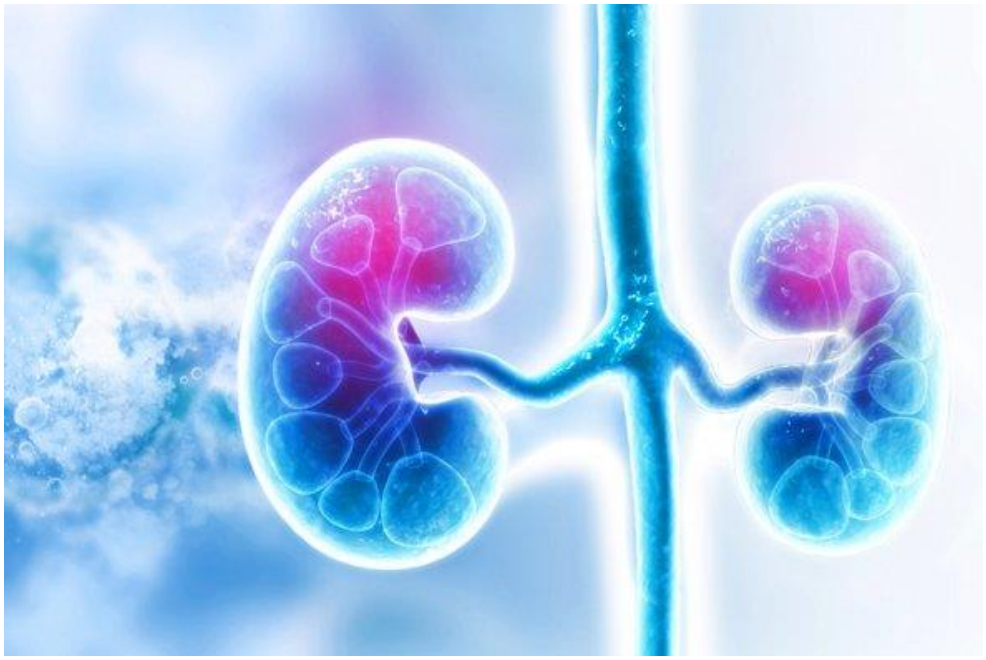
HAMMERSMITH TRANSPLANT SURGERY HANDBOOK



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Georgina Hicks

A guide to the transplant surgery job at Hammersmith Hospital

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Surgical Registrar, North West Thames Deanery

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Hammersmith Transplant Surgery Handbook

GEORGINA HICKS

INTRODUCTION

The transplant team at Hammersmith is a fantastic team specialising in renal (both live donor and deceased donor) and pancreatic transplants as well as vascular access. We are not a retrieval centre meaning the consultants are not on call to retrieve organs from deceased donors. We receive organs from around the country.

We hope you enjoy your time here at Hammersmith and develop an interest in transplant surgery. If you can read this handbook before starting the job it will make your life easier!

THE TRANSPLANT TEAM

Consultant surgeons

Mr Frank Dor – frank.dor@nhs.net (FD)

Mr Jeremy Crane – jeremy.crane@nhs.net (JC)

Mr Paul Herbert – paul.herbert@nhs.net (PEH)

Mr Anand Muthusamy – anand.muthusamy@nhs.net (ARM)

Professor Vassilios Papalois – vassilios.papalois@nhs.net (VP)

Fellows / Registrars

There are usually about 5 transplant fellows, either pre or post CCT.

1 or 2 training registrars from the deanery for 6 months (usually ST3/ST4) – traditionally this was a job to gain vascular competencies for general surgery, although this is now no longer compulsory.

It is possible to declare transplant as your specialty in general surgery after this rotation.

SHO

F2 doctor for 4 months

Consultant nephrologists

Dr Darren Parsons, Dr Damien Ashby, Dr Neill Duncan, Dr Jack Galliford, Dr Megan Griffith, Dr Peter Hill

Dr Marina Loucaidou, Dr Adam McLean, Dr Andrew Palmer, Dr Tom Cairns, Professor David Taube

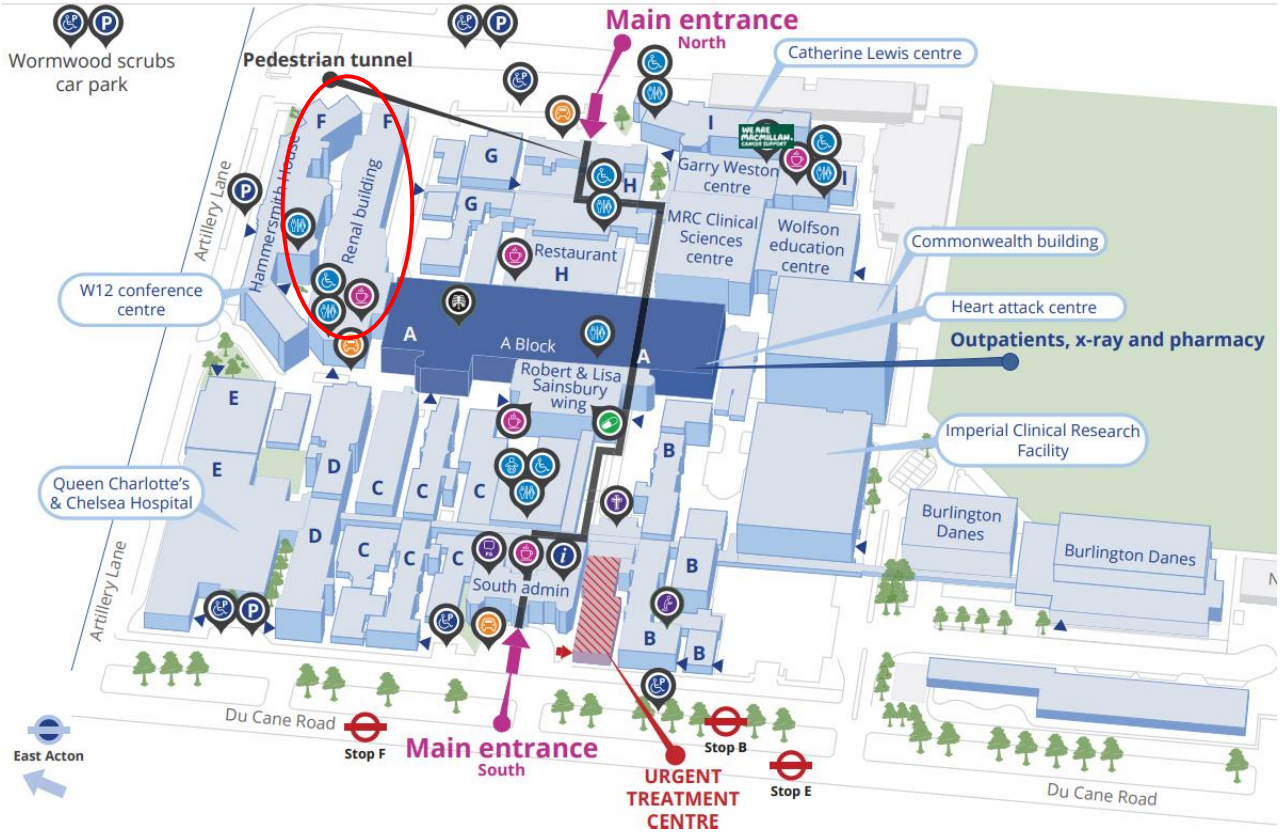
Dr Emma Salisbury, Dr Richard Corbett, Dr Philip Webster, Dr Rawya Charif, Dr Michelle Willicombe

Live donor coordinators

Harvinder Kaur / Honeylett Orr

WARDS / AREAS

You will be based at Hammersmith Hospital in the RENAL BUILDING, which is at the back of the main hospital.



