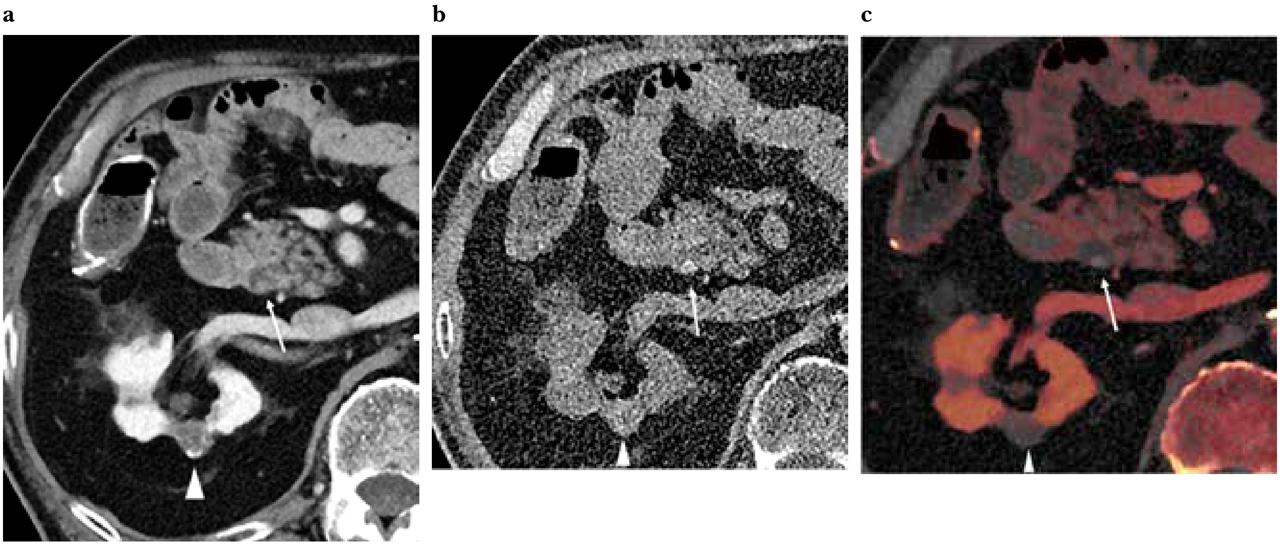


Fig. 2 A case of common bile duct (CBD) stone and complicated renal cyst.
a. Contrast-enhanced computed tomography (CE-CT) image shows a tiny high density in CBD (arrow) and an inhomogeneous high-density nodule with calcification in the right kidney (arrowhead).
b. Virtual non-contrast image reveals a clear CBD stone (arrow) and a low-density nodule in the right kidney (arrowhead).
c. Iodine map shows no enhancement within the CBD stone (arrow) and a nodule in the right kidney (arrowhead).

between the PCD-CT and CSE-CT groups ($p = 0.738$). Fifteen IFHCS on PCD-CT coluld not be diagnosed with only CE-CT, and the IFHCSs were evaluated using an additional PCD-CT postprocessing technique. Table 2 shows the radiological and clinical findings on IFHCS evaluated using additional photo-counting techniques. Diagnoses were possible in 7 complicated renal cysts (Fig. 2), 3 adrenal adenomas, 1 adrenal metastasis (Fig. 3), 1 splenic aneurysm, 1 benign tuomr, 1 endoleak on endovascular aortic repair (Fig. 4), and 1 common bile duct stone (Fig. 2). Thus, the additional PCD-CT technique helped to detect and diagnose 68.2% of lesions (15/22) and 65% of patients (13/20). Ten IFHCSs on CSE-CT were not diagnosed with only CE-CT (58.8% of lesions [10/17] and 53.3% of patients [8/15]). Table 3 shows the cause of diagnostic difficulty on 10 IFHCSs on CSE-CT.

