

GRAND ROUNDS

## Posterior lumbar fixation in a kidney transplant recipient: logistics and perioperative challenges

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### Abstract



**Background** Kidney transplantation has become the ideal and successful treatment for medically suitable patients with established kidney disease. This results in increased likelihood of these patients developing unrelated conditions requiring surgery, including spinal surgery. There are only a few publications available regarding spinal patients with renal transplants.

**Case report** A 67-year-old patient presented with recurrent sciatica. Four years prior to this, he received a living

donor kidney transplant. He was diagnosed with right L4 radiculopathy due to recurrent foraminal stenosis as a result of the grade I L4/5 spondylolisthesis. He was offered a reoperation including microdecompression and posterolateral fixation and fusion. The renal transplant necessitated specific pre- and intraoperative considerations. The knee-chest position with extra padding was used to maintain the region of the renal transplant free from any pressure. The renal care was planned in detail by the transplant surgeons and nephrologists and shared with the ward doctors and on-call teams. The procedure was uneventful; there were no signs of intraoperative or postoperative acute renal injury. The patient was discharged 5 days postoperatively; all renal parameters remained within normal ranges and the postoperative plain films demonstrated satisfactory surgical results.

**Conclusions** The key to success was a multidisciplinary approach and detailed planning regarding pre-, intra- and postoperative care. The presented scheme of care might be useful when considering the posterior approach and prone positioning in kidney transplant recipients with spinal pathologies requiring surgical treatment.

**Keywords** Spinal fixation · Renal transplant · Positioning · Perioperative care

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### Case presentation

A 67-year-old patient presented with recurrent right-sided sciatica.

Four years prior to this, he received a living donor kidney transplant, and apart from an early episode of treated acute cellular rejection, he has had an unremarkable post-transplant period. He had no other relevant past

medical history and had no problems with previous anaesthetics.

Due to the right-sided sciatica, a lumbar spine MRI was performed and he was diagnosed with L4/5 stenosis. Initially, L4/5 microdecompression was performed and the patient experienced intermittent improvement with regard to pain and mobility. Several months later, he noted a recurrence of symptoms, particularly on the right hand side, and was diagnosed with right L4 radiculopathy due to recurrent foraminal stenosis as a result of the grade I L4/5 spondylolisthesis. He was offered a reoperation including microdecompression and postero-lateral fixation and fusion. The renal transplant necessitated specific pre- and intraoperative considerations.

## Diagnostic imaging (Fig. 1)

### Historical review of the condition, epidemiology, diagnosis, pathology and differential diagnosis

The first successful kidney transplant was performed in the USA in 1954 between identical twins. Kidney transplantation has become the ideal treatment for medically suitable patients with established kidney disease, due to advances in immunosuppression, histocompatibility and medical care of renal failure patients. Outcomes have improved and 10-year graft and patient survival following a deceased donor kidney transplant are 72 and 73 %, respectively; and following a living donor transplant, 77 and 89 % [1]. This has resulted in an increased likelihood of these patients developing unrelated conditions requiring surgery, including spinal surgery. There are few reports

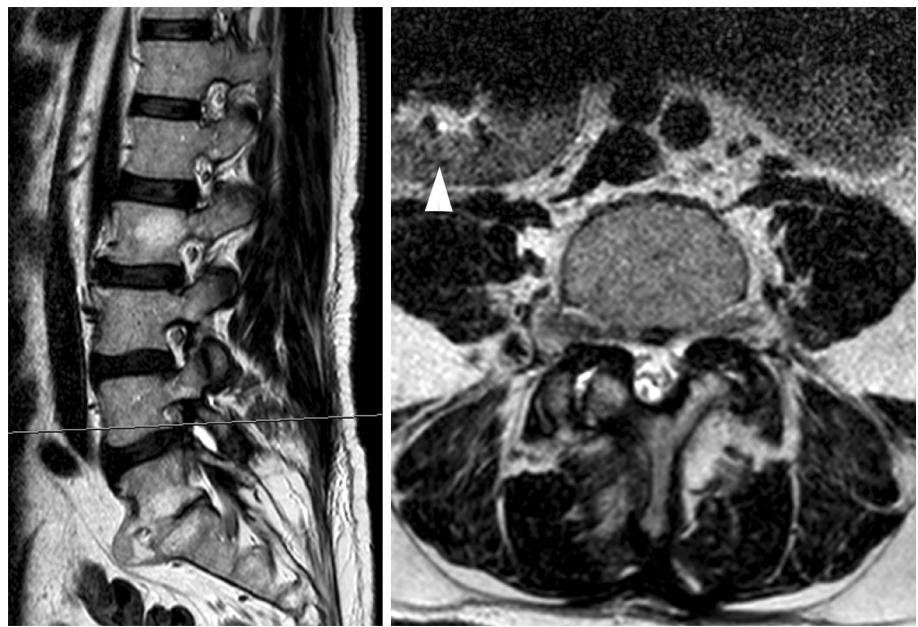
describing spinal surgery on renal transplant recipients and none of these reports describe related technical and organizational challenges [2–4].

