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Pro/Con Debate

PRO/CON DEBATE

Should we enlarge the indication for kidney biopsy in diabetics? The con part

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ABSTRACT

Diabetes is the most common cause of chronic kidney disease (CKD), a condition found in 850 million persons and projected to become the fifth global cause of death by 2040. Research is needed that examines kidney tissue to characterize distinct phenotypes in patients with diabetes mellitus (DM) and CKD so as to identify non-invasive biomarker signatures and develop targeted therapeutic approaches. However, from a routine care point of view, kidney biopsy is likely overused in patients with CKD and DM, as most biopsy results are not expected to be associated with a therapeutic approach that differs from standard kidney protection with triple or quadruple therapy (renin–angiotensin system blockade, sodium-glucose cotransporter 2 inhibitors, nonsteroidal mineralocorticoid receptor antagonists and glucagon-like peptide-1 receptor agonists). Moreover, expanding the kidney biopsy criteria will increase the absolute number of complications from kidney biopsies, which may reach 27 000 to 108 000 deaths of persons that would derive little benefit from kidney biopsy if all people with DM and severe CKD were biopsied globally. Finally, limited resources should be optimally allocated. The cost of one kidney biopsy can fund 7000 semiquantitative urinary albumin:creatinine ratio assessments that could identify earlier stages of the disease and allow treatment that prevents progression to a stage at which kidney biopsy may be considered.

Keywords: chronic kidney disease, diabetes, diabetic kidney disease, diabetic nephropathy, kidney biopsy

> "When the facts change, I change my mind. What do you do, sir?" Paul Samuelson

Over 850 million persons have chronic kidney disease (CKD), the most common risk factor for severe COVID-19 and projected to become the fifth global cause of death [1–3]. Diabetes mellitus (DM) is the most common cause of CKD and of need for kidney replacement therapy (KRT) [4–6], despite the availability of treatment for >100 years and of kidney protective treatment for >30 years [7, 8]. Recent game-changing therapies include sodium-glucose cotransporter 2 inhibitors (SGLT2i) which improve outcomes in persons with DM and CKD and may even prevent diabetic kidney disease (DKD), and novel nonsteroidal mineralocorticoid receptor antagonists (MRAs) [9–15]. Early evidence also supports a kidney protective role for glucagon-like peptide-1 (GLP1) receptor agonists and similar drugs [15, 16]. Kidney protection by SGLT2i and MRAs appears to be additive and clinical guidelines support using both in the presence of A2–A3 albuminuria [12–14]. Moreover, SGLT2i protect from multiple causes of CKD, including glomerulonephritides [e.g. immunoglobulin A (IgA) nephropathy] [17, 18], MRAs nephroprotection may expand beyond DKD [19] and a novel nonspecific kidney protective drug was recently approved for IgA nephropathy, the dual endothelin angiotensin receptor antagonist (DEARA)

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Table 1: Current native kidney biopsy indications in persons with diabetes.

UpToDate: diabetic kidney disease [26]
• The diagnosis of DKD is clinical and based upon the presence of albuminuria or reduced eGFR
• In patients with diabetes with severe albuminuria or decreased eGFR, a kidney biopsy should usually be performed if nondiabetic kidney disease is suspected, e.g. (i) glomerular haematuria and suspicion of glomerulonephritis (ii) idiopathic nephrotic syndrome
KDIGO 2022 Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease [22]
• CKD occurring among people with diabetes is usually attributed to diabetes, unless other causes are readily evident
• More work is needed to determine the roles of kidney biopsy and biomarkers
• We avoid the use of the term 'diabetic kidney disease' to avoid the connotation that CKD is caused by traditional diabetes pathophysiology in all cases, although this term is entirely appropriate when this limitation is recognized
• We also avoid the use of the term 'diabetic nephropathy,' an outdated term for which there is currently no consensus definition
Diabetes Management in Chronic Kidney Disease: A Consensus Report by the ADA and KDIGO [14]
• No mention of kidney biopsy
ADA: Chronic Kidney Disease and Risk Management: Standards of Care in Diabetes—2023 [27]
Referral to a nephrologist for further diagnosis, including the possibility of kidney biopsy, should be considered when
o An active urinary sediment (containing red or white blood cells or cellular casts)
o Rapidly increasing albuminuria or total proteinuria
o The presence of nephrotic syndrome
o Rapidly decreasing eGFR
o Absence of retinopathy (in type 1 diabetes)

