Supplementary Materials

Contents **Page**

Supplementary Methods

Diagnostic accuracy analyses (kidney- and patient-level)

Diagnostic accuracy indices—sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy, and area under the ROC curve (AUC) with 95% confidence intervals—were calculated using Tc-99m DMSA scintigraphy as the reference standard. Analyses were performed separately for the left kidney and right kidney, and additionally at the patient level, where patient-level positivity was defined as abnormality in either kidney. Raw 2×2 contingency tables underpinning kidney- and patient-level diagnostic accuracy are provided in Table S4 (left kidney), Table S5 (right kidney), and Table S6 (patient level). Kidneys coded as absent/nonfunctional ("2") in either modality were excluded from performance analyses as specified in the supplementary tables.

Logistic regression (predictors of parenchymal damage)

To evaluate independent predictors of DMSA-defined parenchymal damage, multivariable logistic regression models were fitted at the kidney level, including age (years), sex (female vs male), and renal uptake (%). Effect sizes are reported as odds ratios (OR) with 95% confidence intervals (CI). Regression results for the left kidney are provided in Table S1, and for the right kidney in Table S2. ORs and CIs were estimated using a GLM binomial model with heteroskedasticity-robust (HC3) standard errors.

Model assumption checks (heteroskedasticity diagnostics)

Model assumptions were assessed using Breusch–Pagan and White tests applied to linear probability model diagnostics for residual variance homogeneity. The heteroskedasticity test results are reported in Table S3. Visual inspection of residuals versus fitted values is provided in Figure S3; the left-kidney model shows an increasing residual spread at higher fitted values (consistent with heteroskedasticity), whereas the right-kidney model shows no clear fan-shaped

pattern (consistent with non-significant tests). Given the diagnostic findings, robust (HC3) standard errors were used for the logistic regression outputs reported in Tables S1–S2 to ensure consistent inference.

In addition to regression outputs (Tables S1–S3), raw contingency tables are provided for kidney- and patient-level diagnostic accuracy (Tables S4–S6).

Table S1. Logistic regression for predictors of parenchymal damage – Left kidney

	OR	**95% CI L**	**95% CI U**	**p (robust)**
const	2.845	0.528	15.335	0.224
age_years	1.136	1.053	1.226	0.001
female	1.499	0.663	3.390	0.330
uptake	0.934	0.896	0.973	0.001

Table S2. Logistic regression for predictors of parenchymal damage – Right kidney

	OR	**95% CI L**	**95% CI U**	**p (robust)**
const	3.332	0.686	16.187	0.136
age_years	1.120	1.044	1.201	0.002
female	1.095	0.492	2.435	0.824
uptake	0.934	0.899	0.970	<0.001

Odds ratios (OR) and 95% confidence intervals (CI) were estimated using a GLM binomial model with heteroskedasticity-robust (HC3) standard errors. Abbreviations: OR, odds ratio; CI, confidence interval.

Table S3. Heteroskedasticity diagnostics for linear probability models* of parenchymal damage

Model	**n**	**BP p-value**	**White p-value**
Left kidney	174	0.327	0.047
Right kidney	170	0.339	0.671

* Breusch–Pagan and White tests were applied to assess residual variance homogeneity.

Table S4. Kidney-level diagnostic performance (left kidney): USG vs DMSA scintigraphy

	DMSA positive	**DMSA negative**	**Total**
USG positive	27	0	27
USG negative	26	121	147
Total	53	121	174

Sensitivity: 50.9% (27/53), Specificity: 100.0% (121/121), Accuracy: 85.1% (148/174).

Note: Kidneys coded as '2' (absent/nonfunctional) in either modality were excluded from performance analysis (excluded = 6). DMSAscintigraphy-positive indicates parenchymal damage; DMSA scintigraphy-negative indicates no damage.

Table S5. Kidney-level diagnostic performance (right kidney): USG vs DMSA scintigraphy

	DMSA positive	**DMSA negative**	**Total**
USG positive	21	1	22
USG negative	26	121	147
Total	47	122	169

Sensitivity: 44.7% (21/47), Specificity: 99.2% (121/122), Accuracy: 84.0% (142/169).

Note: Kidneys coded as '2' (absent/nonfunctional) in either modality were excluded from performance analysis (excluded = 12). DMSA-positive indicates parenchymal damage; DMSA-negative indicates no damage.