Wards

- De Wardener (second floor, renal building)
    - An HDU ward where all post op transplant patients go (donor and recipient)
    - The doctors office we use is based here (code 5905)
    - Other 'major' post op patients e.g. bilateral nephrectomy and unwell patients will be here
    - When kidneys arrive they are delivered to this ward
    - The 'lines' room for Tesio insertion is also at the end of this ward

    - You will spend a lot of time here as these patients require the most attention
    - The renal registrar on call is based on this ward

- Other wards in the renal building
    - Handfield Jones (first floor) / Peters (first floor) / Kerr (third floor)
    - These other wards are for stepdown post transplant or other elective surgery e.g. PD catheter insertion, fistula surgery

- Intensive care (second floor)

- Each ward has a separate dedicated medical nephrology team.

Theatres

- Based on the second floor
- Theatre 6 is the main theatre we used for transplants, donor nephrectomies and other elective lists
- Theatre 1 is also used for fistula lists
- There is no dedicated CEPOD theatre at Hammersmith

Other important areas

- Rapid Assessment Unit
    - RAU
    - Ground floor, renal building
    - Used as a drop in center for renal patients with urgent problems, you will often be called here when on call to assess patients

- Auchi Dialysis Unit
    - Ground floor, renal building
    - You will sometimes be called to assess patients having dialysis here

- Vascular ultrasound
    - Second floor on the way to theatres
    - For patients requiring detailed scans of AV fistulas (either from ward or clinic or outpatient)

- Planned Investigation Unit
    - PIU / also known as Pam Sassoa
    - Third floor C block
        - You can access this from the renal building via the second floor bridge, or from the main hospital corridor
    - Patients having elective surgery arrive here (consenting, pre-op bloods etc. occur here)
    - Patients requiring Tesio line removal, cystoscopic stent removal, fistulogram, renal biopsy also attend here

- Renal Haematology Triage Unit
    - RHTU
    - Ground floor B block
    - You will sometimes be called to assess patients here

- Outpatient clinics
    - General transplant clinic and vascular access clinic take place in renal outpatients (Ground floor A block Main Building)
    - Live donor clinic and general transplant clinic takes place in Home Therapies Unit (South Corridor)

On call room – 3rd floor renal building, between Kerr and Fraser Gamble (code 123456)

TIMETABLE

General Weekly Timetable

Monday	Tuesday	Wednesday	Thursday	Friday	Weekend
Consultant of the week on call Monday – Thursday 8am to 5pm + Friday 24 hours + Saturday 24 hours + Sunday 24 hours					
Registrar on call Monday – Thursday 8am to 5pm Separate registrar each night				Reg on call 8am to 8pm. Separate weekend reg overnight	
Live donor day (Nephrectomy am Transplant pm)	Tesio lines list Fistula list	MDT (declined offers presentation) Fistula/PD list Live donor clinic	Tesio lines list PD list Transplant clinic Live donor clinic	Alternate weeks Tesio lines list Vascular access clinic Fistula list	

An example of the weekly rota allocation:

Day	On call 8-17 Cons	On call 17-8 Cons	On call 8-17 Middle grade	On call 17-8 Middle grade	Off	Theatre	Lines	Clinic
Mon	ARM	JC	John	Henry		Jane		
Tues	ARM	PEH	John	Peter	Henry	Sophie	Jane	
Wed	ARM	FD	John	Alex	Peter	Jane		
Thurs	ARM	VP	John	Sophie	Alex	John	Peter	Henry
Fri	ARM	ARM	Peter	Jane	Sophie	Henry		Alex
Sat	ARM	ARM	Peter	Jane				
Sun	ARM	ARM	Peter	Jane				

Days off

- Single night shift during the weekdays – you get the day before and after off
- After weekend days Fri-Sun – you get Monday off
- After weekend nights Fri-Sun – you get Monday to Wednesday off

For deanery registrars – I personally used the days off in lieu to attend teaching as I found this the most efficient way to spend the most time in theatre and gain 100% teaching attendance. Nights are often quiet if there are no offers so it is not a problem attending teaching after nights usually.

YOUR ROLE SUMMARISED

On call (day and night)	Theatre days	Clinic	Lines
See all inpatients on ward round and chase up urgent bloods and scans Take calls for transplant offers When transplant recipient arrives work them up for theatre Review unwell patients in RAU/ RHTU Remove Tesio lines *(see how later)* Prepare deceased donor offers from the previous week and present at Wednesday MDT	Review what is on the list use SURGINET (can do the day before to prepare) Consent and mark patients Check anesthetists have seen and help sort out any issues Check pre-op bloods, G&S or cross match done, blood or platelets ready Prescribe antibiotics and TED stockings Do operation note Book post op USS and stent removal for transplant Do transplant paperwork forms Review post ops +/- discharge	Live donor clinic General transplant clinic Vascular access clinic *See patients, request scans and bloods, highlight any patients to discuss at MDT, book operations*	The lines room is covered by the senior registrars or fellows (i.e. not the junior ST3/4 registrar)

ISCP AND OPERATION NUMBERS

The transplant job used to be an alternate way to gain vascular competencies during ST3/ST4, although there are discussions that vascular will now no longer be a compulsory 6 month rotation.

You should easily be able to get a large number of operations on your logbook (although these will be more as assisted rather than STS compared to other rotations) as there are theatre lists every day and all of the consultants are very willing to teach and help with sign offs.

Essential to do:

- **60 WBAs minimum**
- **Compulsory teaching at St Mary's (you get a certificate for 100% attendance!)**
- **End of year assessment at St Mary's**
- **MSF (one per year)**
- **Learning agreement**
- **TWO clinical supervisor reports**
- **Educational supervisor reports**

It is reasonable for an ST3/4 to try and achieve the following as STS (supervised trainer scrubbed), some of these would be more towards the end of a 6 month placement:

- Vessel exposure, slinging, arteriotomy
- Vascular anastomosis
    - This should initially be in a fistula case
    - You may progress to being able to do this in a transplant (particularly for the vein)
- Graft to vessel anastomosis
- Thrombo-embolectomy
    - E.g. Fogarty catheters in fistula case
- Laparoscopic PD catheter insertion
- PD catheter removal
- Tesio line removal
- Ureter to bladder anastomosis in a transplant (Ureteroneocystostomy)
- Closure of the transplant (similar to laparotomy closure)
- Opening and access to vessels in transplant case
- Benching a kidney
- Occasionally there are inguinal or umbilical hernias to do and other small cases e.g. Lymph node excision biopsy

You should accept that this is a very different job to doing general surgery in a DGH. It is a much more consultant led specialty. You will not do any appendicectomies / cholecystectomies / laparotomies for 6 months which reduces the number of STS and performed procedures.

But you will gain invaluable transplant knowledge that is essential for the FRCS and is difficult to learn elsewhere or from a book. You will feel much more confident than your peers handling patients with renal failure, post-transplant patients, fistula and peritoneal dialysis patients if you ever come across them in your future career.

It is a welcome break from a general surgery rota which gives you time to write papers and do projects. The rota makes it easy to attend compulsory teaching and take your annual leave. It is a chance to try a new and very exciting branch of surgery which you may end up wanting to do forever.

DOPS for this rotation as per ISCP:

- Ability to administer local anaesthetic safely
- Laparoscopy
- Induction of pneumoperitoneum for laparoscopy

PBAs for this rotation as per ISCP:

- Elective generic open hernia repair
- Elective hernia repair inguinal
- Transplant access arteriovenous fistula
- Transplant kidney transplant
- Transplant peritoneal dialysis catheter insert
- Vascular thrombo embolectomy

THE PATIENT LIST

- Please keep the list of inpatients up to date, it helps you and your colleagues and looks good if you know the bloods and results quickly on the ward round

- Important information :
    - Blood results (especially trend of haemoglobin, platelets and creatinine)
    - Patients admission date / date of any surgery
    - Details of what operation they had
        - Any pertinent operation findings or complications
    - Record of heparin type / dose
    - Antibiotic and immunosuppression regime
    - Scan results
    - Outstanding jobs and issues

List location – S drive – pt mgmt – WLRTC documents – surgical handover – date

If you are not able to access the shared drive, please email to get this asap. Currently manager christopher.kennedy1@nhs.net can give access, although this may change.

