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Dual Yield of Pre-Transplant CT Angiography in Renal Transplant Recipients: Incidental Extra-Vascular Findings, Predictors, and Implications for Surgical Planning

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Abstract

Purpose

To evaluate the incidence, organ-system distribution, and clinical impact of extra-vascular incidental findings (IFs) on pre-transplant computed tomography angiography (CTA) in renal transplant recipients, and to identify demographic and clinical predictors of clinically significant IFs.

Methods

In this IRB-approved retrospective cohort study, 143 consecutive adult renal transplant recipients (mean age 51.8 ± 13.6 years; 89 male [62.2%]) who underwent pre-transplant CTA between January and December 2024 were included. Two fellowship-trained abdominal radiologists independently reviewed all studies blinded to clinical data. Findings were classified as surgical vascular anatomy or true extra-vascular IFs per ACR Incidental Findings White Paper guidelines (2023 edition). ACR Type 3 or higher was defined as clinically significant. Comorbidities were recorded and the Charlson Comorbidity Index (CCI) calculated. Univariate logistic regression analyses assessed associations with ACR Type 3 + IFs; multivariate modelling was not performed given the exploratory nature of the study and limited event count. Interobserver agreement was assessed using Cohen's κ.

Results

IFs warranting further evaluation (ACR Type 3+) were identified in 33 patients (23.1%). Surgically relevant vascular findings were present in 86 patients (60.1%) and were significantly associated with co-detection of ACR Type 3 + IFs (OR 9.64; 95% CI 2.80–33.2; $p < 0.001$). Female sex was a significant predictor of ACR Type 3 + IFs on univariate analysis (35.2% vs. 15.7% in males; OR 2.91; 95% CI 1.27–6.66; $p = 0.013$). Ischemic heart disease showed a borderline association (OR 3.27; $p = 0.076$). Comorbidity count showed a non-significant trend ($p = 0.097$). Interobserver agreement was substantial ($\kappa = 0.78$; 95% CI 0.66–0.90).

Conclusions

Pre-transplant CTA yields ACR Type 3 + extra-vascular IFs in 23.1% of renal transplant recipients, well above the 5% threshold for systematic radiological review. The strong association with vascular finding burden and the identification of female sex as a significant predictor on univariate analysis provide a basis for targeted radiological review in the pre-transplant setting.

KEY POINTS

- Clinically significant extra-vascular incidental findings (ACR Type 3+) were identified in 23.1% of renal transplant recipients on pre-transplant CTA — nearly one in four patients, substantially exceeding the 5% threshold for systematic radiological review.
- Surgically relevant vascular findings were present in 60.1% of recipients and were strongly associated with co-detection of clinically significant incidental findings (OR 9.64; $p < 0.001$), suggesting shared systemic disease burden.
- Female sex was a significant predictor of ACR Type 3 + incidental findings on univariate analysis (OR 2.91; 95% CI 1.27–6.66; $p = 0.013$), a novel finding with direct implications for pre-transplant imaging triage.
- Substantial interobserver agreement ($\kappa = 0.78$) validates the ACR Incidental Findings framework as a reliable and reproducible classification tool in the renal transplant population.

INTRODUCTION

Renal transplantation is the treatment of choice for end-stage kidney disease, offering superior survival and quality of life compared with long-term dialysis [1]. Computed tomography angiography (CTA) of the abdomen and pelvis is widely employed in pre-transplant recipient evaluation, primarily to delineate iliac and pelvic vascular anatomy in preparation for surgical anastomosis [2, 3]. This expected and essential component of the examination enables the transplant surgeon to anticipate vascular challenges — including calcific stenosis, anomalous vessels, or prior surgical changes — and to select the optimal side and technique for allograft implantation.

A less-studied consequence of this imaging is the inevitable capture of the entire abdomen and pelvis, creating the opportunity to detect extra-vascular incidental findings (IFs). IFs are defined as unexpected abnormalities unrelated to the primary imaging indication. Their management presents a well-documented clinical dilemma: the benefit of detecting occult significant disease must be weighed against the risks of overdiagnosis, unnecessary follow-up, patient anxiety, and increased healthcare costs [4, 5]. In the renal transplant population, this balance is further complicated by a high burden of systemic comorbidities, ongoing immunosuppression, and the time-sensitive nature of the procedure.