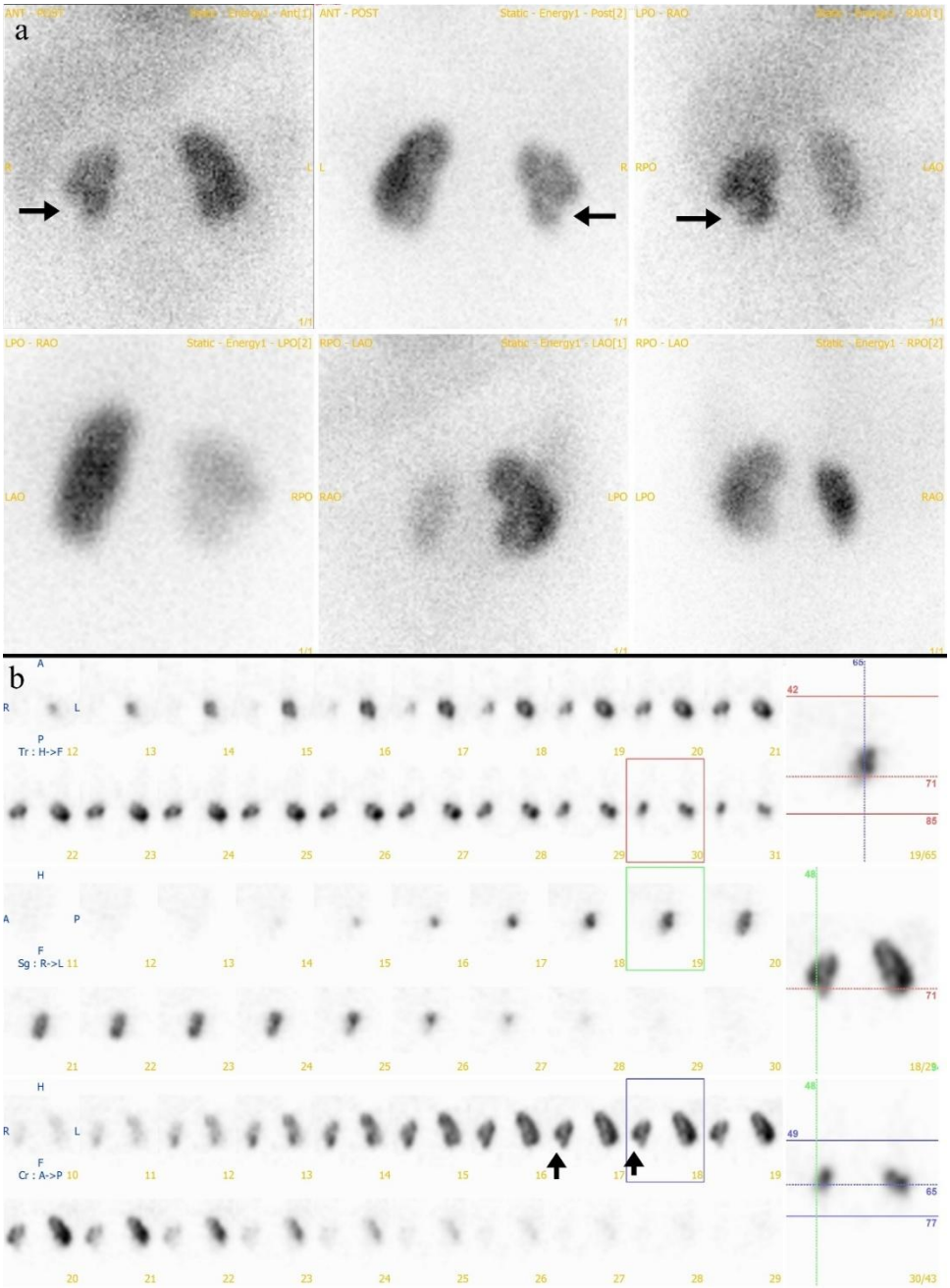
Table S6. Patient-level diagnostic performance: USG vs DMSA scintigraphy

	DMSA positive	**DMSA negative**	**Total**
USG positive	38	0	38
USG negative	39	85	124
Total	77	85	162

Sensitivity: 49.4% (38/77), Specificity: 100.0% (85/85), Accuracy: 76.0% (123/162), PPV: 100.0% (38/38), NPV: 68.6% (85/124).