BASICS OF PANCREAS TRANSPLANTATION

The main indication for pancreas transplantation is type 1 diabetes (+ hypoglycaemia unawareness) with accompanying kidney transplantation for end-stage renal failure.

Pancreas transplants are mostly performed simultaneously with or after kidney transplants, although rarely pancreas transplants alone are performed.

Although this does not occur at Hammersmith, it is possible to perform a segmental pancreas transplant from a living donor as well as islet cell transplantation.

SPK = simultaneous pancreas kidney

PAK = pancreas after kidney

INTRODUCTION TO RENAL TRANSPLANTATION

- Kidney transplants are for patients with end stage renal failure (ESRF)
- The main causes of ESRF we see requiring transplantation are
    - Type 2 diabetes (T2DM)
    - Hypertension
    - Stone disease
    - Obstructive nephropathy
    - Polycystic kidney disease (PCKD)
    - IgA nephropathy
    - Glomerulonephritis
    - Drug induced (NSAIDS, steroids, protein supplements)

- Guidelines recommend all patients with chronic kidney disease stage 4 ot 5 likely to require dialysis within six months should be considered for transplantation
- There is increased survival for renal transplantation compared with dialysis

The best outcomes occur in patients transplanted early in the course of ESRF, before they have started dialysis = Pre-emptive transplantation / pre-dialysis

The five stages of CKD and GFR for each stage:

Stage 1 with normal or high GFR (GFR > 90 mL/min)
Stage 2 Mild CKD (GFR = 60-89 mL/min)
Stage 3A Moderate CKD (GFR = 45-59 mL/min)
Stage 3B Moderate CKD (GFR = 30-44 mL/min)
Stage 4 Severe CKD (GFR = 15-29 mL/min)
Stage 5 End Stage CKD (GFR <15 mL/min)

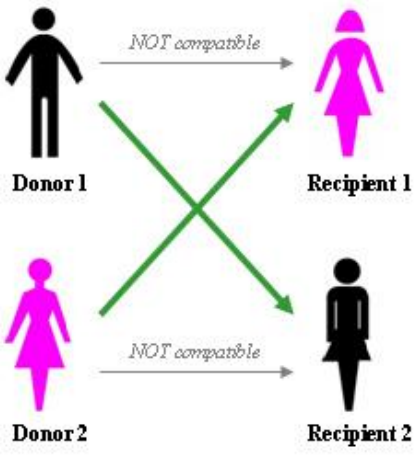
- On average patients spend about 3 years on the deceased donor waiting list
- The average lifespan of a renal transplant is now 8–15 years, depending on the type of graft (live vs deceased)
- Some kidneys have been known to survive for more than 30 years though!

	Survival rates	
Kidney survival time	**Deceased donor**	**Live donor**
At 1 year	85-90	90-95
At 5 years	70	80
At 15 years	50	60

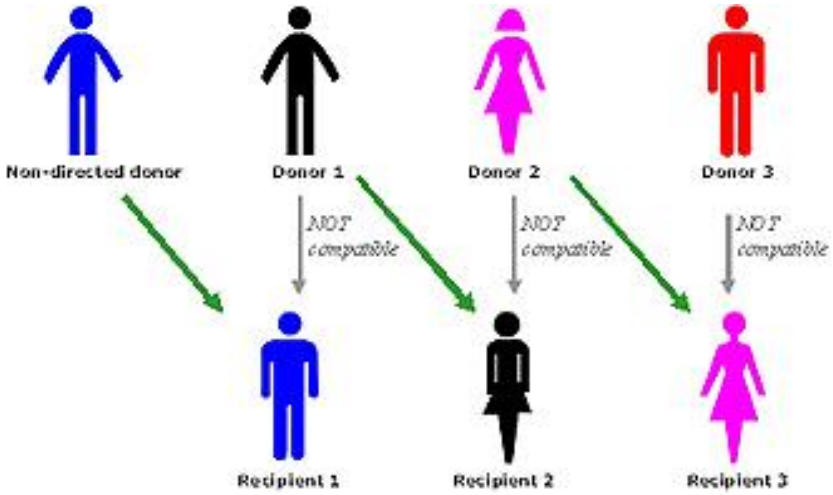
Live donors

- One in three transplants in the UK are now from a living donor
- Live donor transplants are associated with reduced rates of delayed graft function and better allograft and patient survival
- Types of live donation
    - Relative, partner of friend donating
        - Compatible direct donation
    - Matched pair donation
        - Relative, friend, or partner of a potential recipient can donate an incompatible organ by being matched with another incompatible donor-recipient pair, enabling both people in need of a transplant to receive a compatible organ
        - For example we retrieve a kidney from a live donor and send the kidney to Glasgow. We receive a live donor kidney from Glasgow and transplant into our recipient.
    - Paired / Pooled (P&P)
        - As above but with more than two living donor pairs
        - A "3 way swap of organs"
    - Altruistic donor / chain
        - Healthy person who does not know who the recipient will be (sometimes done as a chain e.g. we retrieve from a live donor and send the kidney to Newcastle, Newcastle sends to Oxford, Oxford kidney put into our recipient)

Always be careful when talking to recipients about where their kidney has come from. The location and identity of the donor are protected for privacy and confidentiality of the donor. If in doubt do not say too much to the patient and speak to a consultant about what you are allowed to discuss.



Matched pair



Altruistic chain

ODT HUB – for deceased donors

- The organ donation and transplantation hub
- They coordinate offers for organs around the UK and you will be in contact with them frequently

ODT HUB NUMBER - 01179757580

- A potential organ donor is identified at a hospital
- This hospital then informs the ODT hub and essential details are taken
    - Renal function
    - Blood group
    - Tissue type
- This information is added to the national database which identifies the most suitable recipient for the kidney
- A kidney donor in Aberdeen may be best matched to a recipient in Plymouth or Liverpool, and the kidneys would be sent to these transplant centres for specifically identified individuals

"Suitability is determined by a complex mathematical process which gives priority based on the following factors, each of which are given points:

- The compatibility of the blood group
- The similarity of the donor and recipient's tissue types – the better the match the more the points
- Length of time on the waiting list – one point for every day waiting
- Whether the recipient's tissue type is unusual such that it would be particularly hard to find a transplant for that person. Difficult to match patients are awarded more points in order not to miss the rare chance of a transplant
- Whether the recipient has developed antibodies that reduce the likelihood of a match. This is called sensitisation - highly sensitised patients get more points
- The age of the recipient – children get more priority"

When a potential recipient is identified the ODT hub contact us at Hammersmith and offer the kidney for the potential recipient. Not all offers are accepted

The proportion of offers that a centre accepts and declines is monitored and reported in the annual report.

We also present all of the declined offers at a weekly meeting *(more details later)*

STEPS IN DECEASED TRANSPLANT PROCESS

Call from HUB that organ is avaiable

- On call renal registrar is contacted by ODT hub
- Renal registrar phones surgical registrar (or speaks directly to on De Wardener)
- Take details of donor and potential recipient (*more detail later) - look up donor details on EOS MOBILE*

Call surgical consultant on call

- Discuss case with surgical consultant on call
- Decision to Reject or Accept made by surgical consultant

Call ODT

- Accept or reject organ by contacting ODT again
- Ask about timings (do they know when retrieval team will be there if DBD or the time of withdrawal if DCD)
- How many organs are being retrieved

Call Recipient if accepted

- Recipient will be called in (usually by renal registrar)
- Read recipient notes thoroughly, take history and examine patient
- Consent
- Book for theatre as CEPOD EMERGENCY case
- Call anaesthetics to see
- Liaise with ODT HUB about timings of knife to skin, estimated transport time and any anatomy/ damage details given by retrieval team

Kidney arrives

- Occasionally photographs of the kidneys are sent in advance
- Kidney arrives on De Wardender
- Take kidney to theatre
- Bench kidney
- Recipient sent to theatre when benching nearly finished

DECEASED DONOR

When discussing an offer with a consultant these are the important things to have ready. As always with phone calls in the night try to be efficient and clear with information.