The American College of Radiology (ACR) Incidental Findings Committee White Papers provide an evidence-based, organ-specific framework for categorising IFs and recommending management pathways [6]. While validated in general radiology populations, the yield and clinical impact of this framework applied systematically to renal transplant recipients — a population with unique comorbidity profiles and clinical imperatives — remains poorly characterised. Existing literature on recipient pre-transplant imaging focuses predominantly on vascular anatomy, with limited data on the prevalence, spectrum, and predictors of co-detected extra-vascular pathology [3, 7]. Furthermore, no prior study has examined sex as a potential predictor of incidental pathology in this population.

This study addresses this gap with three primary aims: (1) to determine the incidence and organ-system distribution of extra-vascular IFs on pre-transplant CTA using the ACR classification; (2) to identify demographic and clinical predictors of clinically significant IFs; and (3) to assess the interobserver reliability of the ACR framework in this population.

METHODS

Ethics Approval and Study Design

This retrospective cohort study was conducted at a tertiary academic transplant centre. IRB approval was obtained (IRB #2251210). The requirement for individual informed consent was waived owing to the retrospective, non-interventional nature of the study. The study was conducted in accordance with the Declaration of Helsinki.

Study Population and Patient Selection

Pre-transplant CTA of the abdomen and pelvis is the institutional standard of care at our centre for all adult renal transplant candidates, performed to delineate iliac and pelvic vascular anatomy prior to surgical anastomosis planning. Consecutive adult patients (≥18 years) who underwent renal transplantation between January and December 2024 and had a dedicated pre-operative CTA of the abdomen and pelvis for surgical planning were eligible. Exclusion criteria were: (1) prior major abdominal or pelvic surgery substantially altering pelvic vascular anatomy; (2) technically incomplete CT studies; or (3) insufficient clinical data in electronic medical records. Where a patient had multiple CT examinations during the evaluation period, only the earliest pre-transplant scan was analysed. During the study period, 215 renal transplants were performed; 143 patients (66.5%) met all inclusion criteria and comprised the final study cohort (Figure 4).

CT Imaging Protocol

All studies were acquired on a 256-slice multidetector CT scanner (Revolution CT; GE Healthcare, Chicago, IL, USA) using a standardised pre-transplant CTA protocol comprising four phases:

- Unenhanced phase: Diaphragmatic domes to pubic symphysis.
- Arterial phase: Bolus-triggered acquisition (threshold 150 HU in the abdominal aorta).
- Venous phase: Fixed delay of 70 seconds post-injection.
- Contrast agent: 100 mL iohexol (Omnipaque 350; GE Healthcare) administered intravenously at 4–5 mL/s.
- Reconstruction: 120 kVp; automated tube current modulation; 0.625 mm (angiographic) and 1.5 mm (diagnostic) slice thickness.

Image Analysis and Classification of Findings

Two fellowship-trained abdominal radiologists (Reader 1: 10 years post-fellowship experience; Reader 2: 8 years) independently reviewed all CT studies in randomised order on a dedicated Picture Archiving and Communication System (PACS) workstation, blinded to clinical details and original radiology reports. A minimum 4-week washout period was observed between each reader's review of the same case to prevent recall bias and ensure truly independent assessments.

All findings were categorised into one of two mutually exclusive groups:

- Surgical Vascular Anatomy: Stenoses, occlusions, calcific disease, or anomalies of the iliac, femoral, and renal vessels and IVC. These constituted the primary indication for CT and were not classified as incidental.
- True Extra-Vascular Incidental Findings (IFs): Any extra-vascular abnormality unrelated to the transplant procedure. Each IF was classified per the relevant organ-specific ACR Incidental Findings White Paper (2023 edition) [6], using a five-tier system from Type 1 (benign, no follow-up required) to Type 5 (highly suspicious for malignancy). ACR Type 3 or higher (indeterminate or suspicious, warranting further evaluation) was defined as clinically significant for the purposes of this study.

Reader discrepancies were resolved by consensus read with a third senior abdominal radiologist (≥15 years of experience), whose classification constituted the reference standard. Cohen's κ was calculated from independent pre-consensus reads.

Clinical Data Collection and Comorbidity Assessment

Clinical data were extracted from structured electronic medical records by a trained research coordinator blinded to imaging results. The following comorbidities were recorded as present or absent: diabetes mellitus (DM), hypertension (HTN), ischaemic heart disease/coronary artery disease (IHD/CAD), cerebrovascular accident/stroke (CVA), systemic lupus erythematosus (SLE), chronic kidney disease (CKD; stage ≥4), and heart failure (HF). Two comorbidity metrics were calculated: (1) simple comorbidity count (unweighted sum); and (2) Charlson Comorbidity Index (CCI), a validated weighted score predictive of 10-year mortality [8]. Absent fields were treated as absence of the condition.