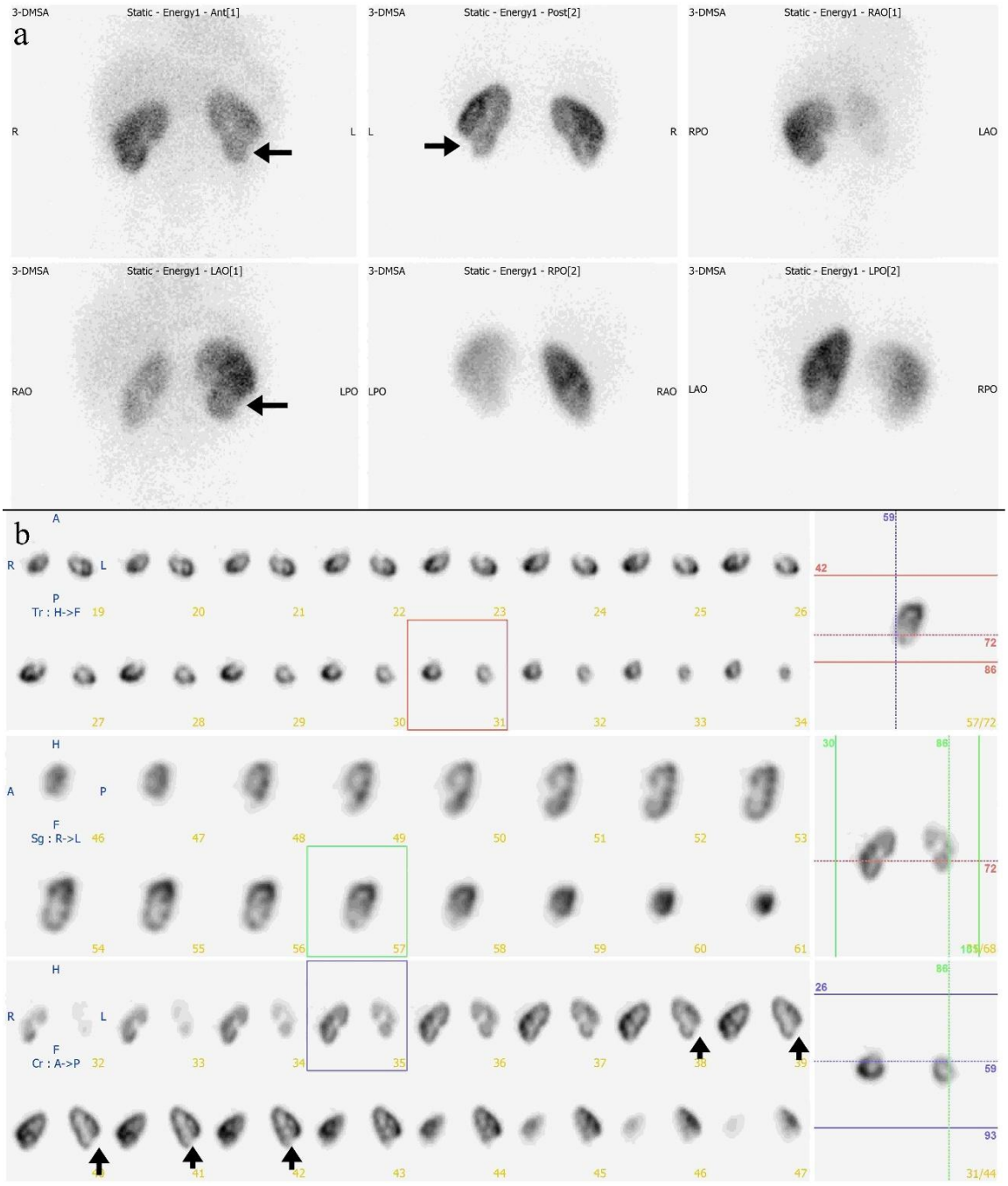
Note: Patient-level positivity was defined as at least one kidney positive on DMSA scintigraphy.

