

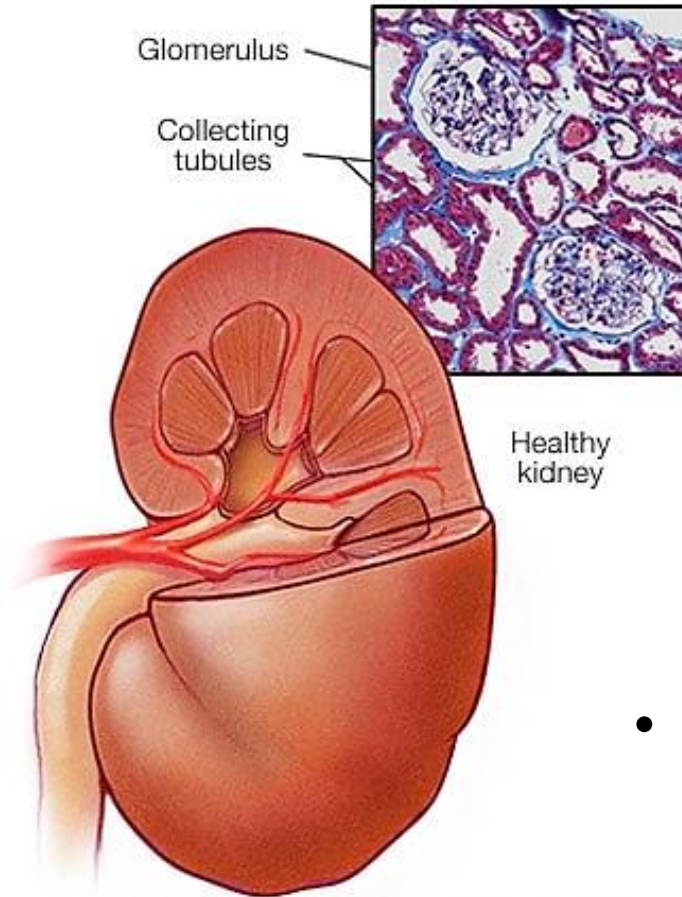


Trine Balschmidt

MD, PhD student

Department of Radiology
Herlev and Gentofte Hospital
Denmark

Diabetic Kidney Disease



- 40% of people with diabetes end up with DKD
- Leading cause of end-stage kidney disease worldwide

Early changes from DKD

Diabetic Kidney Disease

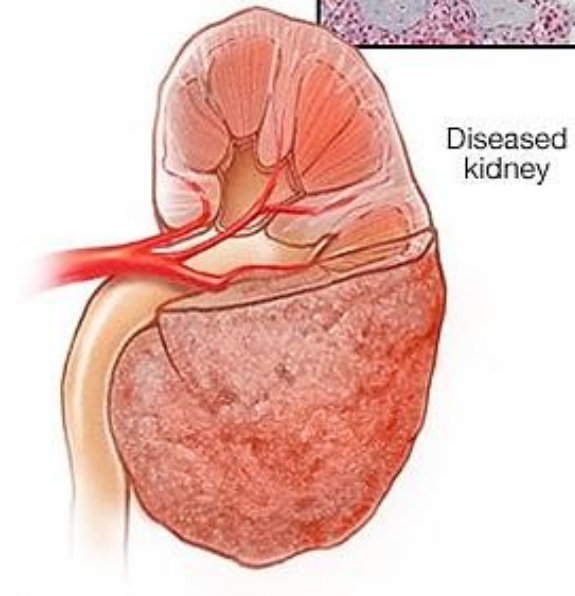
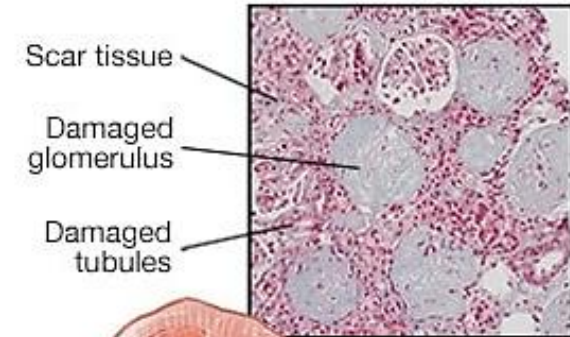
Fat accumulation