The usual site of a kidney transplant is in the retroperitoneal space of the iliac fossa, most commonly the right, although the kidney can be more prominent depending on the relative size of the kidney and the recipient.

Although there is only one paper describing prone positioning of kidney transplant recipients undergoing spinal operations [2], it seems reasonable to use that position in the majority of cases requiring instrumentation and/or fusion. However, one needs to bear in mind that compression related to suboptimal positioning of the patient may result in acute renal injury. Hypertension and loss of function related to an extrinsic compression is well described—also for kidney transplants—and is called the Page kidney phenomenon [5, 6]. Classically, Page kidney phenomenon-related renal failure is a result of the compression by the subcapsular haematoma caused by blunt trauma [7, 8] or renal biopsy [9]. Although preservation of the compressed renal graft is possible in some cases [10, 11], affected recipients usually need surgical treatment and often require subsequent re-transplantation [8].

Surgical management of kidney transplant recipients is well described; however only a few publications are available regarding spinal patients with renal transplants [2–4]. Hence, a plan for safe intraoperative positioning as well as for pre-, intra- and postoperative care needed to be developed by the multidisciplinary team (consultant spinal surgeon, consultant anaesthetist, consultant in general surgery and renal transplantation) based on previous experience, literature and common sense.

**Fig. 1** Preoperative MRI of the lumbar spine (T2-weighted images). *Left* sagittal section with scout line at the level of L4/5. Note, the L5/S1 fusion and L4/5 foraminal stenosis are visible. *Right* axial section of the L4/5 intervertebral space. Bilateral foraminal stenosis and facet joint hypertrophy as well as degeneration are visible. Note, kidney transplant visible in the right iliac fossa (white arrow)



## Procedure

The patient underwent postero-lateral L4–5 fixation and fusion.

### Patient positioning

A major concern was safe intraoperative patient positioning given the fact that his transplanted right-sided pelvic kidney was palpable above the anterior superior iliac spine (ASIS). Different options were discussed within the multidisciplinary team well in advance of the operation. The safest option for positioning from a renal point of view was the lateral position (used during the first operation); however, this plan was abandoned due to expected significant technical difficulties related to the instrumentation.

Standard positioning on bolsters—used for the majority of spinal fixations performed at our institution—was not considered appropriate for this patient, as points of the support for the lower bolster localised on the ASISs. This is also the case for Jackson table and the Wilson frame.

Following the advice of the renal and transplant team, we decided to use the knee-chest position with extra padding, marking the area which was supposed to remain free of any pressure with a patch of an adhesive plaster to provide a visible reminder about the region, which needed to be treated with extra caution. The knee-chest position allowed us to maintain the region of ASIS free on any pressure due to favourable localisation of support points.

During positioning, all care was taken to avoid any compression of the abdomen and especially the transplanted kidney with special attention given to avoid compression related to sliding. Consideration had to be given to the laterality of the transplanted kidney when transferring the patient from the supine position of the anaesthetic trolley to the prone position, so that the patient was rolled over the safe contralateral side. The procedure was performed following general standards; the operative duration was 159 min.

The renal care was planned by the transplant surgeons and nephrologists and shared with the ward doctors and on-call teams:

### Prior to hospital admission

Surgical high-dependency unit (SHDU) bed for postoperative care was arranged and the transplant/nephrology team was contacted and advised of patient's medical background and proposed date of admission.

The anaesthetic department was informed and involved in the planning of his care.

### Preoperatively

The patient was admitted to hospital preoperatively and received intravenous fluids (Hartmann's solution 100 ml/h) overnight prior to the operation. Blood tests including full blood count (FBC), blood sample for possible cross-match, urea and electrolytes (U&E), liver function tests (LFT), calcium and magnesium were taken the night before surgery.

Four days prior to the operation, a 7-day course of flucloxacillin (250 mg i.v., every 6 h) was introduced.