Details of the donor can be looked up on EOS MOBILE (electronic offering system) which is accessible from any computer including at home. The renal registrar often prints out a hard copy of the offer details to keep on De Wardener.

Donor details to discuss with consultant

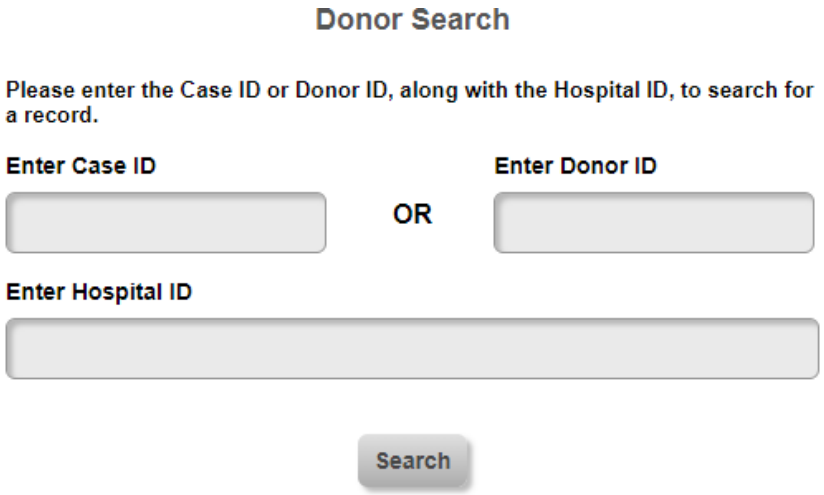
- Donor ID and hospital ID
- Look at the donor type (DCD / DBD)
    - Donation after circulatory death
    - Donation after brain death
- Donor Hospital
    - Use google maps to get an idea of the journey time for this organ
- Age
- Gender
- BMI
- Cause of death and details of cardiac arrest, down time, resuscitation and subsequent hospital events
- Urine output
    - Per hour and over 24 hours
- Urinalysis
    - Protein ? Blood ? Glucose? Nitrites and Leucocytes?
- Bloods
    - Current creatinine and trend
    - Admission creatinine
    - May need to calculate Cockcroft Gault sometimes e.g. low BMI https://www.mdcalc.com/creatinine-clearance-cockcroft-gault-equation
    - Amylase important for pancreas transplants
- Past medical history
    - Especially malignancy, diabetes
    - Hypertension and number of antihypertensives
- Drug abuse
    - IVDU especially
- Smoking and alcohol
    - Amounts of each
- Virology
    - Hep B / Hep C / HIV
    - CMV and EBV bloods (often positive indicating past infection)
- Ionotropes
    - Number and amounts
    - Gives an idea of how much support a DCD patient is having (see more details about DCD below)

Other details from ODT after accepting

- What time will withdrawal of support be?
- What time are retrieval team arriving?
- How many organs is the donor consented to retrieve
    - Gives an idea about timings of retrieval surgery
    - Full retrieval takes about 4 hours
    - Kidneys and liver takes about 2-3 hours
- Anatomical details
    - How many arteries / veins / ureters on the kidney
- Damage on organs
    - Is there any damage (either iatrogenic or otherwise) to the kidney / ureter / vessels

EOS LOGIN SCREEN:

Speak to another surgical or renal registrar about getting login details for EOS as we have often been using the same one but you should be able to apply for your own.



DCD VS DBD

Donation after circulatory death (DCD)

- Make up approximately 40% of deceased donors
- Death is diagnosed using cardio-respiratory criteria
    - Irreversible cessation of cardiac function
- Usually these are patients who have had a cardiac arrest and return of spontaneous circulation has been achieved (ROSC) but the patient is now on intensive care requiring support
    - Very rarely they are patients dead on arrival to hospital or in whom ROSC was not achieved

- DCD patients have a planned withdrawal of intensive care support time (agreed by ITU staff, family, retrieval team etc.)
- The decision to withdraw life-sustaining treatment should be made independently of any decision to donate organs
- After support withdrawal, death is confirmed by a medical practitioner independent from the retrieval team
- Sometimes death does not occur quickly after withdrawal
    - There is a cutoff of <2 hours for kidneys and <1 hour for pancreas offers (although this should be discussed with each individual consultant on call)
    - In this case we do not proceed with transplantation and the recipient is sent home again
- If death occurs quickly after support withdrawal, the family do not have much time with the patient if organ donation is to proceed

- By definition DCD organs have an interval after asystole where organs are not being perfused and have not yet been cooled
- Compared to DBD organs – DCD organs have a longer warm ischaemia time (WIT) and higher rates of both delayed graft function (DGF) and primary non-function but similar long term patient outcomes and graft survival

Donation after brainstem death

- Death has been confirmed using neurological criteria
- Brain injury is suspected to have caused irreversible loss of the capacity for consciousness and respiration and terminal apnoea has resulted in hypoxic cardiac arrest and circulatory standstill. This diagnosis is only possible in patients who are on mechanical ventilation.

- These patients are taken to the operating theatre for organ retrieval at a defined time
- During DBD, organs undergo cold perfusion before organ retrieval and thus warm ischaemia time (WIT) is minimal

RECIPIENT

The recipient will have been seen many times in clinic before and cleared for surgery although this may have been a while ago. You need to make sure there are no contraindications to proceed with transplantation today and that everything is ready from a surgical side.

- Review the patients notes on cerner
  - Look for surgical review clinic
    - Confirm which side we are implanting on (usually right unless otherwise stated)
  - Read recent medical notes, any periods of illness or any issues recently?
- Check the patient has been seen and cleared by cardiology
  - The anaesthetists often ask about angiogram and echo results and dates
  - May need to get cardiology to see +/- new bedside echo if any new concerns
- Check any imaging
  - Suitable iliacs? Any other issues seen on CT?
- Inform recipient about donor details
  - Age / gender / cause of death
  - Approximate waiting time (Do not reveal location)
- Consent patient and mark side we will likely implant on
- Order any other scans if needed
  - Everyone will have CXR and ECG
- Order operation on CEPOD
- Call anaesthetist
- Call blood bank
  - 4 units cross matched for every transplant case
- Physically examine patient and take a history
  - Are they well today?
  - Any recent illness or complications?
- Recipient may need dialysis before surgery
  - Liaise with medical registrar about timings and why dialysis is needed
  - The anaesthetists do not like it if patients are 'too dry' pre-operatively
- Pre-op medications and immunosuppressive induction
  - Prescribed by medical team but it is good to know what the patient is being given and liaise about timings of starting these

It is important not to mention to recipients where the organ is coming from. This protects the confidentiality of the donor and relatives. They are allowed to know medical details relevant to the organ. If in doubt discuss with a consultant.

Booking transplant case on CEPOD – go to orders – request 'CEPOD' and emergency case option appears.
Type deceased donor renal transplant
Speak to theatre 6 team and update them about timings
Speak to anaesthetist on call (Bleep 9313)

REASONS FOR REJECTING OFFERS

There are many reasons why organs are rejected and the decision is made by a consultant.

