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INVITED COMMENTARY

Percutaneous renal transplant biopsy: is the safety profile adequate for short-term postprocedure monitoring?

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Despite advances in noninvasive tests and techniques, renal transplant biopsy (RTB) is well established as the standard procedure to determine the etiology of acute and chronic renal allograft dysfunction. Moreover, as graft biopsy provides the earliest available evidence of morphological damage in stable renal transplants, protocol biopsies have become a diagnostic tool to detect unexpected early changes, such as subclinical acute rejection and chronic allograft nephropathy, or to monitor calcineurin inhibitor nephrotoxicity.

The general safety and complication rate of the procedure have substantially improved as automated spring loaded biopsy devices and ultrasound guidance have been implemented. However, the Society of Interventional Radiology (SIR) consensus guidelines for periprocedural management of coagulation status and hemostasis risk in percutaneous image-guided interventions still classify renal biopsy within the category of procedures with the highest bleeding risk together for example with transjugular intrahepatic portosystemic shunt or complex radiofrequency ablations [1]. Therefore, the identification of factors affecting the probability of complications and the appropriate time period of patient surveillance after renal biopsy are of crucial interest for institutions dealing with those patients.

In particular, the optimal period of observation has been widely discussed for both, native renal and renal transplant biopsy. From a strict economic point of view, the question of whether percutaneous renal biopsy should be performed as an outpatient procedure has been unambiguously answered by several publications within the last two decades [2,3]. For low-risk patients undergoing native renal biopsy, the institutional costs for outpatient day surgery could be reduced by roughly a quarter compared with inpatient observation when assuming a complication rate of 10% with major bleeding occurring in 2.5% of patients and death in 0.1% and 0.15% of inpatients and outpatients, respectively [3]. Even if comparable data on the cost-effectiveness of RTB is lacking to date, the difference of the institutional costs might be even more pronounced in renal transplant patients as the procedural safety of graft biopsy has been reported to be tendentially higher than in native renal biopsy [4].

The rate of severe complications reported by Redfield *et al.* [5] in one of the largest study on the safety of RTB so

far has been even lower than assumed for the cost minimization study mentioned before. In their retrospective analysis on 3738 transplant biopsies, the authors reported a complication rate of only 1.8% with severe bleeding complications occurring in 0.21% and life-threatening complications in 0.19%. All severe and life-threatening complications were treated with surgical interventions. No deaths or graft loss secondary to biopsy complications occurred in their cohort. The findings are in line with former retrospective studies on the safety of RTB, of which the largest ones reported severe complications in 0.4% of 2127 biopsies with no deaths and one graft loss [6] or in 1.0% of 1171 biopsies with no deaths and no graft loss [7]. Consequently, the authors conclude that RTB may be considered as a safe procedure if performed with strict adherence to contraindications due to coagulation parameters, anticoagulation medication within the last 5d, or elevated blood pressure.

Beyond the high number of included biopsies, the data from the study of Redfield *et al.* are of particular value as the authors focus not only on the incidence but also on the timing of severe adverse events following RTB. In the final analysis, only the combination of both the incidence and the timing of relevant adverse events enables clinicians to specify the optimal length of the postprocedure-monitoring period. While the average presentation time of moderate complications was 5 h 37 min with the majority of complications (77%) occurring within 4 h postbiopsy, the average presentation time of severe complications was 12 h 22 min with only a minority of complications (33%) presenting within the 4-h observation time. More than the half of the severe complications occurred later than 8 h postbiopsy with a maximum time delay of up to 48 h.

The study is not the first one in the literature which draws attention to the risk of delayed bleeding complications following renal biopsy in general. In a series of 750 native renal biopsies complications were identified in only 42% by ≤4 h, in 67% by ≤8 h, in 85% by ≤12 h, and in 89% by ≤24 h [8]. However, with corresponding results on late bleeding complications in transplant biopsies, Redfield *et al.* clearly contradict former studies on the safety of RTB, in which the vast majority of severe complications were found to occur within a 4 h postprocedure observation period although the seriousness of the problem occasionally may not have become evident if the patient had not been submitted to 24-h observation [6,7,9]. The authors of those studies uniformly conclude that RTB can widely be performed as an outpatient procedure with the necessity to prolong the observation period only in a small percentage of patients.

Due to the low complication rate, even the data of Redfield *et al.* should not be interpreted to be contrary to the outpatient concept which enables institutional cost benefits and allows patients to avoid hospitalization. The findings rather emphasize the necessity to search for risk factors and to identify patients who need to be monitored more extensively. In the cohort of Redfield *et al.,* a fall of hematocrit or hemoglobin within 4 h postbiopsy was a predictor of bleeding. Furthermore, biopsy within 1 week of transplant was associated with a significant increase of adverse events. Postbiopsy ultrasound, however, was not established as a standard observational tool, which might have provided further reassurance prior to discharge as it has been shown by others [10]. To become a widely accepted concept, however, short-term postprocedure monitoring has to be enabled to identify all patients who might be at risk for delayed complications and should be observed overnight.

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