DISCUSSION

We evaluated IFHCSs on AP-CECT without non-enhancement using PCD-CT and CSE-CT. The present study revealed the initial experience of IFHCS evaluations on AP-CECT using PCD-CT compared to CSE-CT because some IFHCS cases on AP-CECT without non-enhancement could not be confirmed for final diagnosis. We assumed that PCD-CT increases the diagnosability of IFHCS using additional PCD-CT postprocessing techniques and eliminates the need for further workup. The final diagnosis in 7 of 17 IFHSCs was not confirmed on CSE-CT. The final diagnosis in 10 of 22 IFHSCs on PCD-CT group could not be confirmed with only CE-CT ; however, the final diagnoses of IFHSCs using additional PCD-CT postprocessing techniques were possible. Two radiologists evaluated

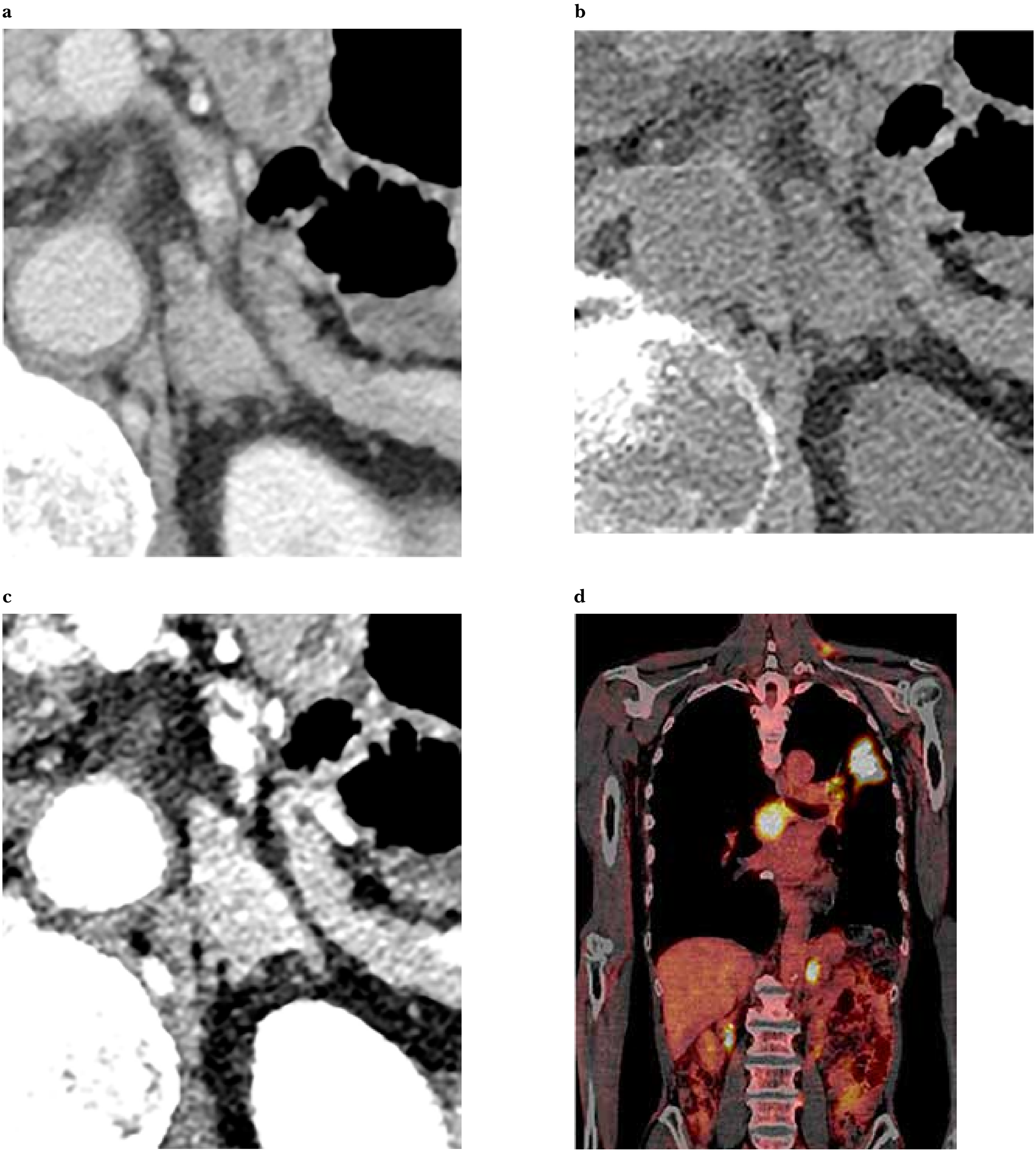
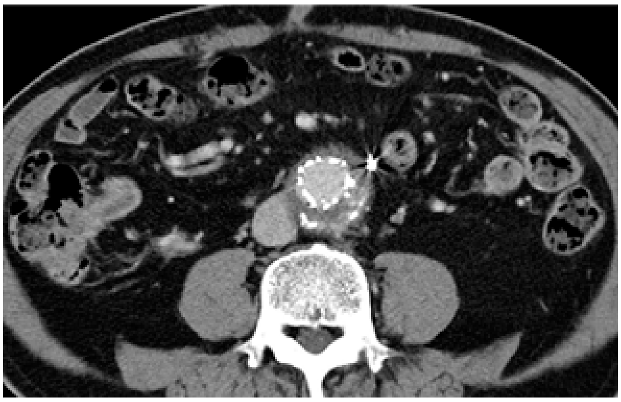


