LETTER TO THE EDITORS

Robotic kidney transplantation allows safe access for transplant renal biopsy and percutaneous procedures

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Dear Editors,
Robot-assisted kidney transplantation (RAKT) is being increasingly performed in selected centers with extensive experience in robotic surgery and kidney transplantation [1–3].

Several surgical techniques have been proposed for RAKT [2,4–6]. To date, most centers, including the European Association of Urology (EAU) Robotic Urology Section (ERUS)—RAKT group [1], follow the principles of the Vattikuti Urology Institute-Medanta technique, developed following the IDEAL framework for introducing surgical innovations [2,7], potentially with few technical nuances [8].

A key point of the Vattikuti-Medanta technique is the transperitoneal approach with final extraperitoneization of the graft after kidney reperfusion. In particular, the graft is allocated in an extraperitoneal pouch by reapproximating two peritoneal flaps prepared at the beginning of surgery (Fig. 1a–f and Video S1).

This critical step aims to avoid graft torsion, facilitate postoperative graft monitoring, and allow convenient access for ultrasound-guided transplant renal biopsy and/or placement of nephrostomy tubes, if needed.

Of note, despite commonly performed in routine clinical practice, there is lack of evidence on the use of ultrasound imaging for postoperative graft monitoring and on the feasibility and safety of percutaneous procedures after transperitoneal RAKT with extraperitoneization of the graft.

As such, herein we report our experience after 31 RAKTs from living ($n = 13$) or deceased ($n = 18$) donors, performed by a single surgeon [G.V.] between January 2017 and July 2019 following the principles of the Vattikuti-Medanta technique [8]. (Video S1).

Postoperative ultrasound imaging was performed according to a standardized protocol [9], without any technical difficulty related to the anatomic position of the graft (Fig. 1g). Notably, a laminar perirenal fluid collection was recorded in almost all patients at ultrasound examinations during the first postoperative period (i.e., postoperative day 1, 7 and at hospital discharge) (Fig. 1h). Subsequent follow-up evaluations showed a progressive reduction of the fluid collection until reabsorption within 20–30 days after surgery (Fig. 1i,j), confirming the complete extraperitoneization of the graft.

In our cohort, 5/31 (16%) patients underwent percutaneous transplant renal biopsy for suspected acute rejection (Fig. 1l,m). All biopsies were performed using an automated needle biopsy system, as recommended [10], and achieved proper diagnostic yield. Acute rejection was confirmed in one case.

In addition, one patient required percutaneous placement of a nephrostomy tube (with antegrade insertion of a double-J stent) for hydronephrosis and rise in serum creatinine ($n = 1$, Fig. 1n).

The anatomic extraperitoneal position of the graft achieved by RAKT (Fig. 1k) allowed safe performance of these percutaneous procedures since the early postoperative period, with no need for more invasive (i.e., laparoscopic) approaches and no periprocedural complications.

We believe transperitoneal RAKT with extraperitoneization of the graft according to the Vattikuti-

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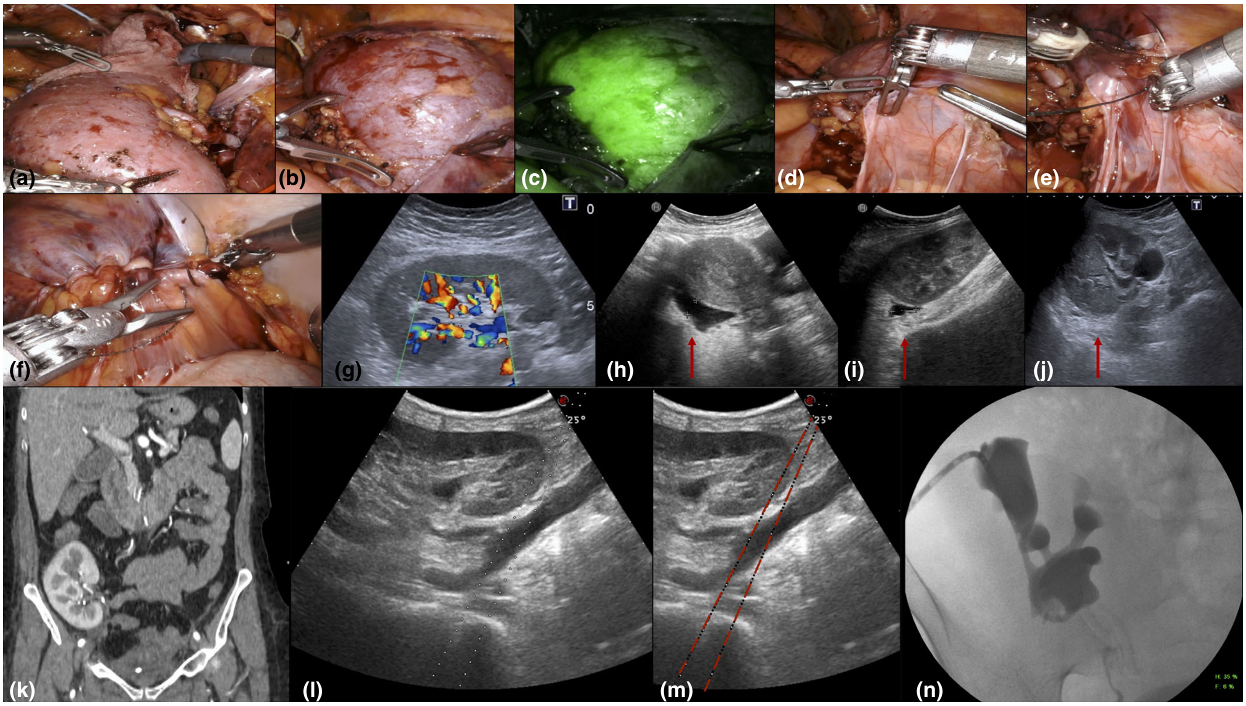