### Perioperatively

Extra corticosteroid cover was administered on the morning of surgery then continued for a week postoperatively, before gradually returning to baseline immunosuppression. A mannitol bolus (0.5 ml/kg of 10 % mannitol) was administered at induction, followed by an infusion of 0.5 ml/kg/h of 10 % mannitol peri- and postoperatively. The patient was catheterised and the urine output was closely monitored aiming for 0.5 ml/kg/h. According to the internal protocol of the perioperative antibiotic prophylaxis, patients undergoing spinal instrumentations are routinely given cefuroxime and gentamicin. Due to the known negative effect to renal function, gentamicin was omitted. Cefuroxime alone (1.5 g i.v.) was administered on induction, followed by another dose 8 and 16 h postoperatively as an add-on to the above-mentioned flucloxacillin course.

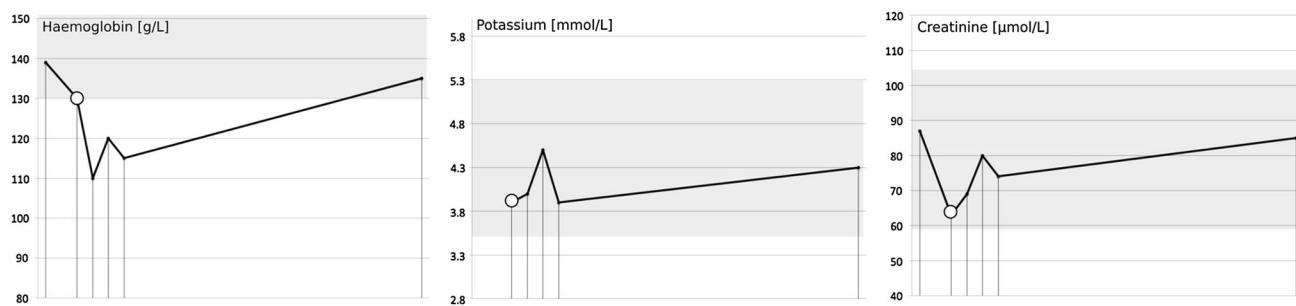
### Postoperatively

The patient was kept well hydrated and received his immunosuppression regularly together with extra corticosteroid cover as detailed above. The target for the post-operative fluid intake was calculated as the previous hour urine output + 40 ml/h for the first 24–36 h. The nephrologist based on the daily rounds guided the dosage of immunosuppressive agents as well as the fluid and electrolyte replacement.

### Outcome and follow-up

The procedure was uneventful; there were no signs of intraoperative or postoperative acute renal injury. Postoperatively, the patient was managed according to the guidance provided by the renal team and all renal parameters remained within normal ranges (Fig. 2).

The patient was mobilised on the second postoperative day with the physiotherapists and discharged 5 days after the procedure. The postoperative plain films demonstrated satisfactory surgical results (Fig. 3).



**Fig. 2** Pre- and postoperative selected blood parameters. The day of the operation was marked as a *white circle*. Postoperatively, blood tests were performed daily, and the last parameters visualised were

checked at the first 2 weeks follow-up review. Normal ranges are marked as *darker areas*



**Fig. 3** Standing lateral and antero-posterior XR films obtained 6 weeks after the operation. Good alignment of the metal work and satisfactory lumbar lordosis

The presented technique and plan allowed for a safe provision of perioperative care. The key to the success was a multidisciplinary approach and detailed planning regarding pre-, peri- and postoperative care, especially renal care as advised by the renal and transplant team.

According to our experience, the milestones of care of a kidney transplant recipient patient presenting for spinal surgery are:

1. Early discussions with the involvement of the multidisciplinary team: the transplant surgeons, nephrologists, anaesthetists and intensive care/high dependency teams.
2. The renal and transplant team to lead on the care with regard to immunosuppressive therapy and fluid administration.
3. Communication—all team members including anaesthetic team, ward doctors and nurses need to be aware of the kidney transplant recipient being operated on.

4. Thorough planning—covering all steps of the operative procedure and perioperative care and with special attention to patient positioning and protection of the kidney—this should be discussed beforehand and simulated if needed.

We believe that the presented scheme of care—after necessary modifications depending on the clinical situation of an individual patient—may be useful while considering the posterior approach and prone position in kidney transplant recipients with spinal pathologies requiring surgical treatment.

**Conflict of interest** None of the authors has any potential conflict of interest.

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