Fig. 3 A case suspected of adrenal metastasis.
a. CE-CT image revealed a right adrenal enlargement by 50 HU.
b. Virtual non-contrast image shows a right adrenal enlargement by 30 HU.
c. Low keV image shows an increased adrenal enhancement, thus adrenal metastasis is suspected rather than adenoma.
d. Positron emission tomography-CT image after photon-counting detector CT (PCD-CT) examination shows multiple fluorodeoxyglucose uptakes in lung mass, right hilum lymph node, left subclavian lymph node, and left adrenal, and lung cancer with multiple metastases is diagnosed.

the results using reading score grades and a significant difference in diagnosability was observed between them ($\kappa = 0.7$). The review article by Hsieh *et al.* described the spectral characterization of IF using PCD-CT [6]. However, to our knowledge, the present study is the first to evaluate IFHCS on AP-CECT using PCD-CT.

Attainable image contrast optimization with PCD-CT has multiple potential applications in the abdomen and pelvis, including improved conspicuity and delineation of neoplasms within parenchymal backgrounds such as hepaic tumor in fatty liver. In particular, PCD-CT enhances the visibility of liver lesions and pancreatic cancers by accentuating CT number differences

a



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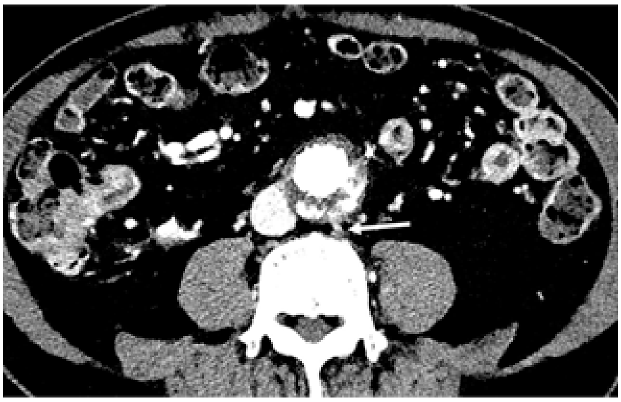

Fig. 4 A case of type 2 endoleak after endovascular aortic repair.
a. CE-CT image shows mild high density around endograft in the abdominal aorta.
b. Virtual non-contrast image reveals no high density around the endograft.
c. Low keV image shows marked enhancement around the endograft in the abdominal aorta and type 2 endoleak due to the flow lumbar artery (arrow).

due to small iodine enhancement differences [5]. PCD-CT improves the detectability of small objects, such as small hypoattenuating liver metastases, with improved iodine contrast signal using the PCD, alone or in combination with virtual monoenergetic images (VMIs) [5, 7]. Intraluminal high density mass in gastrointestinal tract souble be distinguished from food residue on CE-CT. VNC and low keV imades useful for the correct diagnosis of ture tumor with enhcnacement. The improved dose efficiency of PCDs allows the use of narrower slice thicknesses at matched radiation doses, resulting in less partial volume averaging [5]. Iodine signal improvements with PCDs, potentially in combination with low-energy VMIs, can alternatively be used to reduce the amount of iodine used to achieve similar differences in image contrast for different diagnostic tasks [5]. Hagen *et al.* reported that image quality can be maintained while significantly reducing the contrast volume and the radiation dose on high body mass index(BMI) patients, however, with growing BMI the noise increase at lower keV was less for PCD-CT compared to the energy integrating-detector CT [19].

