Nephroquiz
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The ‘Double Dutch’ Doppler

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Case

A 42-year-old lady underwent a routine renal transplant ultrasound. She had IgA nephropathy and had received a first renal transplant from a deceased donor 2 years before. Her transplant function was stable and serum creatinine was found to be 200 μmol/l on tacrolimus monotherapy. On ultrasound, the renal transplant was 11 × 4 cm with mild parenchymal changes and no evidence of obstruction was found. Surprisingly, Doppler ultrasound of the segmental arteries showed two distinct and alternating waveforms (Figure 1). The patient was entirely asymptomatic. An electrocardiogram (ECG) showed sinus rhythm (Figure 2).

Question: What is the diagnosis?

Answer: The diagnosis is intermittent bigeminy, as shown on a repeat ECG (Figure 3).

Discussion

Graft ultrasound with Doppler of the segmental arteries and measurement of the renal resistive index (RI) is a routine procedure following renal transplantation. The RI is calculated as the difference between peak systolic and end diastolic velocities, divided by the peak systolic velocity. The index is also referred to as the Pourcelot index to honour Léandre Pourcelot, who described its use in the mid-1970s [1]. Not surprisingly, Pourcelot, one of the forefathers of Doppler ultrasound, was double qualified as a medical doctor and as an electrical engineer.

Some controversy persists as to utility and limits of the renal RI [2]. Suffice it to say that in renal transplant ultrasound most RI values are between 0.6 and 0.75. An elevated RI (for instance >0.8) is a non-specific sign of an acute parenchymal problem. It does not distinguish between rejection and other causes. Conversely, a low renal RI is a good prognostic marker for the survival of patient and graft [3]. However, a low RI (i.e. <0.6) is also seen in transplant renal artery stenosis [4]. It is also well documented that the graft RI depends heavily on the vascular stiffness of the transplant recipient [5]. Accordingly, it has been suggested to take into account indices of vascular stiffness, such as pulse wave velocity or intima–media thickness, during the interpretation of the RI [5]. Finally, it has to be emphasized that obtaining renal-resistive indices requires a fair bit of practice until, eventually, RI measurement becomes a reliable but rather tedious part of transplant ultrasound.

It is well known that several extra-renal factors affect the renal RI [6]. In this regard, atrial fibrillation renders the RI invalid (the RI will differ from beat to beat). Aortic insufficiency leads to a high intrarenal RI, while aortic stenosis produces a low RI. To the sophomore, this is easily memorized if aortic stenosis is regarded as a very proximal renal artery stenosis. Finally, extremes of heart rate can also affect the RI [6].

In our case, the usual boredom in the dark and peaceful ultrasound cabin was replaced with bewilderment when we encountered a Doppler signal that we had never seen before. The English describe as ‘Double Dutch’ something that is well beyond comprehension. The phrase has its origin in the 17th century when all things Dutch were held in low esteem after a succession of Anglo-Dutch conflicts. We were led astray by the initial normal ECG but eventually concluded that only bigeminy could explain this peculiar waveform and obtained a second, diagnostic, ECG. No cause for the intermittent bigeminy was ever found, an echocardiogram was essentially normal, and the patient continues to be well and asymptomatic.

Conflict of interest statement. None declared.

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Fig. 1. Doppler signal of the distal segmental artery. Note two distinct and alternating wave forms.

Fig. 2. ECG performed on the day of the ultrasound exam.
Fig. 3. Second ECG, obtained a week later, showing bigeminy.

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