ADA: American Diabetes Association; KDIGO: Kidney Disease: Improving Global Outcomes.

sparsentan [20, 21]. Thus, multiple efficacious and safe choices protecting the kidneys from multiple insults independently of the cause of CKD are becoming available. In this regard, KDIGO in 2022 did not use the term 'DKD' in order to avoid the connotation that CKD is caused by traditional diabetes pathophysiology in all cases, i.e. the recommended kidney protection applies when CKD and DM coincide [22]. The availability of safe drugs that may prevent or treat CKD shifts prevention and early diagnosis and treatment to a primary care setting, if adequate resources allow the use of appropriate tools (widespread implementation of albuminuria screening). The rapid implementation of novel kidney protective therapies to the global DM and CKD community is a public health priority. Might alternative policies improve kidney outcomes in persons with DM? In a world with infinite resources, multiple avenues are possible. However, resources are limited: allocating resources to one strategy will detract from other strategies.

In the above context, we will discuss kidney biopsy in routine clinical care, not in a research context. Tissue-based research may improve our understanding of disease pathogenesis and allow innovation. However, even for research there are alternatives to kidney biopsies, such as the prospective collection of kidney tissue from patients subjected to kidney surgeries, as done by the European Nephrectomy Biobank (ENBiBa) project of the European Renal Association (ERA) Diabesity Working Group [23]. However, from a routine clinical practice point of view, healthcare systems should decide on whether to invest additional resources (on top of those already available) in the early detection of CKD or in the late-stage characterization of patients with advanced CKD (e.g. by expanding kidney biopsy indications in DM), and determine what the efficacy and safety implications of each approach would be (Supplementary data, Fig. S1) [24, 25].

CURRENT INDICATIONS FOR KIDNEY BIOPSY IN PERSONS WITH DM

The conversation around the indications of kidney biopsy is usually complex, given the multitude of clinical parameters that may contribute to the decision, as well as the need to consider non-clinical parameters (e.g. availability and safety of the procedure at the local level, availability of enough histological techniques and of skilled kidney pathologists). This complexity is likely the reason why recent guidelines on CKD and DM barely discuss kidney biopsy (Table 1) [14, 22, 26, 27]. Most nephrologists would agree that a kidney biopsy is needed when its result may change treatment, especially if treatment involves drugs with a suboptimal safety profile. This is likely why the most widely accepted indications for kidney biopsy involve the confirmation of diagnoses that may require immunosuppressive or corticosteroid treatment (Supplementary data, Table S1) [28].

When primary care is optimal, DM would be expected to be diagnosed (either because of symptomatic complaints or workplace health checks or screening of at-risk populations) and monitored and treated for CKD. If primary care is adequate, monitoring would mean an annual test for estimated glomerular filtration rate (eGFR), albuminuria and urinary sediment. If this was done properly, it would remove any lingering doubt about the indication of kidney biopsy for acute/subacute conditions, such as idiopathic nephrotic syndrome, nephritic syndrome or unexplained acute kidney injury, as the timelines for the development of kidney abnormalities would be clear. This would also be the case for the indication of kidney biopsy for subnephrotic proteinuria: the early initiation of SGLT2i to prevent CKD would delay the onset of A2 albuminuria, to which the use of renin–angiotensin system blockers for hypertension may contribute [14]. When and if A2 albuminuria develops, a nonsteroidal MRA may again lower albuminuria, as would GLP1 receptor agonists [14]. Thus, once the full array of kidney protective drugs for DM is unleashed in well-monitored patients, eligibility for kidney biopsy would decrease. However, this scenario requires that healthcare systems devote enough resources to increase awareness, education and implementation at the primary care level.