Statistical Analysis

Categorical variables are reported as counts and percentages; continuous variables as mean ± standard deviation (SD). Group comparisons used Student's t-test for continuous variables and χ^2 or Fisher's exact test for categorical variables. Odds ratios (OR) with 95% confidence intervals (CI) were calculated for significant binary associations. Given the exploratory nature of this study and the limited number of outcome events (n=33 ACR Type 3+ cases), multivariate logistic regression was not performed to avoid

model overfitting; all associations are reported as univariate estimates and should be interpreted accordingly. Statistical significance was defined as $p<0.05$ (two-tailed). All analyses were performed using IBM SPSS Statistics version 28.0 (IBM Corp., Armonk, NY, USA). Interobserver agreement was quantified using Cohen's κ with 95% CI, interpreted per Landis and Koch benchmarks (κ 0.61–0.80 = substantial agreement) [9].

RESULTS

Study Cohort Characteristics

Of 215 consecutive renal transplant recipients, 143 met inclusion criteria and formed the final study cohort (mean age 51.8 ± 13.6 years; 89 male [62.2%], 54 female [37.8%]). All patients had CKD stage ≥4 by definition. Mean CCI was 4.2 ± 1.8. The most prevalent comorbidities were HTN (n=112, 78.3%) and DM (n=91, 63.6%). Complete baseline demographics and comorbidity profiles are presented in Table 4.

Vascular Anatomy Findings and Surgical Impact

Surgically relevant vascular findings were identified in 86 patients (60.1%), directly influencing operative planning in all cases (Table 1). Iliac or femoral artery stenosis or calcification was the most frequent finding (n=28, 19.6%), altering the anastomosis side in 18 patients and prompting pre-operative angioplasty in 2. Duplicated inferior vena cava (n=9, 6.3%) required modification of the venous anastomosis strategy. May–Thurner anatomy (n=6, 4.2%) influenced side selection. A representative example of severe calcific iliac artery stenosis dictating contralateral anastomosis is illustrated in Figure 2.

Table 1. Vascular Anatomy Findings and Their Impact on Surgical Planning (n=86/143, 60.1%)

Vascular Finding	n (%)	Surgical Impact
Iliac/Femoral Artery Stenosis or Calcification	28 (19.6%)	Changed anastomosis side (n=18); pre-operative angioplasty (n=2)
Duplicated Inferior Vena Cava	9 (6.3%)	Altered venous anastomosis strategy
May–Thurner Anatomy	6 (4.2%)	Influenced anastomosis side selection
Iliac Vein Stenosis or Occlusion	4 (2.8%)	Changed anastomosis side (n=3)
Other (Aneurysm, Renal Artery Variant, etc.)	39 (27.3%)	Required specialist consultation or altered operative plan

IVC, inferior vena cava.

Incidental Findings: Incidence and Organ-System Distribution

Clinically significant IFs (ACR Type 3+) were present in 33 patients (23.1%). ACR Type 1 findings were identified in 88 patients (61.5%) and ACR Type 2 in 22 patients (15.4%). The complete spectrum of findings by organ system and ACR category is presented in Table 2. Renal findings were most prevalent across all ACR categories; complex renal lesions (including Bosniak IIf/III cysts, angiomyolipoma, and polycystic kidneys) constituted the largest subgroup of ACR Type 3+ findings. Hepatic, pancreatic, adrenal, mesenteric, biliary, pulmonary, and other findings are detailed in Table 2. A representative complex renal cyst classified as Bosniak III (ACR Type 3) is shown in Figure 1. A representative mesenteric lobulated soft tissue lesion requiring oncological referral (ACR Type 3) is illustrated in Figure 3.

Table 2. Spectrum of Extra-Vascular Incidental Findings by Organ System and ACR Category

Organ System	ACR Type 1/2 — Benign	ACR Type 3+ — Clinically Significant
Renal	Simple cysts (n=25)	Complex cysts, angiomyolipoma, polycystic kidneys (n=4)
Hepatic	Haemangioma, simple cysts (n=12)	Indeterminate hypodensities (n=2)
Pancreatic	Simple/incidental cyst (n=6)	Hypo-dense lesion (n=1)
Adrenal	Lipid-rich adenoma (n=3)	Hypo-dense mass (n=1)
Mesenteric / Retroperitoneal	Benign lymph nodes; simple mesenteric cyst (n=3)	Lobulated soft tissue mass (n=1)
Biliary / Gallbladder	Gallstones (n=4)	Indeterminate biliary finding (n=2)
Pulmonary / Chest	Sub-6 mm nodules (n=3)	Solid right lower lobe nodule (n=1)
Other	Benign osseous lesions (n=2)	Duodenal mass; enlarged retroperitoneal lymph nodes (n=2)

ACR, American College of Radiology.

