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The inferior vena caval conduit – a neglected technique in transplantation of the right cadaveric kidney?

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Abstract A short right renal vein may reduce access or compromise optimal positioning during transplantation of the right cadaveric kidney. This difficulty could be overcome by using the inferior vena cava (IVC) as a venous conduit to lengthen the short right renal vein. This manoeuvre would also facilitate training by ensuring safe tension-free vascular anastomoses since the kidney can be lifted up a comfortable distance, thus improving exposure of the operative field. In a postal survey, only a third of UK renal transplant units utilised the IVC

conduit. Despite 81.5% of units claiming that they harvest the IVC during organ retrieval, a 2-year retrospective audit revealed that only 4.3% of imported right kidneys had the IVC. The IVC remains a much under-utilised resource in the UK despite its potential benefit as a venous conduit in transplanting the right cadaveric kidney. We urge all retrieving surgeons to routinely harvest the IVC with right cadaveric kidneys during organ procurement.

Key words Inferior vena cava · Venous conduit · Transplantation

Introduction

A common difficulty encountered in the transplantation of the right cadaveric kidney is the short renal vein. This limits the exposure of the operative field both during the anastomosis of the donor vein to the recipient iliac vein and following reperfusion during graft inspection for haemostasis. Moreover, the optimal placement of the transplanted kidney may be compromised by the limited mobility of the graft on its short vascular pedicle.

The inferior vena cava (IVC) may be used in various ways to extend the length of the short right renal vein [1–7]. Although it is our preferred practice to use the IVC as a conduit routinely, the IVC was often not available in the right cadaveric kidneys imported via the United Kingdom Transplant Support Service Authority (UKTSSA). We therefore set out to survey how often the IVC is harvested during organ procurement and its usage as a venous conduit in transplantation of right cadaveric kidneys in the UK.

Patients and methods

A postal survey of all the renal transplant units in the UK was conducted. To place the survey in perspective, we also performed a retrospective audit of all cadaveric renal transplants performed in our unit over a period of 2 years, to determine the frequency with which the IVC was harvested with imported right cadaveric kidneys and our usage of the IVC as a venous conduit.

The technique we used to fashion the IVC into a venous conduit was similar to that described by Corry and Kelley [4]. Briefly, during harvesting of cadaveric kidneys, the left renal vein is taken with a small cuff of IVC, and the IVC is transected at the proximal edge of the junction between the right renal vein and the IVC as part of the liver retrieval (Figs. 1 and 2). The IVC attached to the right cadaveric kidney is then fashioned into a venous conduit by closing the proximal cut end of the IVC with continuous monofilament suture (Fig. 3). The distal transected end is then trimmed to the appropriate length and the conduit checked for leakage prior to transplantation.

Fig. 1 Kidneys in situ with *dotted lines* marking lines of transection of the IVC during organ retrieval