Existing dual-energy (DE) technologies require the prospective selection of a DE protocol [6]. Spectral CT provides full-time multi-energy imaging, but it is detector-based spectral CT [20]. This is not an issue if the clinical indication for the CT scan requires spectral information from the start. However, spectral information is sometimes desired for an IF, and the ability of PCDs to provide retrospective spectral information is valuable in these cases [6]. CE-CT without non-enhancement is usually not performed. However, it was used for preoperative metastatic evaluation on patients with cancer of early stages. Diagnosis of IFHCSs is important in these cases.

IF frequencies have been documented for various imaging modalities and clinical indications [12-18]. The incidence of IFHCS on abdominal CT is 7%-16% [12-14], similar to our result. Wortman *et al.* reported about IFs using abdominal DE-CT, including adrenal, hepatic, and pancreatic lesions [15]. Adenoma is a common incidental adrenal lesion [18], and VNC images can be used to characterize many lesions, such as lipid-rich adenomas [15]. Our study diagnosed three cases of enhanced adrenal nodule as adenoma because the lesions had fat density on the VNC image, and one case of enhanced adrenal nodule could be diagnosed as metastasis because of no fat on the VNC image. Niehof *et al.* revealed that the difference between true non-contrast and VNC derived from PCD-CT for abdominal CT images was ≤ 10 HU in 40% and ≤ 15 HU in 72% [21]. Therefore, special caution should be exercised when using VNC images in routine clinical practice. Hyperattenuating renal cysts can be distinguished from enhancing mass using VNC images, and VNC, VMIs, or iodine map is useful for evaluating complex cystic renal lesion [6]. Our 5 of 7 renal nodules with high attenuation could be diagnosed as complicated cysts of Bosniak type II because of no enhancement on the 40-keV image and iodine map. One case was diagnosed as complicated cyst of Bosniak type IV with faint enhancement on dynamic MRI, and follow-up was continued. Enhancement of small aneurysms and endoleak could be revealed on 40 keV images in our study because PCD-CT improved the iodine signal due to the lack of the down-weighting of low-energy photons. PCD-CT improved the detection and characterization of urolithiasis smaller than 3 mm compared to DE-CT [10]. Our study revealed no urolithiasis; however, the same potential was seen in detecting tiny common bile duct stone. Iodine maps are helpful in risk stratification of pancreatic cystic lesions during initial detection because areas of nodularity, wall thickening, and enhancement were assessed [15]. PCD-CT, as well as DE-CT, can characterize abdominal IFs. The need for further workup might be eliminated if the issue is addressed on AP-CECT without non-enhancement using an additional PCD-CT postprocessing technique. Our study revealed the effectiveness of PCD-CT postprocessing technique evaluation for IFHCSs in 68.2% of lesions and 65% of patients. One of the most promising PCD-CT applications is its ability to characterize IFs more fully in the abdomen. A routine PCD-CT can help avoid unnecessary additional imaging, associated costs, and patient radiation exposure because PCD-CT exonerates many IFs as benign during detection.

Our study had some limitations. First is the small number of patients examined by PCD-CT and CSE-CT and the short observation time to evaluate IFs. One of the reasons for the small sample size is the rarity of initial AP-CECT without non-enhancement. The indication of initial AP-CECT without non-enhancement in our institution is as follows: metastasis evaluation from early-stage cancer, excluding blast cancer; mainly head and neck cancer, request of attending physician, etc. Thus, some selection bias may have occurred. Other influence of selection bias was diagnostic difficulty of IFHCSs with grades 1 and 2. IFHCSs with grades 1 and 2 were defined as IFHCS that are impossible to be diagnosed on only CE-CT, and those cases included high density nodule or faint enhanced mass. In some cases, super experienced radiologists might be able to diagnose boldly, however, our two radiologists diagenosed carefully. Second, various IFHCSs were not included and final payhological diagnoses of IFHCSs were not perfomed. Furthermore, a large study that included a long follow-up period is necessary to evaluate IFs using PCD-CT.

CONCLUSIONS

Our initial experience showed that PCD-CT offered potential benefit over CSE-CT on evaluation of IFHCS on only abdominopelvic CT and PCD-CT postprocessing technique evaluation for IFHCSs was useful on approximately 65% of patients with IFHCS. Routine use of PCD-CT may eliminate the need for additional imaging in some IFHCS workup.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interest

The authors declare that they have no conflict of interest in this study.

Ethical approval

The retrospective study was approved by the institutional review board, and the requirement for informed consent was waived.

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