Association Between Vascular Findings and Incidental Findings

The presence of a surgically relevant vascular finding was significantly associated with the detection of ACR Type 3+ IFs. Among patients with a vascular finding, 30 of 86 (34.9%) had a concurrent ACR Type 3+ IF, compared with only 3 of 57 (5.3%) patients without a vascular finding (OR 9.64; 95% CI 2.80–33.2;

p<0.001). This association likely reflects shared underlying systemic disease burden, whereby recipients with advanced vascular disease are more likely to harbour concurrent occult extra-vascular pathology.

Predictors of Clinically Significant Incidental Findings

Female sex was a significant predictor of ACR Type 3+ IFs on univariate analysis. Among female recipients, 19 of 54 (35.2%) had an ACR Type 3+ IF, compared with 14 of 89 (15.7%) among male recipients (OR 2.91; 95% CI 1.27–6.66; p=0.013). IHD showed a borderline association (OR 3.27; 95% CI 0.89–12.0; p=0.076), with 6 of 13 IHD patients (46.2%) having ACR Type 3+ IFs. Age (mean 53.8 vs. 51.2 years; p=0.332) and comorbidity count (mean 1.82 vs. 1.53; p=0.097) did not reach statistical significance. All results are from univariate analysis only. Full univariate results are presented in Table 3.

Table 3. Univariate Analysis of Predictors of ACR Type 3+ Incidental Findings

Variable	ACR 3+ (n=33)	ACR 1/2 (n=110)	OR (95% CI)	p-value
Age, years — mean ± SD	53.8 ± 13.0	51.2 ± 13.8	—	0.332
Female sex, n (%)	19 (57.6%)	35 (31.8%)	2.91 (1.27–6.66)	0.013*
Hypertension, n (%)	26 (78.8%)	87 (79.1%)	0.98 (0.38–2.52)	1.000
Diabetes Mellitus, n (%)	24 (72.7%)	67 (60.9%)	1.71 (0.73–4.03)	0.302
IHD / CAD, n (%)	6 (18.2%)	7 (6.4%)	3.27 (0.89–12.0)	0.076
Comorbidity count — mean ± SD	1.82 ± 1.01	1.53 ± 0.83	—	0.097
Vascular finding present, n (%)	30 (90.9%)	56 (50.9%)	9.64 (2.80–33.2)	<0.001*

**Statistically significant (p<0.05). All associations are from univariate analysis; multivariate adjustment was not performed. OR, odds ratio; CI, confidence interval; CAD, coronary artery disease; IHD, ischaemic heart disease; SD, standard deviation.*

Interobserver Agreement

Pre-consensus interobserver agreement for ACR categorisation (Type 1/2 versus Type 3+) was substantial (κ=0.78; 95% CI 0.66–0.90), consistent with Landis and Koch benchmarks [9]. Exact categorical agreement was achieved in 125 of 143 cases (87.4%). Discrepancies were most frequently

observed for complex cystic renal lesions (Bosniak IIf versus III distinction) and indeterminate hepatic hypodensities.

Table 4. Baseline Demographic and Clinical Characteristics of the Study Cohort (n=143)

Characteristic	Value
Age, years — mean ± SD	51.8 ± 13.6
Sex — Male, n (%)	89 (62.2%)
Sex — Female, n (%)	54 (37.8%)
Hypertension, n (%)	112 (78.3%)
Diabetes Mellitus, n (%)	91 (63.6%)
Ischaemic Heart Disease / CAD, n (%)	13 (9.1%)
Cerebrovascular Accident / Stroke, n (%)	5 (3.5%)
Systemic Lupus Erythematosus, n (%)	5 (3.5%)
Heart Failure, n (%)	1 (0.7%)
No comorbidities recorded, n (%)	12 (8.4%)
CKD Stage ≥4, n (%)	143 (100%)
Charlson Comorbidity Index — mean ± SD	4.2 ± 1.8

CKD, chronic kidney disease; CAD, coronary artery disease; SD, standard deviation.