EFFICACY

The efficacy of a kidney biopsy may be estimated as the extent to which it provides information that changes clinical management. In large series, as detailed in the Supplementary data,

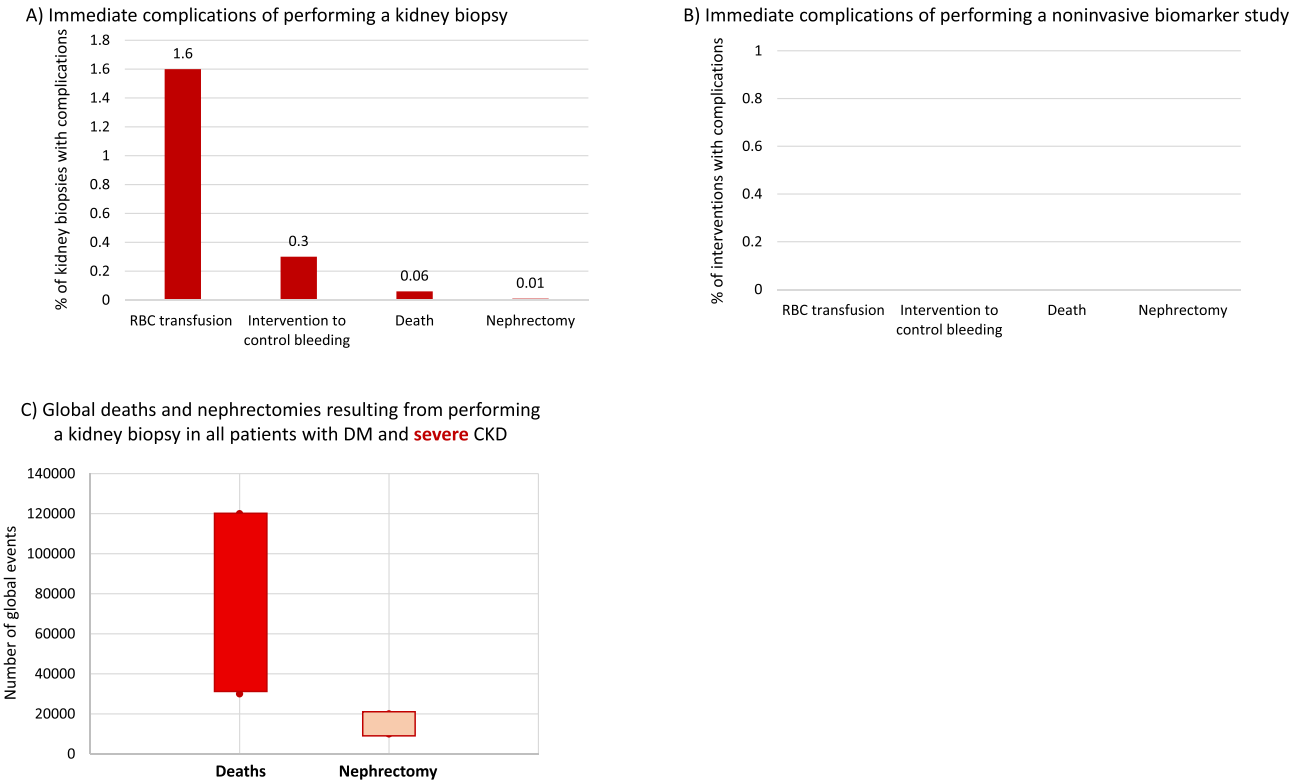

Figure 1: Safety of kidney biopsy. (**A**) Immediate complications of performing a kidney biopsy according to references [28, 32, 33]. (**B**) Immediate complications of assessing a non-invasive biomarker. (**C**) Expected number of global deaths and nephrectomies from kidney biopsies if they were performed globally in all patients with DM and severe CKD. For further details, see Supplementary data. RBC: red blood cell.

the histological diagnosis in 93% of kidney biopsies in diabetics would not be expected to change therapy (Supplementary data, Fig. S2) [26, 29].