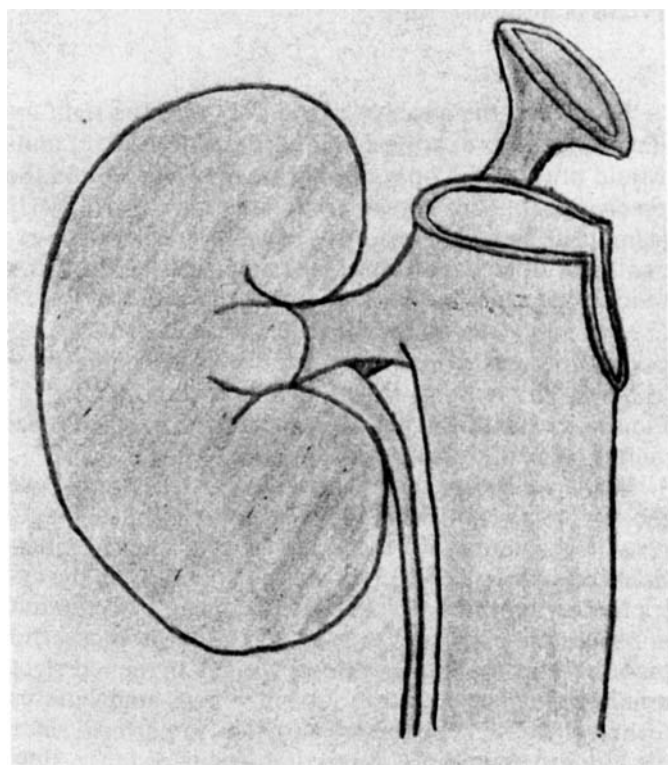
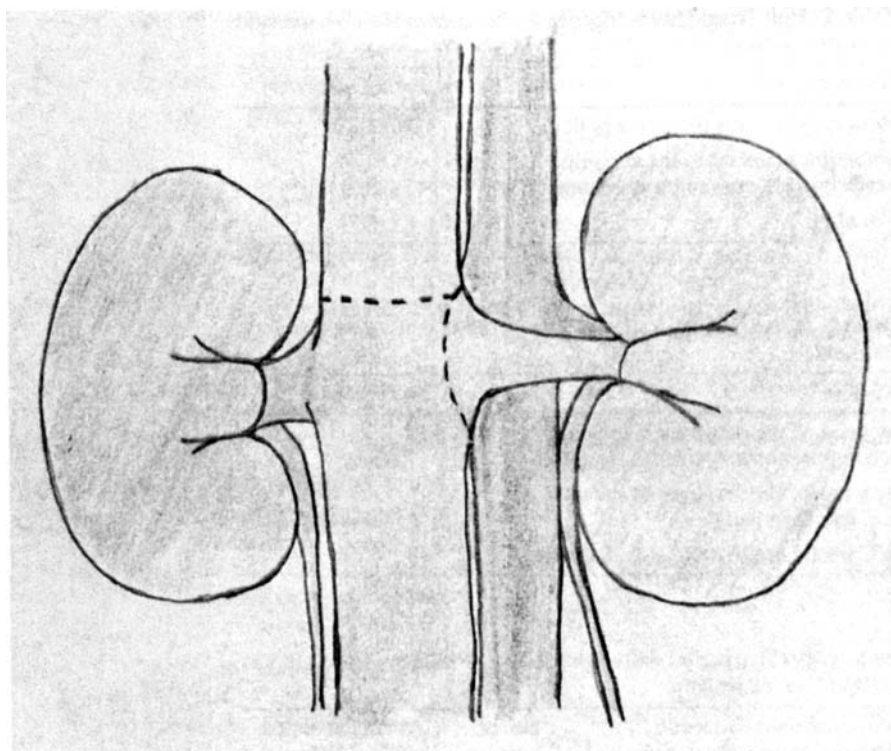


Fig. 2 Right cadaveric kidney with the attached IVC following its retrieval

Results

A questionnaire was sent to 31 consultant surgeons representing all the adult renal transplant units in the UK, of whom 27 replied (87.1%). The results of the survey are set out in Tables 1 and 2. Over a 2-year period (from May 1995 to April 1997), a total of 145 cadaveric renal transplants were performed in our unit, of which 29 (20%) involved kidneys imported from 16 renal transplant units via UKTSSA. The total number of right kidneys transplanted during this period was 74 (51%), of which 23 (31.1%) were imported. Of the imported right kidneys, 13 (56.5%) were from units which described their frequency of harvesting IVC as routine (84.6%) or occasional (15.4%).

Table 3 compares the proportion of IVC harvested in imported right cadaveric kidneys with those retrieved in the Wessex region. Of the 31 IVC harvested with the right kidneys, we used 26 (83.9%) as venous conduits in the transplants. No venous thrombosis occurred in any of these transplants.

Discussion

The various methods of elongating the short right renal vein by suturing [1–4, 6, 7] or stapling [5] the IVC into a venous conduit have been well described for many years. Nevertheless, from our postal survey, only a third

Table 1 How frequently is the inferior vena cava (IVC) harvested during organ procurement?

Answer	No. of units (%)
Routinely (i.e. it's the unit's policy)	15 (55.6)
Sometimes (i.e. up to the surgeon performing the organ procurement)	7 (25.9)
Not at all	5 (18.5)

Table 2 If the IVC is available, how often is it used as a venous conduit?