DISCUSSION

This study provides the first systematic, ACR-framework-based characterisation of extra-vascular incidental findings on pre-transplant CTA in renal transplant recipients, with dual-reader methodology. The central finding — that ACR Type 3+ IFs requiring further evaluation are present in 23.1% of recipients — is substantially higher than the 5% actionability threshold commonly cited to justify systematic radiological screening [5]. Although follow-up outcome data were not available in this retrospective study, the clinical relevance of ACR Type 3+ categorisation in this population is meaningful: in a transplant setting, any finding warranting further evaluation can influence the timing, eligibility, or planning of transplantation. Among our ACR Type 3+ cases, documented pre-transplant actions included urological specialist referral for complex renal lesions, oncological referral for soft tissue masses, and surveillance imaging scheduling — actions that directly affected pre-operative clinical pathways. This rate supports structured IF review as a standard component of pre-transplant CTA reporting [11].

The significant association between vascular findings and ACR Type 3+ IFs (OR 9.64; 95% CI 2.80–33.2; p<0.001) is a novel and clinically relevant observation, although the wide confidence interval reflects the relatively small number of patients without vascular findings (n=57) and warrants confirmation in larger cohorts. Among patients with vascular findings, 34.9% had concurrent significant IFs, compared with only 5.3% in those without. This likely reflects shared systemic disease burden: patients with advanced vascular disease harbour more diffuse end-organ pathology detectable on cross-sectional imaging. Practically, this suggests that the identification of vascular abnormalities — itself the primary indication for CTA — should prompt heightened radiological vigilance for co-existing extra-vascular pathology and systematic application of the ACR IF classification framework.

The identification of female sex as a significant predictor of ACR Type 3+ IFs on univariate analysis (OR 2.91; p=0.013) has not been previously reported in this population and warrants discussion. Possible explanations include a higher prevalence of SLE (a disease with a strong female predilection that is both a renal disease cause and a systemic inflammatory condition predisposing to organ pathology), sex-based differences in the incidence of specific malignancies and benign lesions detectable as IFs, and potential differences in body composition influencing lesion detectability. While the mechanism requires further study and multivariate confirmation in larger cohorts, this finding is immediately clinically useful: female sex is a simple, universally available patient-level characteristic that could inform selective radiology review protocols in pre-transplant multidisciplinary teams.

IHD showed a borderline association with significant IFs (OR 3.27; p=0.076). Although not statistically significant at the conventional threshold, this magnitude of association is clinically plausible: patients with IHD represent a high-risk subgroup with advanced systemic atherosclerotic burden, and the small IHD subgroup (n=13) likely rendered the study underpowered to detect this association definitively. Prospective evaluation in a larger cohort is warranted.

The high rate of surgically relevant vascular findings (60.1%) is higher than some previously reported series [7] and likely reflects our inclusive criteria for classifying both vascular variants and disease. This confirms the indispensable role of CTA as a surgical planning tool while simultaneously demonstrating its substantial additional value for IF detection. The substantial interobserver agreement (κ=0.78) confirms that the ACR framework is reproducible in routine clinical practice [9, 10].

Limitations. This study has several limitations. First, the retrospective, single-centre design at a tertiary transplant centre limits generalisability to other settings and patient populations. Second, no clinical follow-up data were available for the majority of ACR Type 3+ findings; accordingly, this study is appropriately framed as a prevalence and predictor study, and the term “clinically significant” throughout refers to ACR Type 3+ categorisation (warranting further evaluation) rather than proven adverse clinical outcomes. Third, all predictor associations are based on univariate analysis only; multivariate logistic regression was not performed owing to the limited number of outcome events (n=33), which precluded reliable adjustment for confounders. The sex association in particular should be interpreted as hypothesis-generating, and independent predictor status cannot be claimed without adjusted modelling

in a larger cohort. Fourth, the absence of a matched non-transplant comparator group means that the observed IF prevalence cannot be benchmarked against the general population undergoing abdominal CT; this is an inherent limitation of single-arm prevalence studies. Fifth, 12 patients (8.4%) had no comorbidities recorded in the electronic record, which may have introduced some misclassification of comorbidity burden. Sixth, the sample size (n=143) limits statistical power for subgroup analyses of less prevalent comorbidities such as IHD, SLE, and HF. Prospective multicentre studies with standardised data collection, complete follow-up outcome tracking, multivariate modelling, and formal cost-effectiveness analysis are needed to validate these findings and define an optimal imaging strategy.

CONCLUSION

Pre-transplant CTA in renal transplant recipients delivers clinically important dual value: surgically relevant vascular findings in 60.1% of patients and ACR Type 3+ extra-vascular incidental findings in 23.1% — nearly one in four recipients, well above established screening thresholds. The strong association between vascular finding burden and incidental pathology and the identification of female sex as a significant univariate predictor provide actionable data for pre-transplant imaging triage. The ACR Incidental Findings classification is a reliable and reproducible framework for this purpose and its systematic application should be considered a standard component of pre-transplant CTA reporting in transplant multidisciplinary practice.