Some of the most common reasons for declining kidney and pancreas offers:

- Age mismatch e.g. 30 year old recipient with 60 year old deceased donor
- Generally poor sounding
    - For example old donor, long cardiac arrest down time, heavy proteinuria, poor or worsening renal function (high creatinine and low urine output), heavy alcohol and smoking history
- High amylase for pancreas
    - 2 x upper limit of normal
- Donor diabetic or BMI >30 for pancreas
- Abnormal blood glucose for pancreas
    - May have lots of glucose in urine and be on insulin infusion
- IV drug use (IVDU)
- Active invasive cancer recently (except e.g. BCC's and primary brain tumours)
- Haematological malignancy
- Systemic infection

Preparing the deceased donor offers presentation

- On Wednesday morning the registrar on call should present the declined offers from the previous week Monday – Sunday
- This is done as a powerpoint presentation, use the template from the previous week
- This is on the shared drive – S drive – pt mgmt – WLRTC documents – surgical handover – declined offers
- The offers are all written down on a clipboard by the renal registrars desk on De Wardener
- Find out the total number of offers and the outcomes of each of these
- Include as much detail as you can about why the offer was rejected
- You can contact the hub to find out if another centre accepted the organ and what happened

Present at Wednesday MDT approximately 8:30 – 9am in meeting room above canteen

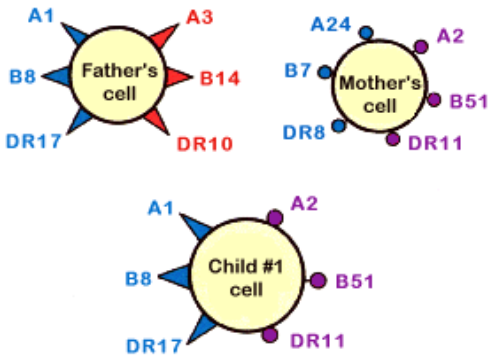
BLOOD GROUPS + TISSUE TYPES

Donor blood group	Recipient blood group
O (47% donors) - universal donor	A, B, AB, O
A (40% of donors)	A, AB
B (9% of donors)	B, AB
AB (4% of donors)	AB - universal recipient

- Kidneys from donors in blood group O ("universal donors") can be given to anyone in other blood groups
- Recipients in blood group AB can receive kidneys from donors in any other blood group ("universal recipients")
- Blood group B is uncommon in the UK (about 9% of donors) but is quite common (40%) in the Indian, Pakistani and Bangladeshi populations

Human Leucocyte Antigen (HLA/Tissue type)

- In the chromosomes we inherit from our mother and father there are HLA (human leucocyte antigen) genes in the genetic material of virtually all the cells in the body.
- There are three principle genes that are particularly important in transplantation:
    - HLA 'A', HLA 'B' and HLA 'DR'.
- There are many different HLA 'A', 'B' and 'DR' genes (59 different HLA-A proteins, 118 different HLA-B and 124 different HLA-DR) and so it is difficult to get two people perfectly alike, but it is possible to achieve a good enough match for a successful transplant.
- It has been shown in many studies that good matching between deceased donor and recipient leads to longer kidney survival, and hence is in the best interests of everyone.
- In living donor kidney transplantation, matching has slightly less impact on outcome
- However, for younger people and children who may need another transplant during their lives, a closer match for a first transplant is preferred.



Terminology of Mismatching

HLA	A	B	DR	
	0	0	0	**Matched**
	1	0	0	**Favourable mismatch**
	0	1	0	
	1	1	0	
	1	1	1	**Non-favourable mismatch**

When we get an offer of a kidney we write down any mismatching like this:

000MM or 110 MM or 111MM for example

We keep this on the patient list in case we need to refer back to it

Sensitisation

- This is the term referring to 'sensitisation' of the immune system due to various events, which ultimately means the immune system may be more likely to 'attack' a transplanted organ and cause rejection
- It results from any exposure to non self HLAs for example
    - Pregnancy
    - Blood transfusion
    - Previous transplantation
- Patients with multiple previous sensitizing events are therefore more complex
- All women (incase they have been pregnant) and patients who have had transfusions recently, will require full formal crossmatching with their potential donor
    - i.e. not suitable for virtual cross match
- CRF
    - Calculated reaction frequency, expressed as a percentage
    - Helps quantify sensitisation
    - A measurement of how the HLA antibodies detected in a patient would have reacted to the previous 10,000 deceased donor kidneys
    - 0% = not sensitised
    - Essentially a high CRF means a patient is less likely to get offered a transplant as fewer suitable donors are available

Virtual crossmatching

- Many patients are suitable for something called virtual cross matching
- This is essentially much quicker than the normal full cross process which takes several hours
- Blood is taken from the donor and recipient and cross matched 'virtually'
- Women (incase they have been pregnant) and people with recent sensitising events e.g. blood transfusion are not suitable
- The tissues typing service will help inform who is suitable for virtual cross match

TISSUE TYPING TEAM - 33226

IMMUNOSUPPRESSION

- Immunosuppressive drugs can be broadly divided into *induction* and *maintenance* drugs
- Induction are given just before surgery and in the early post-operative period
- Maintenance are continued life long

Induction

- Corticosteroids
- Biologics e.g. Alemtuzumab (Campath®), Basiliximab

Maintenance

- Calcineurin inhibitor e.g. Tacrolimus, ciclosporin
- Corticosteroids
- Antiproliferatives e.g. mycophenolate, azathioprine
- mTOR inhibitors e.g. sirolimus, everolimus

At Hammersmith the most common regime is:

Methylprednisolone + Tacrolimus (pre-op) then Campath + Hydrocortisone + Tacrolimus (post op)

Note about Campth

- Campth can drop blood pressure as well as Haemoglobin and Platelets
- Therefore Hb and PLT are monitored very frequently in the early post operative period
- It is important to keep the up to date bloods on the list and be aware of the trend
- Heparin regimes are often held if there is significant Hb and / or PLT drop
- We avoid transfusion as much as possible in transplant patients due to *sensitisation*
- Discuss management with a consultant

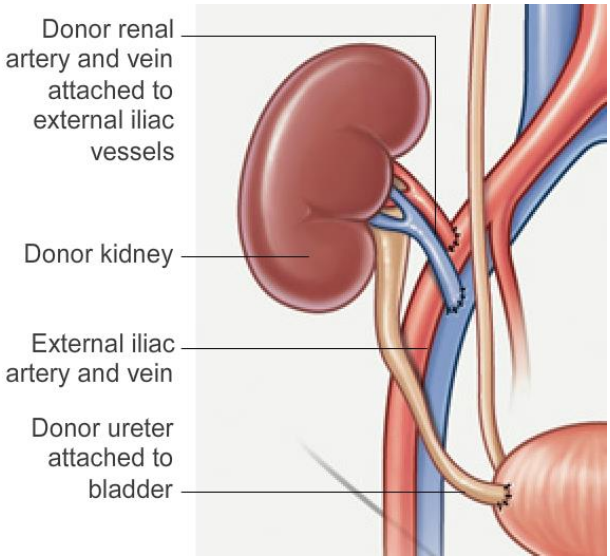
Immunosuppressant agents and adverse effects

Agent	Mechanism of action	Adverse effects
Corticosteroids	Inhibit cytokine production	Diabetes, osteoporosis, weight gain, hypertension
Ciclosporin	Calcineurin inhibitor	Hirsuitism, gum hypertrophy, hypertension, diabetes, nephrotoxicity
Tacrolimus	Calcineurin inhibitor	Diabetes, nephrotoxicity, neurotoxicity (tremor)
Mycophenolate mofetil	Inosine monophosphate dehydrogenase inhibitor	Gastrointestinal disturbance (diarrhoea), haematological (anaemia, leucopenia), mouth ulcers
Azathioprine	Purine synthesis inhibitor	Myelosuppression, hepatitis
Sirolimus	Mammalian target of rapamycin (mTOR) inhibitor	Peripheral oedema, poor wound healing, hypertriglyceridaemia, anaemia, proteinuria

OPERATIONS

Summary of the main operations done:

- Recipient kidney transplantation
  - Either from live donor or deceased donor
- Donor nephrectomy
  - Mini Open
  - Laparoscopic
  - Hand-assisted retroperitoneoscopic (HARP)
- Other nephrectomy
  - E.g. for polycystic kidney disease
- Kidney benching
- Pancreas benching
  - Benching is the term used for inspecting and preparing the organ
- Simultaneous pancreas kidney transplantation
- Graft nephrectomy
- Laparoscopic peritoneal dialysis catheter insertion
- PD catheter removal
- Hernia repair
- VASCULAR ACCESS
  - AV fistula creation
    - Radiocephalic
    - Brachiocephalic
    - Brachiobasilic first stage
    - Brachiobasilic second stage
  - Graft for dialysis access
  - Fistula ligation / ligation of side branch
  - Fistula excision
  - Fistula plication
  - Patch plasty
  - Declotting of fistula



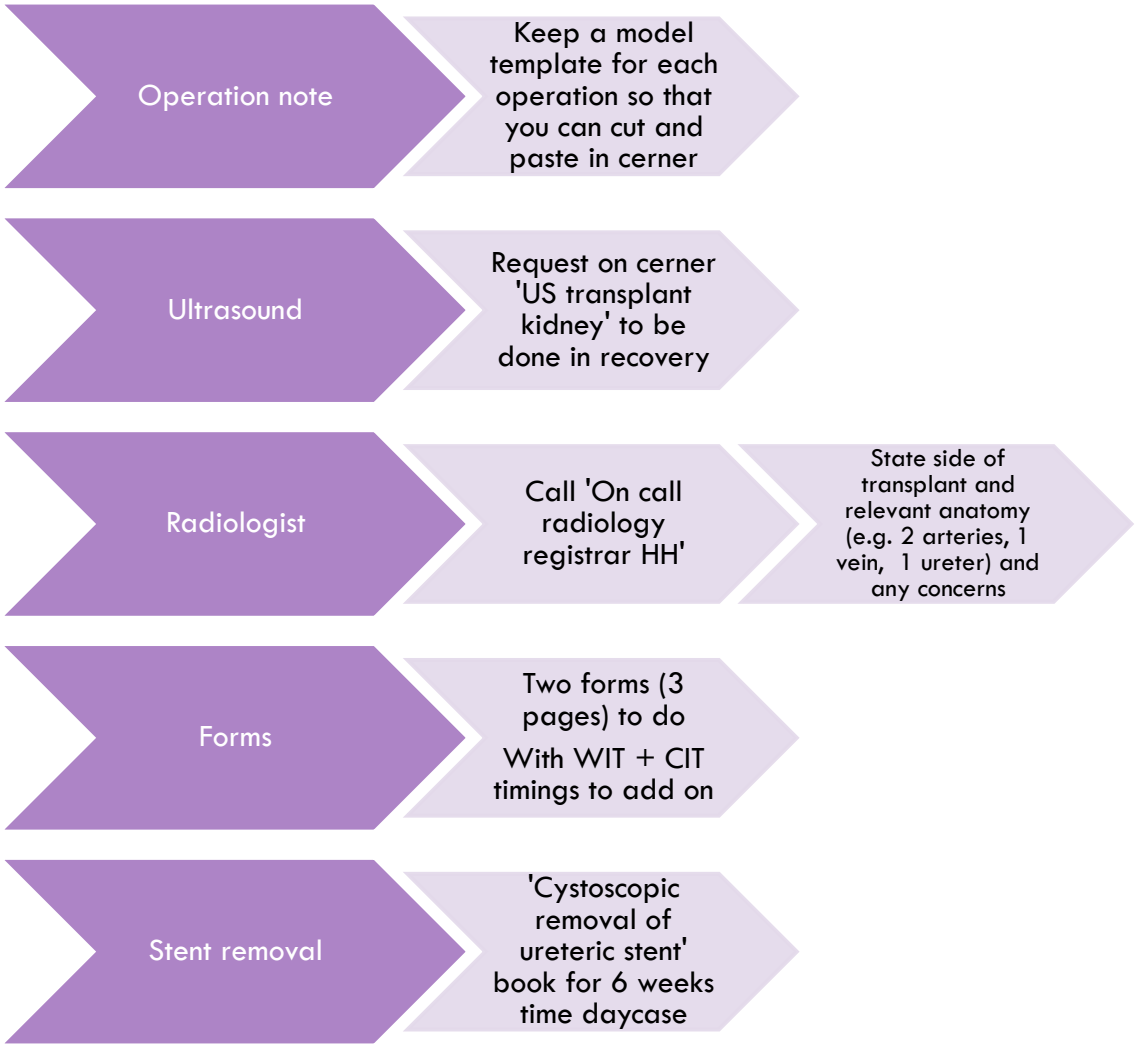
Renal transplantation procedure

- Kidneys are usually implanted on the right hand side
  - The iliac vessels are more superficial on the right so easier to access
- The native kidneys are very rarely removed
  - The main indication is for large polycystic kidneys to make space
- The transplant involves three important anastomoses
  - The donor renal artery is anastomosed to the recipient external iliac artery (end-to side)
  - The donor renal vein is anastomosed to the external iliac vein (end-to-side)
  - The donor ureter is reimplanted to the recipient's bladder forming a ureterneocystostomy with a J-J ureteric stent left in situ
- The J-J stent is removed 6 weeks postoperatively via flexible cystoscopy

- 3 way catheter inserted at start of operation
  - Connect irrigation tap to bag of saline containing antibiotic
- Curved / J shaped incision in the right iliac fossa
  - Ideal location along lateral edge of rectus
  - Sometimes called (modified) Gibson incision
- Dissection through layers
  - Tying off of inferior epigastric vessels
- Peritoneum swept medially
- Round ligament divided in females
- Spermatic cord mobilized medially and slung (yellow sling) in males
- Omnitract applied to keep bowel and abdominal wall out of the way
- External iliac vessels exposed
  - Lymph nodes sometimes removed and sent for histology
  - Vessels need to be mobile enough to apply clamps
  - Blue and red slings applied
  - Sweeny usually used for external iliac vein and Dardicks or Sweeny or Satinsky for artery
- Kidney removed from ice and brought into operating field
- Venous followed by arterial anastomosis
- Clamps removed
  - Distal arterial – proximal arterial - venous
- Bladder irrigation started and catheter clamped to fill bladder
  - Incision made in bladder
  - Ureteroneocystostomy (ureter anastomosed with absorbable PDS suture)
- Handheld Doppler can be used to check perfusion of kidney intraoperatively
- Use of drain varies between consultants

- Closure of sheath with loop 0 PDS
- Closure of subcutaneous layer with vicryl
- Skin closure and dressings vary between consultants
  - Clips / monocryl / prolene / skin glue / aquacel and tegaderm

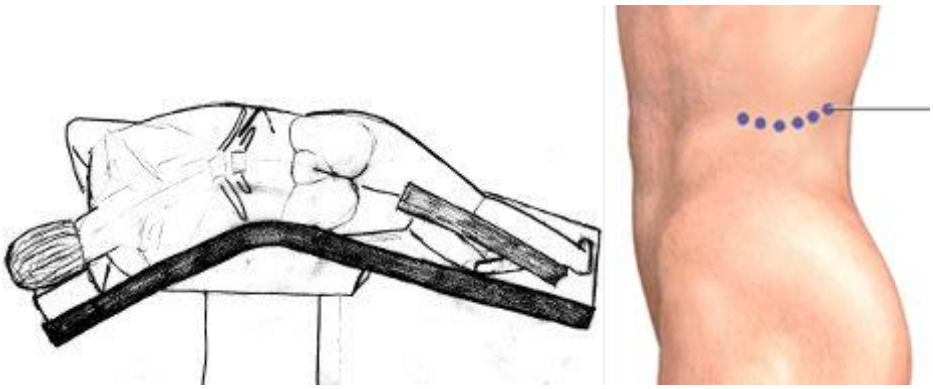
Jobs to do straight after transplant:



Cold ischaemic time = initiation of cold preservation until restoration of warm circulation after transplantation.