Renal hypoxia

Renal hypertrophy
and hyperfiltration

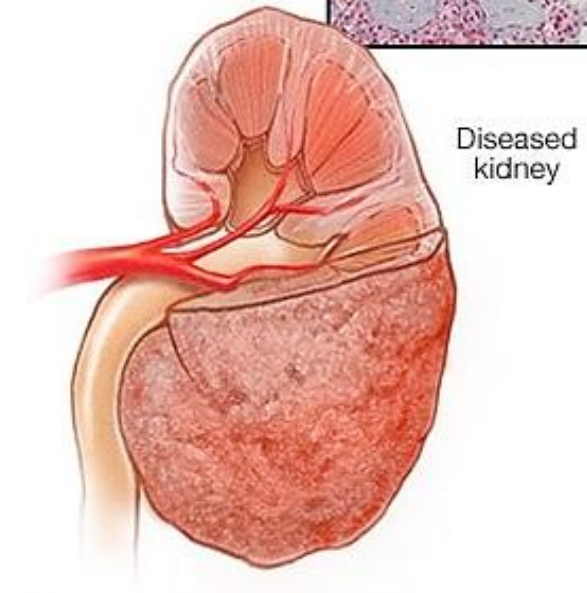
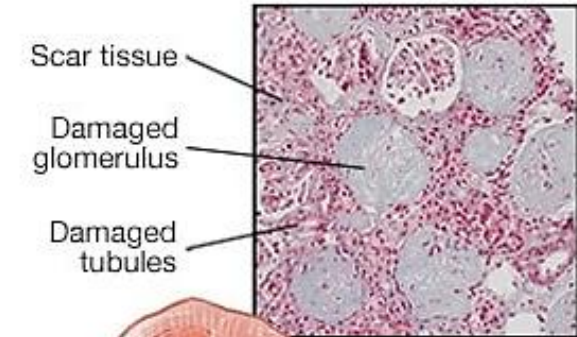
Fibrosis