Abbreviations

ACR, American College of Radiology; CAD, Coronary Artery Disease; CCI, Charlson Comorbidity Index; CKD, Chronic Kidney Disease; CT, Computed Tomography; CTA, Computed Tomography Angiography; CVA, Cerebrovascular Accident; DM, Diabetes Mellitus; HF, Heart Failure; HTN, Hypertension; IF, Incidental Finding; IHD, Ischaemic Heart Disease; IVC, Inferior Vena Cava; OR, Odds Ratio; SD, Standard Deviation; SLE, Systemic Lupus Erythematosus.

Declarations

Ethics Approval and Consent to Participate

This study was approved by the Institutional Review Board at King Faisal Specialist Hospital and Research Centre – Jeddah (IRB #2251210). The requirement for informed consent was waived by the Institutional Review Board owing to the retrospective, non-interventional nature of the study. The study was conducted in accordance with the Declaration of Helsinki.

Consent for Publication

Not applicable. No individual participant data, images, or videos requiring consent for publication are included in this article.

Availability of Data and Materials

De-identified data supporting the findings of this study are available from the corresponding author (H. AlQudsi; halqudsi@kfshrc.edu.sa) upon reasonable written request, subject to institutional review board approval.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

HA: Conceptualisation, Methodology, Formal Analysis, Writing – Original Draft, Writing – Review & Editing, Supervision, Corresponding Author. DK: Data Curation, Image Analysis (Reader 1), Writing – Review & Editing. AF: Data Curation, Image Analysis (Reader 2), Writing – Review & Editing. KN: Data Curation, Clinical Data Extraction, Writing – Review & Editing. EM: Data Curation, Clinical Outcome Tracking, Writing – Review & Editing. MA: Formal Analysis, Statistical Analysis, Writing – Review & Editing. ZZ: Methodology, Consensus Image Review (Senior Radiologist), Writing – Review & Editing, Supervision. All authors have read and approved the final manuscript.