Warm ischaemic time = commences when there is inadequate oxygenation or perfusion of the organ until the initiation of cold perfusion. Longer in DCD, negligible in DBD

Live donor nephrectomy



For all live donor nephrectomy procedures the patient is placed on their side with the table 'broken' to achieve maximum distance below ribs. Optimum padding of pressure points is essential.

Mini open
Small (~10-12cm) horizontal incision in flank
Traditional 'open' method for live donor nephrectomy which has progressed to an increasingly smaller incision
Can be painful for patients as is 'muscle cutting', also risk of post op hernias

Laparoscopic
Increasingly favoured approach, theoretically less pain / faster healing and recovery / less hernias
Kidney is brought out through small suprapubic pfannenstiel incision

HARP
Often selected for patients with higher BMI
Pfannenstiel incision with a gel port placed to allow surgeons hand through and into abdomen
It is a retroperitoneal approach so the peritoneum is swept to the side by the surgeons hand

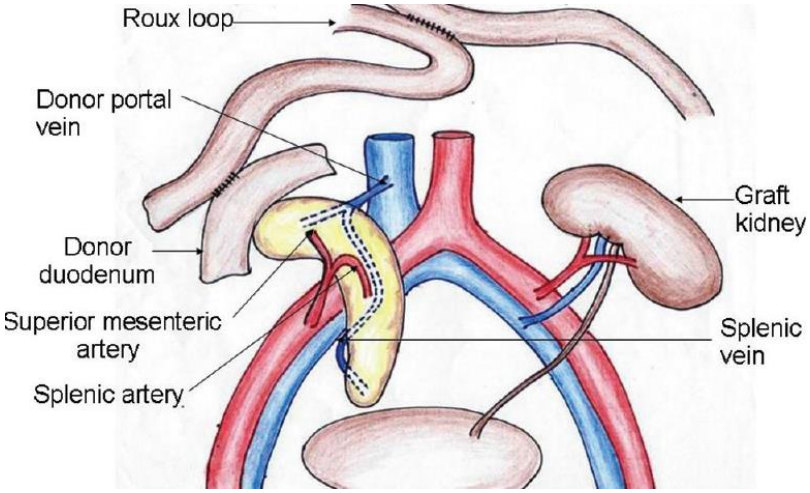
For live donor nephrectomy in general:
All patients need catheterising (normal 2 way catheter) in theatre before surgery
Post operatively they should pass urine normally and can be TWOCed day 1
They should not need post operative antibiotics
They should be encouraged to mobilise early and discharge is aimed for after about 2 days

Nephrectomy

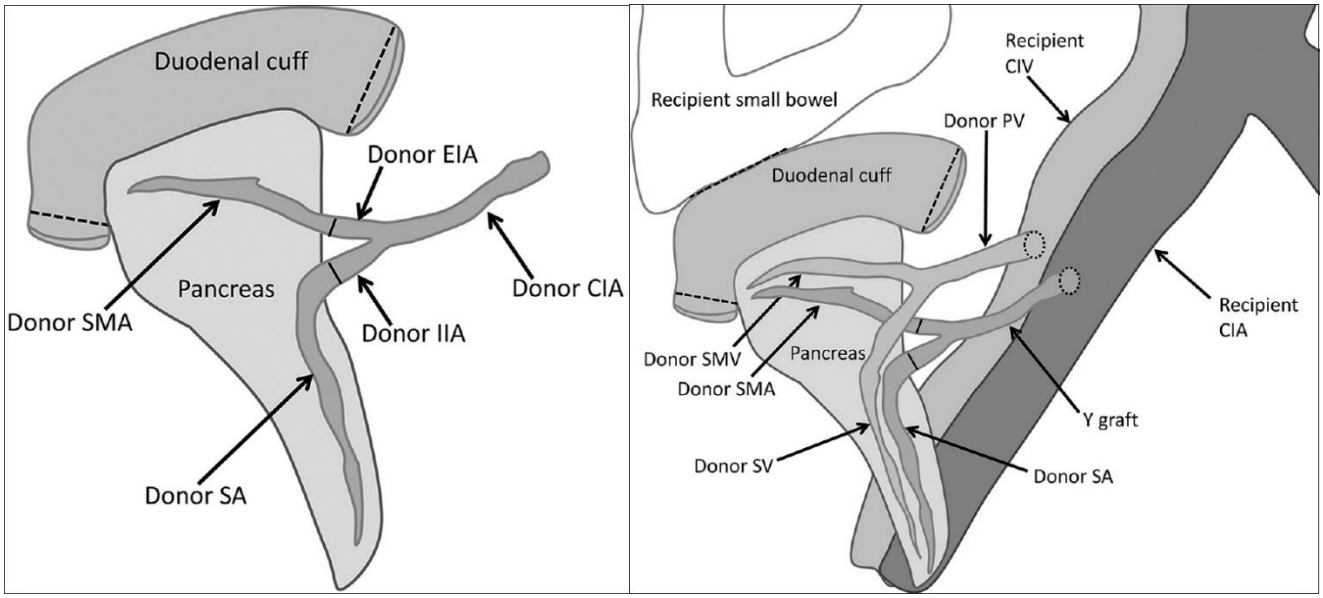
- Nephrectomies are performed in this job mainly for patients with polycystic kidneys to make room for a transplant
- Technique for PCKD
    - Bilateral nephrectomy
    - Midline laparotomy approach
- Remember following bilateral nephrectomy patients will no pass any urine! So no catheter needed

Simultaneous pancreas kidney transplantation

Most commonly at Hammersmith, two incisions are made for a SPK transplant in an extra-peritoneal approach - the pancreas is placed on the right side of the pelvis and the kidney is placed in the left iliac fossa. It is also possible to perform a midline laparotomy intraperitoneal approach.



The donor pancreas is retrieved with its cuff of duodenum. When benching at our hospital, the donor iliac artery bifurcation is anastomosed to the stumps of the splenic and superior mesenteric arteries of the pancreas. During transplantation, the donor common iliac artery is then anastomosed to the recipient artery, usually the common iliac. Thus the donor iliac artery forms what is referred to as the 'Y-graft'.



Venous outflow is via the donor portal vein, which is anastomosed end-to-side to the recipient external iliac vessels or inferior vena cava. The portal vein may need to be extended using donor iliac vein.

Exocrine secretions drain via the donor duodenum, which is anastomosed to recipient small bowel.

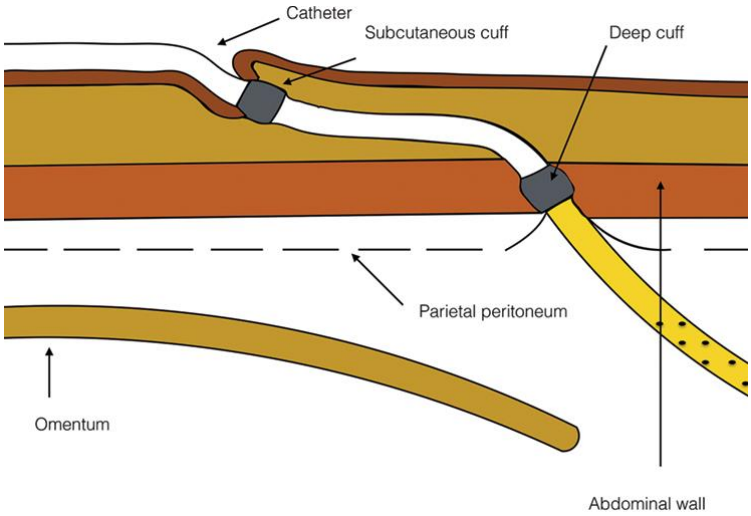
Laparoscopic peritoneal dialysis catheter insertion

Pre-op prophylactic antibiotics = Vancomycin IV stat (1g <60kg, 1.5g <90kg, 2g >90kg)