Figure 1 Robotic kidney transplantation with extraperitoneization of the graft allows a safe access for transplant renal biopsy and percutaneous procedures. (a–f) Intraoperative pictures showing the extraperitoneization of the graft during robot-assisted kidney transplantation (RAKT). (a–c) After revascularization, the graft is allocated in the previously prepared extraperitoneal pouch and checked for reperfusion using fluorescence vascular imaging with indocyanine green. (d–f). Extraperitonealization of the graft by reapproximating two peritoneal flaps prepared at the beginning of the procedure using single hem-o-Lok clips or a single V-lok running suture. (g) The extraperitoneal position of the graft allows safe doppler ultrasound imaging during the early postoperative period to check for graft vascularization. (h–j). Ultrasound imaging of the graft throughout the postoperative period after RAKT showing progressive reduction of a laminar perirenal fluid collection (arrow), which was recorded in almost all patients and completely re-absorbed within 20–30 days after surgery. (k) Postoperative computed tomography scan on postoperative day 6 after RAKT showing the anatomic position of the graft in the extraperitoneal space. (l–m). Percutaneous ultrasound-guided transplant renal biopsy for suspected acute rejection. In all cases (n = 5), renal biopsy was performed at the lower pole of the graft using an automated needle biopsy system. (n) Percutaneous ultrasound-guided placement of a nephrostomy tube in one patient with postoperative rising serum creatinine and hydronephrosis due to uretero-pelvic junction obstruction of the donor's graft.

Medanta technique, which is likely to be increasingly performed by referral centers across Europe, allows to combine the advantages of minimally invasive surgery—from both patients' and surgeons' perspectives—with those of extraperitoneal open kidney transplantation, including the opportunity of a safe access for diagnostic and therapeutic percutaneous procedures during the postoperative period.

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None.

Conflict of interest

The authors declare that they have no conflicts of interest to report.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Video S1. Step-by-step technique for robotic kidney transplantation with extraperitoneization of the graft.

REFERENCES

1. Breda A, Territo A, Gausa L, *et al.* Robot-assisted kidney transplantation: the European experience. *Eur Urol* 2018; **73**: 273.
2. Menon M, Sood A, Bhandari M, *et al.* Robotic kidney transplantation with regional hypothermia: a step-by-step description of the Vattikuti Urology Institute-Medanta technique (IDEAL phase 2a). *Eur Urol* 2014; **65**: 991.
3. Wagenaar S, Nederhoed JH, Hoksbergen AW, Bonjer HJ, Wisselink

W, van Ramshorst GH. Minimally invasive, laparoscopic, and robotic-assisted techniques versus open techniques for kidney transplant recipients: a systematic review. *Eur Urol* 2017; **72**: 205.
4. Tsai MK, Lee CY, Yang CY, *et al*. Robot-assisted renal transplantation in the retroperitoneum. *Transpl Int* 2014; **27**: 452.
5. Giulianotti P, Gorodner V, Sbrana F, *et al*. Robotic transabdominal kidney transplantation in a morbidly obese patient. *Am J Transplant* 2010; **10**: 1478.
6. Bruyère F, Pradère B, d'Arcier BF, Boutin JM, Buchler M, Brichart N. Robot-assisted renal transplantation using the retroperitoneal approach (RART) with more than one year follow up: description of the technique and results. *Progrès en Urologie* 2018; **28**: 48.
7. McCulloch P, Altman DG, Campbell WB, *et al*. No surgical innovation without evaluation: the IDEAL recommendations. *Lancet* 2009; **374**: 1105.
8. Vignolini G, Campi R, Sessa F, *et al*. Development of a robot-assisted kidney transplantation programme from deceased donors in a referral academic centre: technical nuances and preliminary results. *BJU Int* 2019; **123**: 474.
9. Li Marzi V, Campi R, Sessa F, *et al*. Standardized duplex ultrasound- based protocol for early diagnosis of transplant renal artery stenosis: results of a single-institution retrospective cohort study. *Biomed Res Int* 2018; **2018**: 2580181.
10. Breda A, Budde K, Figueiredo A, *et al*. European Association of Urology (EAU) Guidelines on renal transplantation. EAU Guidelines. Edn. presented at the EAU Annual Congress Barcelona 2019. ISBN 978-94-92671-04-2. Available at https://uroweb.org/guideline/renal-transplantation/