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Figures

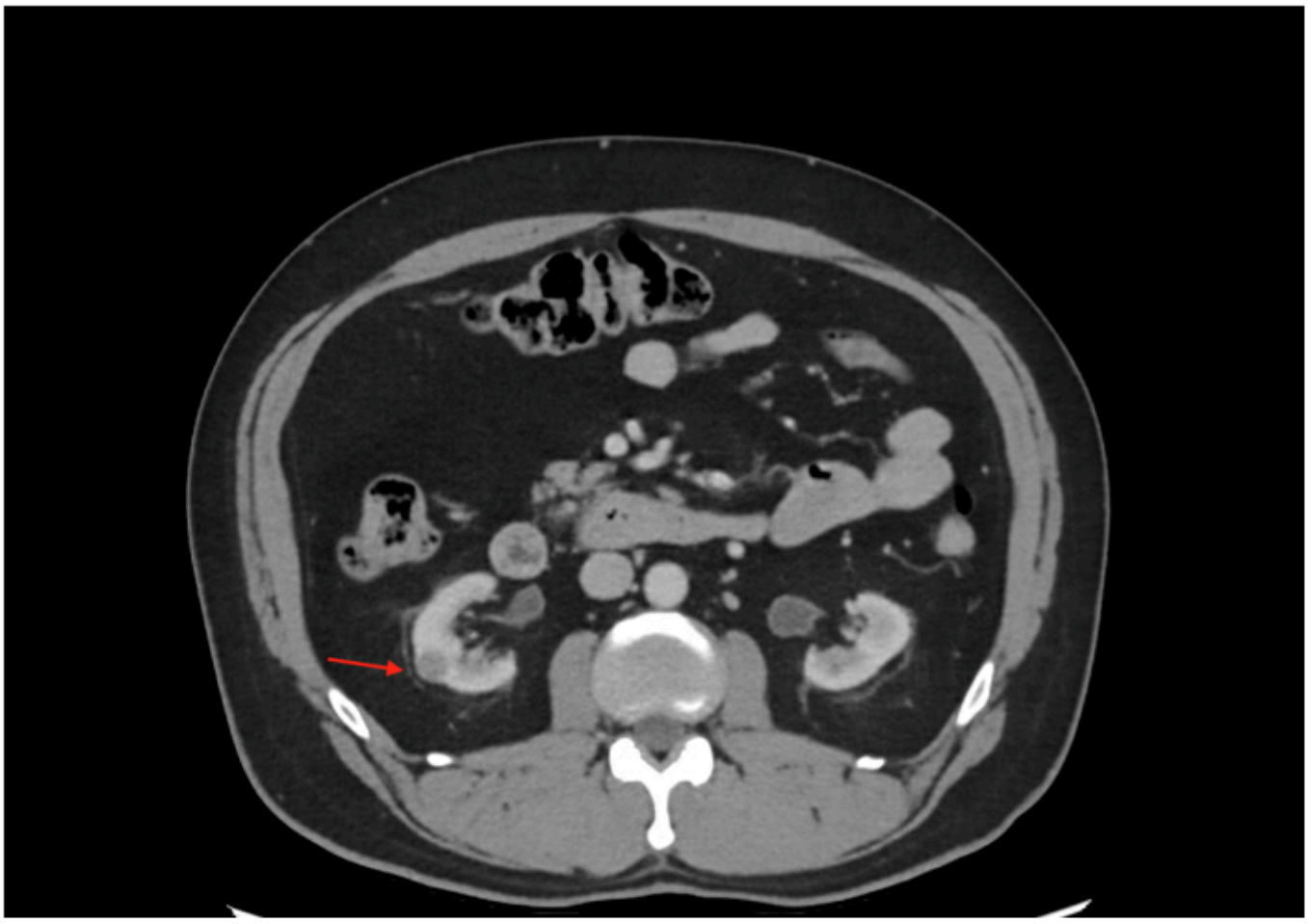


Figure 1

Axial CT image (venous phase) demonstrating a complex right renal cyst with enhancing internal septations (arrow), classified as Bosniak III (ACR Type 3).

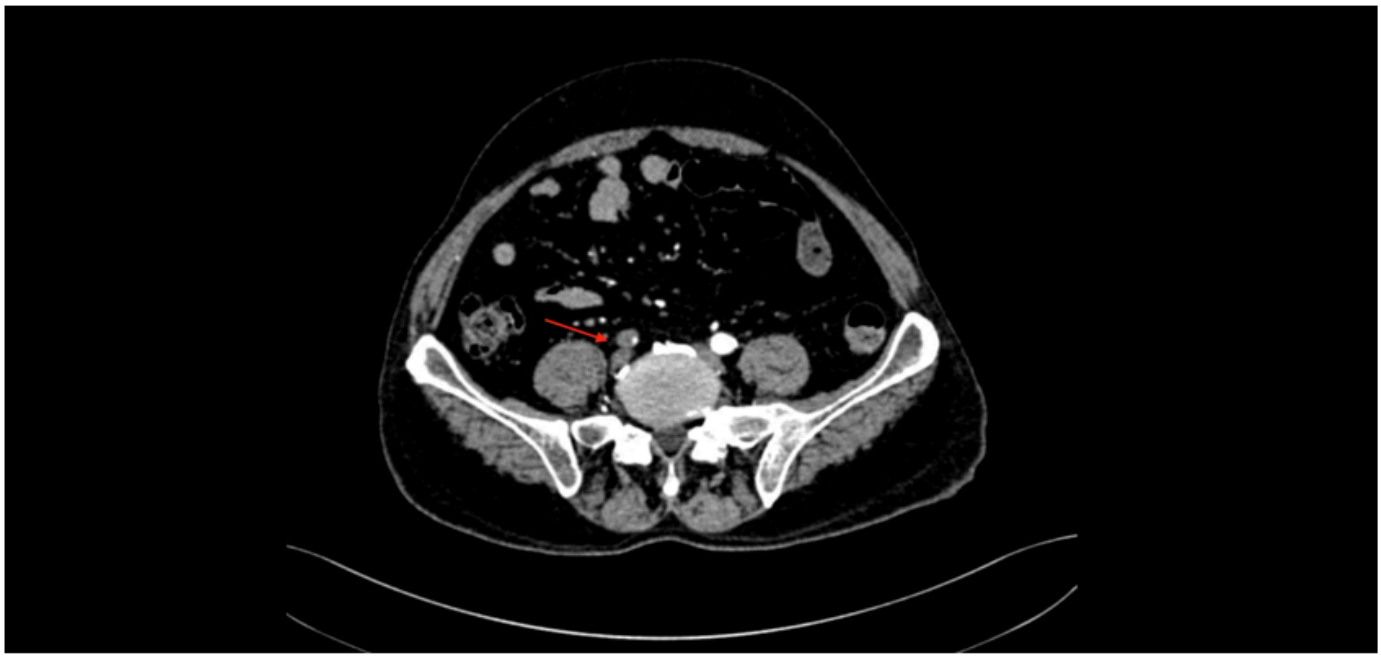


Figure 2

Axial CT angiography image demonstrating severe calcific stenosis of the right common iliac artery (arrow), dictating contralateral allograft implantation.