Extracellular matrix expansion,
edema, and inflammation

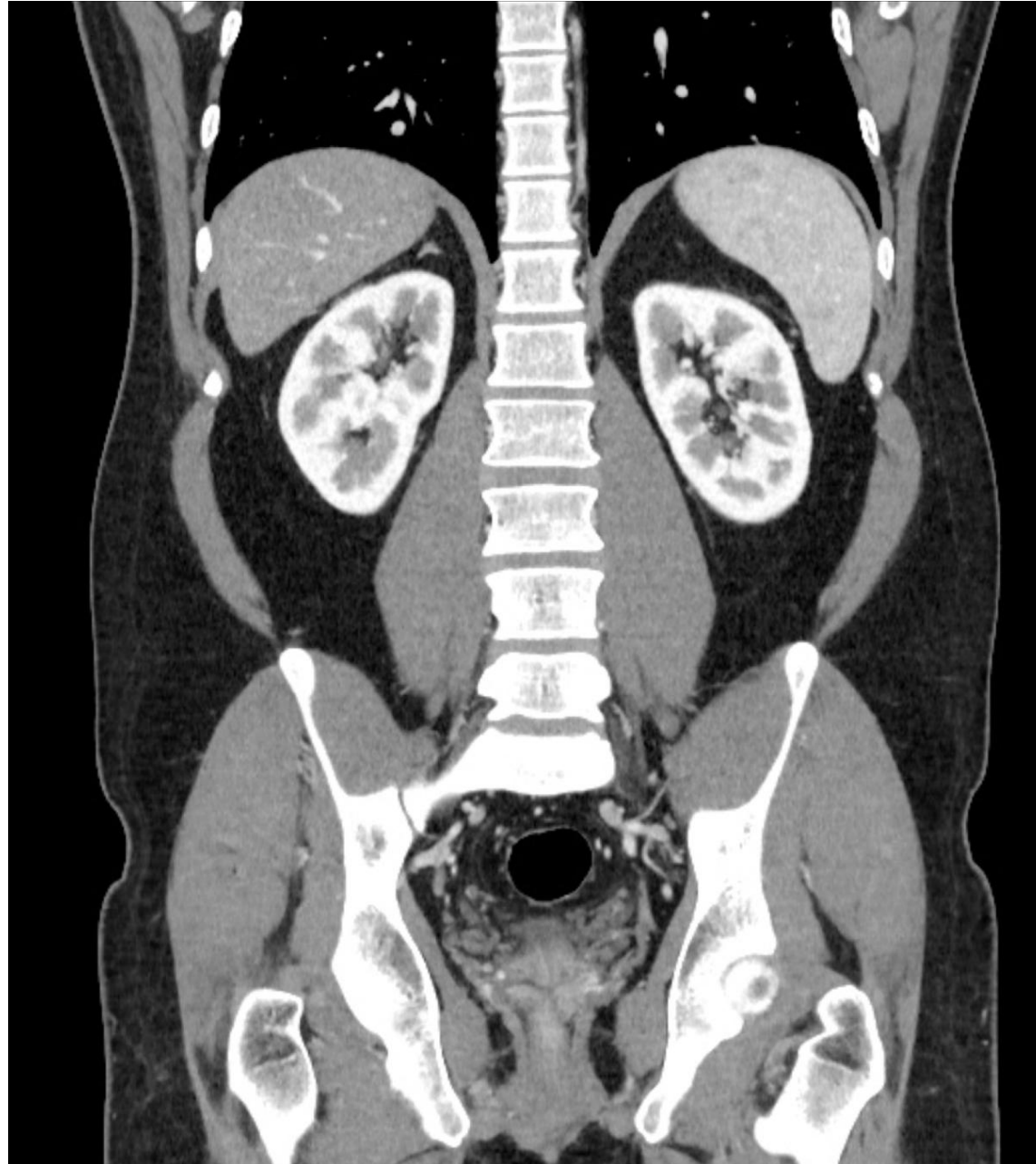


Diagnosing DKD

Diabetic Kidney Disease



Diabetic
Kidney
Disease

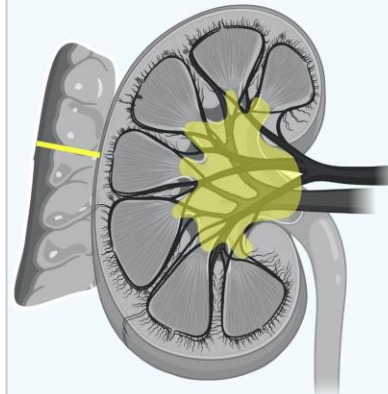


Are CT-relevant imaging
biomarkers of DKD **clinically
relevant** - based on technical and
clinical validation ?

Kidney biomarkers

Method

Fat accumulation

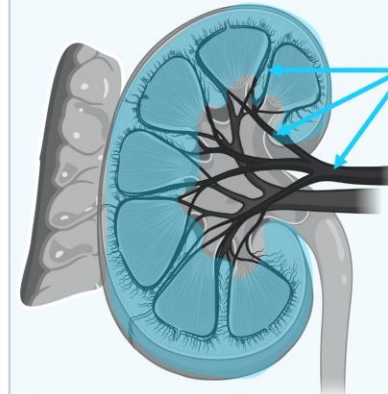


Perirenal Fat Thickness (PRFT)
Bounded by Gerota's fascia and the renal capsule

Sinus fat
Located within the renal sinus

a

Hypoxia



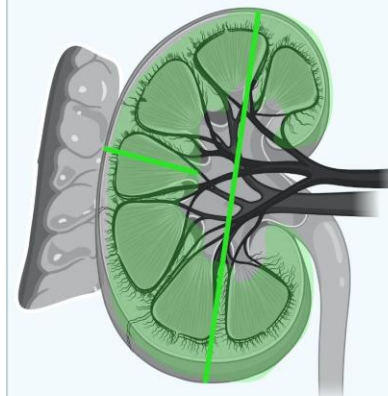
Resistive Index (RI)
Measured in renal arteries
(main/interlobar/segmental)