Kidney biopsies may also inform on prognosis. However, representing 0.0067% of the volume of one of the two kidneys, information on chronicity derived from kidney biopsies may depend on the severity and chronicity of injury of a reduced set of nephrons (up to 50–100 out of 1–2 million). It would make more sense to assess parameters that integrate the information from both whole kidneys, such as urinary proteomics [30] or kidney imaging [31].

SAFETY

Like other invasive procedures, kidney biopsies carry a risk of complication that, in rare cases, includes death and nephrectomy (Fig. 1A) [28, 32, 33]. While it is likely that expert centres have a lower risk of complications than observed in meta-analyses, the degree of expertise will be very variable and, in any case, the complication rate of kidney biopsy will still be higher than for non-invasive biomarkers (Fig. 1B). Additionally, persons with DM frequently fulfill criteria of higher biopsy risk (age >40 years, systolic blood pressure >130 mmHg or haemoglobin concentration <12 g/dL increase the risk of red blood cell transfusion by 5- to 14-fold). Calculations using specific populations may provide insight into the safety impact of expanding the indication for kidney biopsy in DM. There are 3.9 million persons on KRT in the world and 20%–50% have DM, representing 1–2 million persons with DM and severe CKD [1, 5, 6]. Performing kidney biopsy in all persons with DM and severe CKD would result in 30 000–120 000 deaths from kidney biopsy and 10 000–20 000 nephrectomies, as detailed in the Supplementary data (Fig. 1C) [28, 32, 33]. Similar calculations for the 850 million global patients with CKD would yield around 200–400 million people with diabetes and CKD. Biopsying all may cause 6–24 million deaths and 2–4 million nephrectomies (Supplementary data, Fig. S3). Any other more limited expansion of kidney biopsy criteria may take these numbers as starting point for the estimation of the global safety impact.

Integrating the efficacy and safety data, if kidney biopsy results identify a nephropathy that would initially be treated similarly to DKD in 93% of cases (Supplementary data, Fig. S2E), expanding kidney biopsy criteria to all persons with diabetes and severe CKD may result in over 28 000–112 000 deaths of persons who would derive little benefit from kidney biopsy in terms of changing treatment, even if a non-diabetic nephropathy was found. We write 'over' because expanding the criteria to perform a kidney biopsy would presumably decrease the rate of therapy-changing findings.

RESOURCES

Increasing the indications of kidney biopsy in persons with DM would require a matching increase in resources, from in-patient facilities to perform biopsies to kidney pathologists that provide expert interpretation of the histology. Several European countries currently lack resources to even cope with glomerulonephritis diagnoses [34]. The situation for most of the world's population will likely be similar. The cost of a kidney biopsy in Spain is estimated at 1100 € [35]. For every 1100 € invested in a

single uncomplicated kidney biopsy, a healthcare system could perform thousands of albuminuria assessments to identify and treat earlier stages of any CKD (Supplementary data, Fig. S4).

CONCLUSION

The burden of CKD and of CKD in persons with DM is increasing, meaning that radical change is needed in our approach to preventing, diagnosing and treating CKD in these persons. A better understanding of predisposing factors, pathogenic events and evolving phenotypes of CKD associated with DM is clearly needed and may involve kidney biopsy. However, in routine clinical practice, the focus should be on implementing the early assessment and monitoring of kidney injury in persons with DM, increasing testing for eGFR, albuminuria and urinary sediment so that it covers the full global DM population, and using this information for the early prescription of kidney-protective strategies for both prevention and early treatment following current guidelines [14]. This approach will likely decrease the need for expanding the criteria for kidney biopsy in persons with DM. It may even be argued that for routine clinical care purposes, kidney biopsy is being overused in DM, given that 93% of histological diagnoses would not be expected to require a different therapeutic approach, while other simpler and less expensive tests such as albuminuria are being underused or misinterpreted.

SUPPLEMENTARY DATA

Supplementary data are available at *ckj* online.

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CONFLICT OF INTEREST STATEMENT

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