Figure S1. Tc-99m DMSA renal cortical scintigraphy in a 12-year-old boy with recurrent urinary tract infections



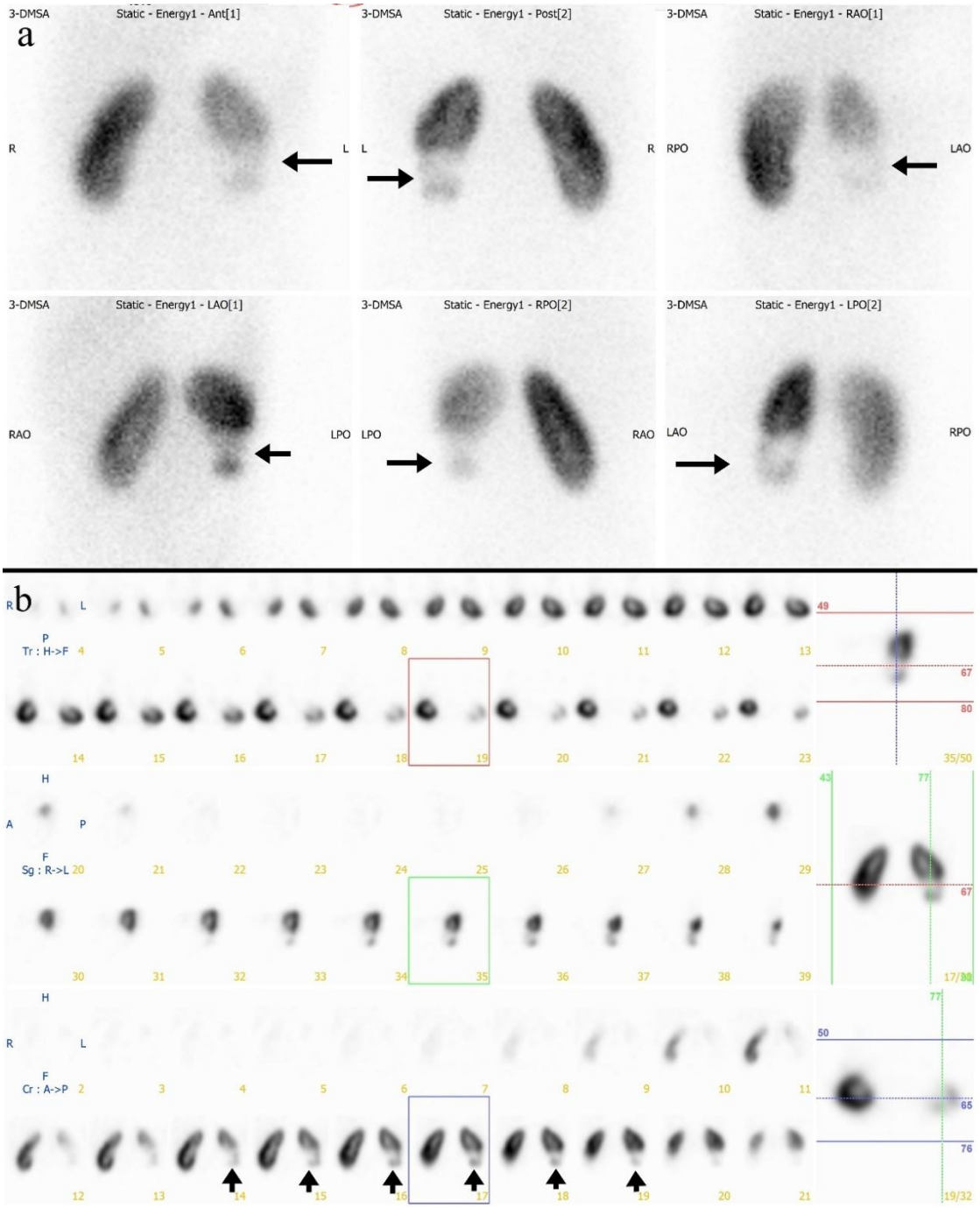
(a) Planar images demonstrate a smaller right kidney with a photopenic cortical defect in the lower pole (arrows). (b) SPECT images further depict the corresponding cortical defect. Differential renal uptake: left 66%, right 34%. Ultrasonography reported reduced right kidney size but no parenchymal abnormality.