Blood flow
Measured in renal arteries
(main/interlobar/segmental)

Blood Oxygen Level-Dependent (BOLD)
Measured in parenchyma (cortex and medulla)

b

Hypertrophy



Kidney volume
Encompasses all kidney structures

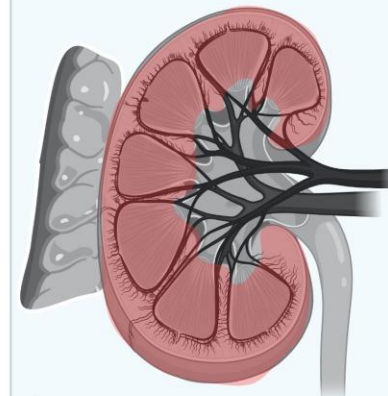
Kidney length
Measured from pole to pole

Parenchymal volume
Encompasses kidney parenchyma (cortex and medulla)

Parenchymal thickness
Measured from capsule to calyces

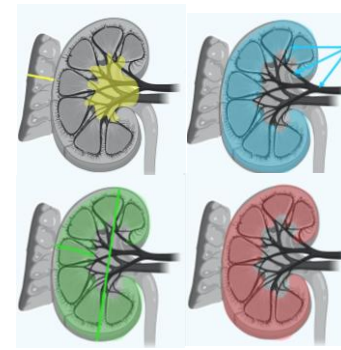
c

Fibrosis



d

Method



Precision

Accuracy

Clinical
endpoint

Performance Indicator	Assays	Statistics	Acceptable*	Minimum
Precision	Assay precision: within assay, between assays, between operators, within operator, between operators, between assays, between operators, between assays	CoV (%) ≤ 10	< 15% (2014-2015)	2/2
Accuracy	Accuracy: relative error to certified ground truth Accuracy: relative error to current gold standard	± (%) ≤ 10	< 15% (2014-2015)	0/2
Clinical Endpoints	Best data: diagnosis & prognosis value Best data: prognosis value	Classifiers Correlation	AUC > 0.85 p < 0.01	1/2
Validated Imaging Biomarker				3/6



Results

- 41 studies, 53 datasets
- 11 kidney imaging biomarkers
- Plausible physiological links to DKD, correlated with clinical endpoints and CT-compatible
- **None** are fully validated
- Accuracy was generally the most underreported

Clinically **relevant** knowledge gap

Earlier diagnosis, earlier treatment

HOOK

- Anecdote: "I was a new doctor in the ultrasound section of radiology..."
 - Do the imaging biomarker have any importance for the nephrologists?
 - Felt pointless/irrational like we can be trusted
- Maybe all imaging biomarkers aren't relevant?



PROBLEM

One disease where imaging biomarkers might help would be to diagnose Diabetic kidney disease

2

Situation:

DKD is commonly diagnosed using blood samples like eGFR/creatinine. Which shows signs that the kidney filter function is deteriorating.

Consequences:

Current treatment might not have the full effect because we don't get the initial start of the DKD changes

Possibility:

Imaging biomarkers on kidneys based on CT is almost free information due to the number of abdominal CT scans yearly AND the scans might show changes in kidney parenchyma before the kidney function has started to decrease

Barriers:

No official validated set of DKD-biomarkers available

3

1 min

4

QUESTION

Can we trust CT-relevant kidney imaging biomarkers to detect Diabetic Kidney Disease?

SOLUTION

Method:

Scoping review aided by LLM to find relevant studies
Scored using the ESR validation tool →

Results:

41 articles – 53 datasets –
11 biomarkers
NONE fully validates

4

BENEFIT

Better diagnostics of DKD
Make better use of CT scans

CALL TO ACTION

Please let us know if you find information in your radiology report you find irrelevant

LOOP

To make sure that what we do as radiologists remain relevant

5