Answer	No. of units (%)
By most of the surgeons in the unit (i.e. more than two-thirds)	7 (25.9)
By a few of the surgeons in the unit (i.e. less than half)	2 (7.4)
IVC would not be used (i.e. discarded)	18 (66.7)

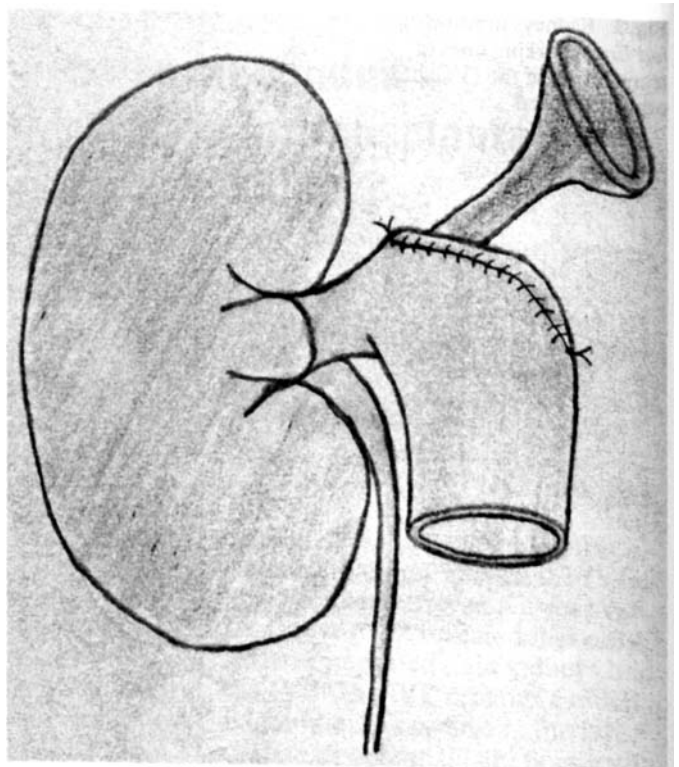
Table 3 IVC harvested with right cadaveric kidneys from UKTSSA and Wessex Region

Source of right cadaveric kidneys for transplantation in Portsmouth (1 May 1995-30 April 1997)	No. of kidneys (%)	IVC harvested (% of kidneys)
UKTSSA (imported)	23 (31.1)	1 (4.3)
Wessex region - retrieved by King's College Liver Team	16 (21.6)	3 (18.8)
Wessex region - retrieved by Wessex Renal & Transplant Unit	35 (47.3)	27 ^a (77.1)

^a Six right kidneys were harvested by the other consultant surgeon in the unit who does not use the IVC at all and two right kidneys were harvested by a visiting registrar at the beginning of his appointment

of the renal transplant units in the UK would use the IVC as a conduit to facilitate transplantation of the right cadaveric kidney (Table 2). This suggests that a short right renal vein is not regarded as a technical problem to the majority of the renal transplant surgeons in the UK.

Despite the fact that the majority (81.5%) of the renal transplant units claim to harvest the IVC with the right kidney during organ retrieval, our experience of kidneys imported from the other renal transplant units via the UKTSSA tells a different story. Of the 23 right kidneys imported in the 2-year period surveyed, only 1 (4.3%) was harvested together with the IVC, despite the fact that nearly half of these came from units that claimed to harvest the IVC as part of their organ procurement policy. We believe that this low percentage of the IVC being harvested is probably a good reflection of current organ retrieval practice nationally.

**Fig. 3** Fashioning of the IVC into a venous conduit by closure of the proximal opening with monofilament suture and trimming the IVC to an appropriate length

Moreover, the absence of the IVC with the right cadaveric kidneys exported to other renal transplant units would prevent the opportunity for their use should the receiving surgeons choose to do so. This is particularly significant since the majority of cadaveric kidneys exported to other renal transplant units via the UKTSSA tends to be right kidneys, as evidenced by 23 of the 29 (79.3%) imported kidneys and 21 of the 29 (72.4%) exported kidneys in our retrospective audit being right kidneys. The reasons why units tend to export the right kidney are unknown, but we suspect that the short renal vein is probably a main consideration!

While we accept that it is not always necessary to use the IVC as a venous conduit to facilitate right cadaveric renal transplantation, there are certain clinical situations like a deep pelvis or an obese patient, when the extra few centimetres of vein provided by an IVC conduit improves the exposure for safe venous anastomosis and placement of the kidney. Moreover, a lengthened right renal vein makes both arterial and venous anastomoses technically easier for trainee surgeons to perform since the kidney can be lifted up a comfortable distance, thus improving exposure of the operative field.

Conclusions

In conclusion, the IVC is a very much under-utilised resource despite its potential benefit as a venous conduit

in transplantation of the right cadaveric kidney. We therefore urge all retrieving surgeons to routinely harvest the IVC with right cadaveric kidneys during organ procurement.

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