Figure S2. Tc-99m DMSA renal cortical scintigraphy in a 17-year-old boy with recurrent urinary tract infections



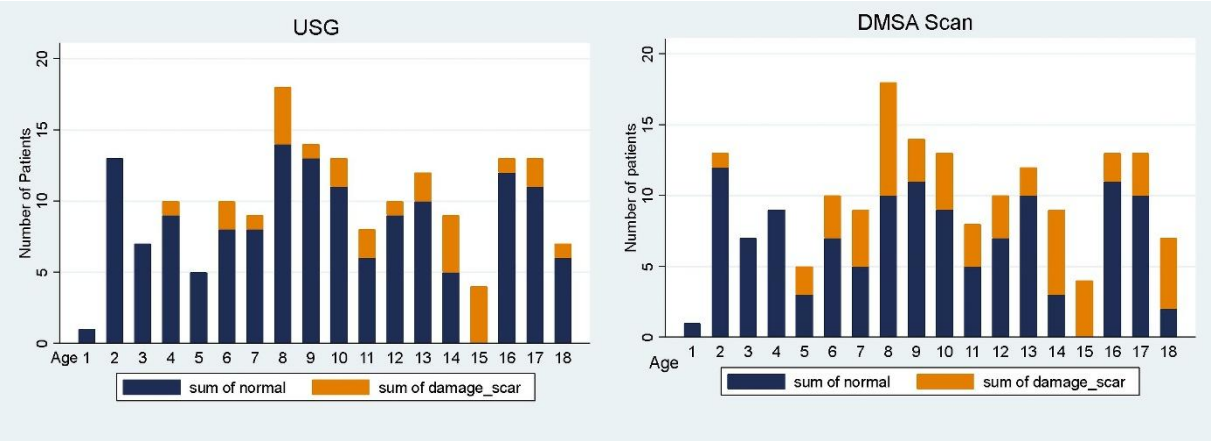
(a) Planar images show a focal photopenic cortical defect in the lower pole of the left kidney (arrows), consistent with cortical scarring. (b) SPECT images further depict the corresponding defect. Differential renal uptake: left 46%, right 54%. Ultrasonography was reported as normal.

Figure S3. Tc-99m DMSA renal cortical scintigraphy in a 5-year-old girl with recurrent urinary tract infections



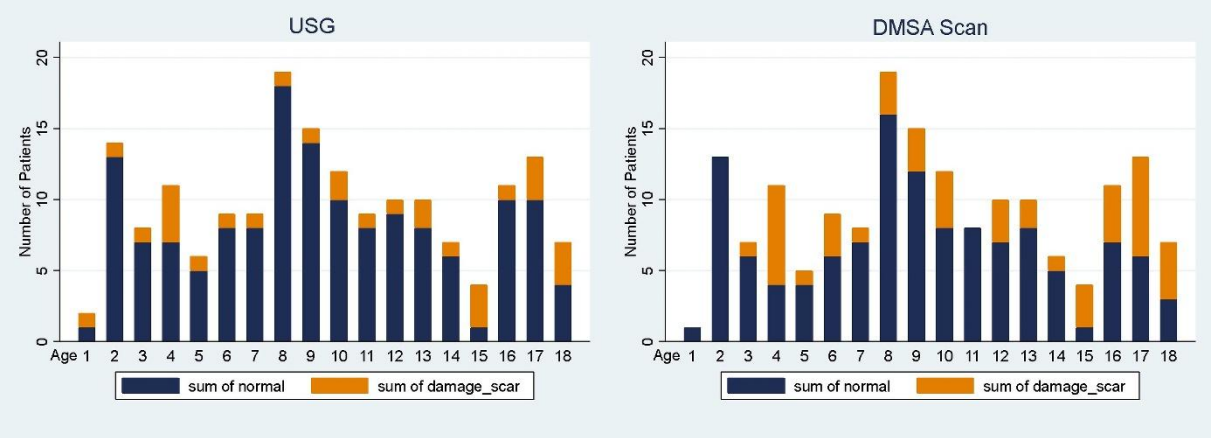
(a) Planar images demonstrate reduced cortical uptake with irregular cortical contours involving the lower half of the left kidney (arrows). (b) SPECT images further depict the corresponding cortical abnormality. Differential renal uptake: left 37%, right 63%. Ultrasonography was reported as normal.

