Kidney biopsy and power Doppler imaging

Sir,

Percutaneous kidney biopsy is an important technique in clinical nephrology and involves certain complications. These can be classified as minor (gross haematuria; silent haematoma) and major (gross haematuria and haematoma requiring intervention; development of arteriovenous fistula (AVF); development of renal abscess; septicaemia; perforation of hollow viscous; death) [1,2]. Practically all complications are connected with haemorrhage. Microscopic haematuria is very common and not accepted as a complication by most authors [1,2]. The performance of biopsies with an automatic, spring-loaded Tru-cut biopsy device and under ultrasound (US) control has increased the safety of the method itself and decreased the number of serious complications [1]. In the last years the use of colour Doppler sonography in monitoring kidney biopsies was described [3]. We present the use of US technique named ‘power imaging’ or ‘power Doppler’ or ‘angio’ (depending on the manufacturer) in performing kidney biopsies.

Colour Doppler sonography (CD), which is generally based on the mean Doppler frequency shift, has proved to be a useful adjunct in the sonographic diagnostic armamentarium and also in nephrology [4,5]. This method has shortcomings including a tendency for noise to overwhelm the flow signal if the gain is too high or the threshold too low, angle dependence and aliasing [4,5]. In an attempt to overcome these shortcomings a new US technique ‘power imaging’/‘power Doppler’ (PD) has been developed [4,5]. PD is based on the integrated Doppler power spectrum [5]. It is a type of sonography in which the colour scale is calculated from the number of red blood cells in blood volume insonated by the US beam [5]. PD has several advantages over CD: (i) PD can be performed with higher colour gains than CD before noise begins to obscure the image; (ii) it is nearly independent of the insonation angle and essentially angle-independent, and (iii) not subject to aliasing [4,5]. PD demonstrates the intrarenal vasculature better than CD and it is also possible to see smaller tortuous renal vessels with low flow [4]. It is possible to see segmental, interlobular and arcuate arteries and their accompanying veins with CD routinely, but with PD more of these vessels can be seen [4]. Diffuse blush of the renal cortex (visualization of interlobular vessels distal to the level of the arcuate vessels) was first seen with PD [4]. PD is much more susceptible to flash artifact from patient motion than CD [4]. However, this is not a true problem in our patients because they must hold their breath when biopsy is performed.

Prior to the biopsy, informed consent is obtained from all our patients, coagulation status is screened and blood pressure is controlled with antihypertensive medications when indicated. We perform real-time US (ATL HDI 3000) guided biopsy with an automatic biopsy device (Bard Biopsy gun). A 2–4 MHz convex probe is used and modified 18 G Trucut needles are also used. The vessels in the region of the biopsy are imaged immediately before the kidney biopsy (using CD and PD). This gives us the possibility to avoid larger vessels in the envisaged path of the biopsy needle. The presence of an AVF can be established as well. After kidney biopsy and the next day, the region of the biopsy is imaged (2-D real-time US, CD and PD). This additional kidney investigation (CD and PD) itself does not essentially prolong the duration of the biopsy.

Biopsy of native kidneys using CD and PD was performed in 54 patients. Indications for biopsy were nephrotic syndrome in 18.5%, proteinuria with or without haematuria in 40.7%, isolated haematuria in 13.0%, systemic diseases in 20.4% and acute renal failure in 7.4%. Material for light microscopy, immunofluorescence and electron microscopy was obtained. Adequate tissue for histologic diagnosis was obtained in all patients with an average 3.15 attempts at biopsy (2–5 attempts depending on the nature of the disease suspected). Average 21.1 (range from 7 to 37) glomeruli were obtained during each session. In other studies using 18 G needles 8.7–20.7 glomeruli were obtained during each session [1,6–8]. We observed complications in two (3.7%) patients, macrohaematuria was presented in one and small haematoma with no need for intervention in one patient. In 52 (96.3%) patients no complications were observed, microhaematuria was present in 49 (90.7%) patients. Parrish [9] observed complications in 7% of the total biopsies performed (1812 biopsies in 37 years). In the majority of studies the complication rate lies between 7% and 15% [1,2].

Complications of kidney biopsy are in majority connected with haemorrhage. For better visualization of kidney vessels and possible AVF in biopsy path, PD was used. Adequate tissue for histologic diagnosis was obtained in all our patients, number of glomeruli obtained during each session was high. The complication rate was low and no major complication was observed.

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