Figure 3

Axial CT image demonstrating an incidental mesenteric lobulated soft tissue lesion with heterogeneous arterial phase enhancement (arrow), classified as ACR Type 3, prompting oncological referral.

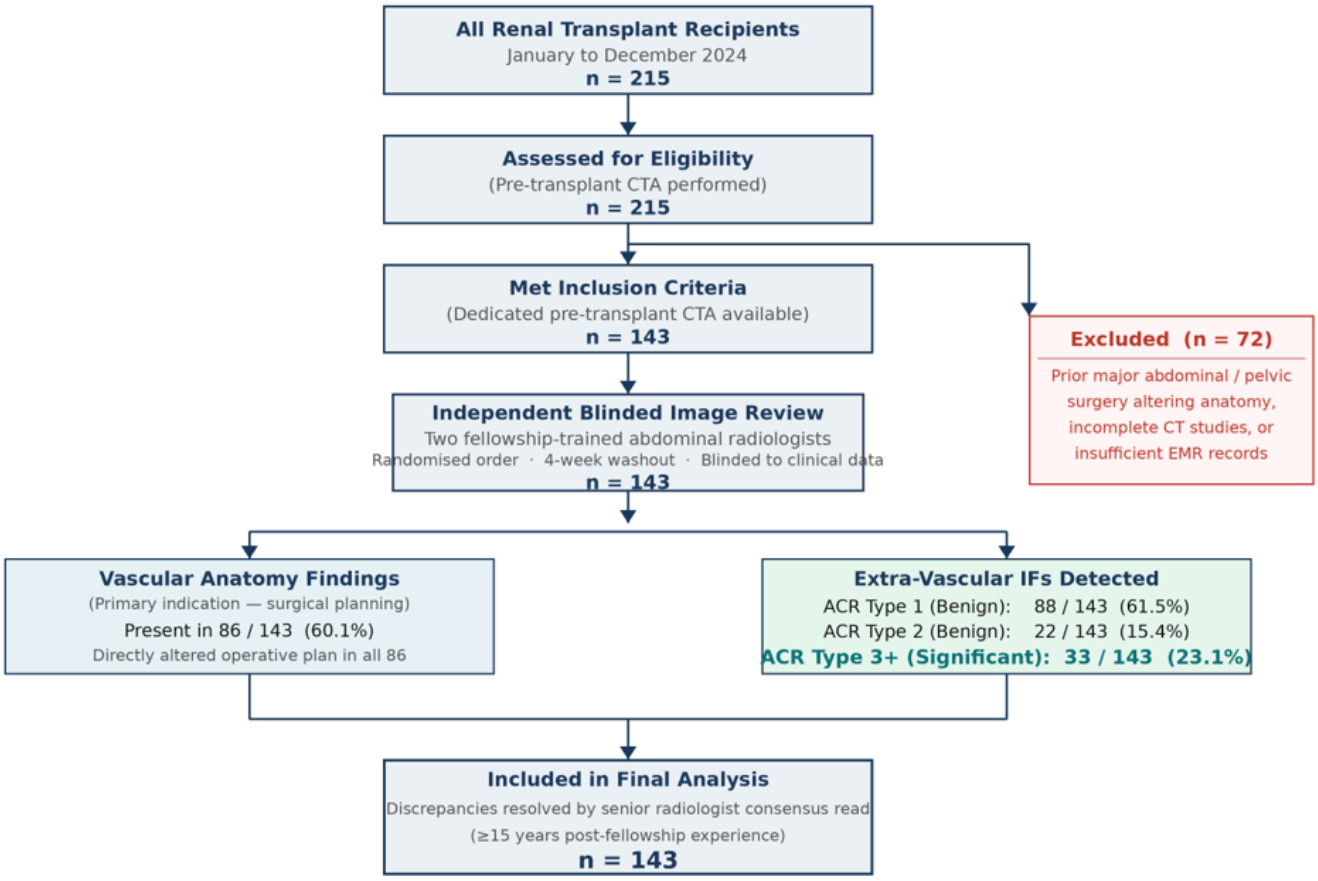


Figure 4. CONSORT-style patient flow diagram.

CTA, computed tomography angiography; EMR, electronic medical record; IF, incidental finding; ACR, American College of Radiology.

Figure 4

CONSORT-style patient flow diagram illustrating the selection of the study cohort from 215 consecutive renal transplant recipients. CTA, computed tomography angiography; EMR, electronic medical record; IF, incidental finding; ACR, American College of Radiology.

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