Figure S4. Distribution of normal and abnormal kidneys by age according to ultrasonography



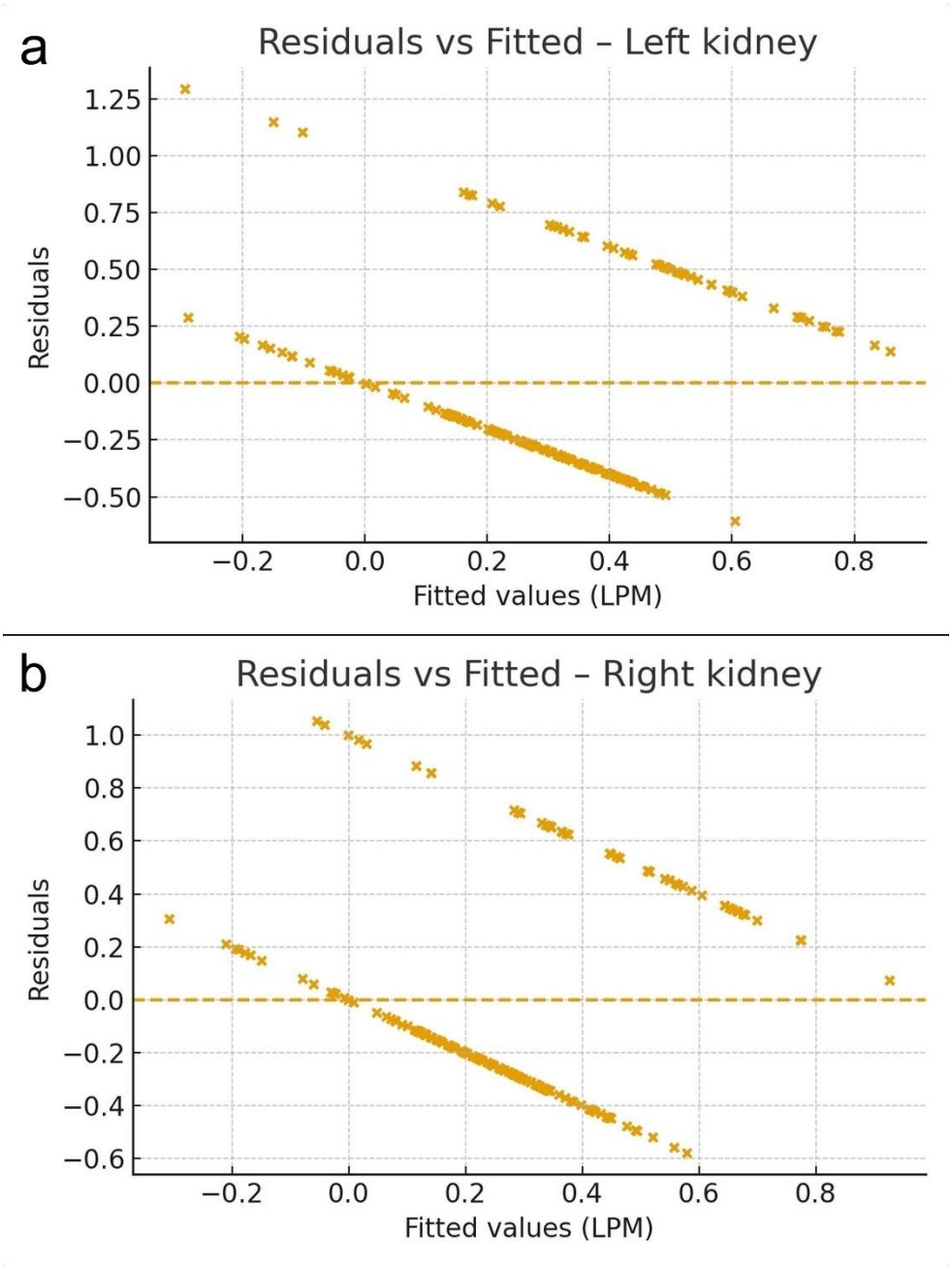
Blue bars indicate normal kidneys, and orange bars indicate kidneys with parenchymal damage or scarring.

Figure S5. Distribution of normal and abnormal kidneys by age according to DMSA scintigraphy.



Blue bars indicate normal kidneys, and orange bars indicate kidneys with parenchymal damage or scarring.

Figure S6. Residuals versus fitted values from the linear probability model (LPM)



(a) Left kidney: the residual–fitted scatter shows an increasing spread of residuals at higher fitted values (fan-shaped pattern), consistent with heteroskedasticity (White test; Table S3). (b) Right kidney: the residual dispersion appears more stable across the fitted range, consistent with non-significant heteroskedasticity tests (Table S3). The dashed horizontal line indicates zero residual.