- Laparoscopic GA by surgeons or under local anaesthetic by medics
- Marking of PD site (on morning of surgery by PD catheter nurse)
  - Avoid waistline
  - Avoid scars / creases / skin folds
- Daycase surgery, pt can go home if well post op
- Catheter can be used straight away (but patients usually undergo training period before use)
- No surgical follow up needed routinely

- On the morning of the surgery:
- See patients cerner notes and review medical history
- Examine abdomen, look for scars
- G&S pre-op for all laparoscopic surgery

- All these patients need a catheter when they arrive in theatre to ensure bladder is empty and does not encroach on the view of the pelvis
- TWOC when patient awake



2 cuffs on the catheter cause scarring which keep the catheter in place

The deep cuff is placed just above the peritoneum. The cuff should not be exposed

See the ISPD (International Society for Peritoneal Dialysis) guidelines by Mr Dor

CREATING AND MAINTAINING OPTIMAL PERITONEAL DIALYSIS ACCESS IN THE ADULT PATIENT: 2019 UPDATE
http://www.pdiconnect.com/content/early/2019/04/26/pdi.2018.00232.full.pdf+html

OPERATION NOTE EXAMPLES

HARP Donor nephrectomy

HARP left donor nephrectomy for P&P
WHO checklist
Bladder catheterised
Right lateral position, patient placed on bean bag and gel pads, pressure points protected
Pfannenstiel incision, rectus parted at midline, dissection down to pre-peritoneal layer

Space made around peritoneum, retroperitoneal space developed digitally/manually
gel port inserted.
12mm epigastric port RLQ on hand (pneumoretroperitoneum created) + 12mm left paramedian port + 5mm left flank port all inserted under direct vision

Medialisation of peritoneum. Further development of retroperitoneal space, identification of kidney.
Dissection of Gerota's fat, exposing the kidney lower pole. Identification of ureter.
Ureter dissected up to pelvis. Nice rim of tissue preserved around ureter.
Renal vein identified and slung
Renal artery identified and slung
Tiny accessory artery at upper pole

Kidney mobilised completely
Ureter divided with endoclips at level of pelvic brim.
Artery divided endoTA + endoclips
Vein divided endoTA
Kidney retrieved through pfannenstiel

Start WIT 11.07
End WIT 11.09
Warm ischemic time 2 minutes
Soltran solution (with added 10.000u heparin to each) batch number =19A23BTT + 18324BH
Kidney benched by Sotiris/Mr Dor. Sent to receiving centre (P&P). Photo's taken.

Surgicel to renal bed
Haemostasis ensured
All ports out under vision
Rectus approximated with interrupted vicryl 3-0
Loop PDS to anterior rectus fascia
Subcut vicryl
J vicryl closure of fascia at 12mm port sites
Monocryl to skin
Dermabond

Plan:
LMWH tomorrow after surgical review
E+D from tonight
No antibiotics for 48h unless discussed surgical team
TWOC tomorrow morning 6am
Sitting out from 8am + mobilise
Aim home friday

Laparoscopic donor nephrectomy

Laparoscopic left donor nephrectomy
WHO
Bladder catheterised
Right lateral position, patient placed on bean bag and gel pads, pressure points protected
Open access at umbilicus, balloon trocar, uncomplicated pneumoperitoneum
12mm epigastric port + 5mm epigstric paramedian port + 5mm left flank port all inserted under direct vision
Mobilisation of descending colon with harmonic up to pelvis, exposure of retroperitoneum.
Dissection of Gerota's fat, exposing the kidney lower pole. Identification of ureter.
Ureter dissected up to pelvis. Nice rim of tissue preserved around ureter.
Small accessory renal vein at lower pole draining into gonadal vein- ligaclips and divided after confirming normal dominant renal vein.
Single artery slung, relatively early bifurcation as per CT scan. Dissected up to origo.
Renal vein slung
Kidney mobilised completely
Ureter divided with endoclips at level of pelvic brim.
4-5 cm pfannenstiehl incision to retrieve kidney, fascia horizontally opened, space between rectus muscles elnarged and purse-string suture with PDS 3-0 on peritoneum.
Peritoneum opened, endocatch inserted.
Artery divided endoTA + endoclips
Vein divided endoTA

Start WIT 10.58
End WIT 11.02
Kidney retrieved with endo-catch through pfannenstiehl.
Warm ischemic time 4 minutes
Soltran solution (with added 10.000u heparin) batch number 19A23BT
Kidney benched by Papalois/Charalampidis

Surgicel to renal bed
Haemostasis ensured
All ports out under vision

Peritoneum closed with PDS 3-0
Rectus approximated with interrupted vicryl 3-0
Loop PDS to anterior rectus fascia
40ml 0.25% chirocaine LA
Subcut vicryl
J vicryl closure of fascia at 10-22mm port site (umbilicus)
Monocryl to skin
Dermabond

Plan:
LMWH tomorrow after surgical review
E+D from tonight
PCA
No antibiotics for 48h unless dw surgical team
TWOC tomorrow morning 6am
Sitting out from 8am + mobilise
Aim home wednesday

Renal transplantation

Live donor paired and pooled scheme- donor left kidney, cold perfused at 11:54, Nottingham city hospital, Donor id-xxxxxx
Bench (SC)-perfused with Soltran 18J24BH with 10,000 IU heparin, single vessels, single ureter
GA and lines

Bladder catheterised
WHO
Chloraprep and draping
Exposure: Modified Gibson incision, extra peritoneal approach to right external iliac vessels. inferior epigastric vessels ligated 2-0 vicryl.
No peritoneal breach.
Round ligament divided
Omnitract
Ext iliac artery (small calibre) and vein dissected and slung. External iliac lymph node sent for HPE
Implantation (FD/SC)
Sweeney to EIV, Venotomy and enlarged, Hep saline flush
Implantation : ETS veno venous anastomosis renal vein- ext iliac vein (5-0 prolene).
Dardiks to EIA, arteriotomy, hep saline flush , ETS anastomosed to ext iliac artery - using 6-0 prolene (Recipient artery- small calibre).
IV, mannitol, frusemide IV before reperfusion. Papaverine given post-reperfusion
Global and homogenous reperfusion. very minimal blood loss. minimal diuresis on table.
ureter cut to perfection and spatulated,
bladder distended - cefuroxime saline .
ureteroneocystostomy- 4-0 PDS over a J-J STENT, muscular tunnel - 5-0 PDS interrupted suture.
saline irrigation.
Perfect hemostasis
Fibrillar to kidney bed
Doppler confirmation of perfusion- twice (Before and after closure of fascia)
Closure (JG/FD) Fascia-loop PDS x2. (Subcutaneous flap raised on both sides, large kidney, small patient))
s/c 2-0 vicryl. 4-0 monocryl to skin.
0.25% chirocaine LA 40ml.
Dermabond
SNI correct
Sign out
Timings
KTS: 16:39 Kidney out of ice: 17:40
All clamps off: 18:01
WIT 21 mins
CIT 06H 07MINS.

Postop:
ultrasound duplex in recovery.
Wean off inotropes if stable
Bloods tonight and early morning tomorrow- Please send serum tryptase tomorrow at 16:00
Heparin - after surgical review tomorrow
Immunosuppresssion as per protocol
can drink when awake.
early mobilisation
catheter out day 5
Stent removal after 6 weeks - Ordered

Laparoscopic PD catheter

WHO
Vancomycin stat
Bladder catheterised
PD catheter landmarks drawn on the skin for optimal positioning.
Open access for epigastric port, 10mm for camera, left side.
Uncomplicated pneumoperitoneum
Inspection of abdomen: no obvious herniae, no real adhaesions (small adheasion between sigmoid and abdominal wall LLQ), omentum not reaching into pelvis.
Skin incision for 8mm torcar at premarked site. Rectus sheath tunneling, entry point at premarked site.
PD catheter inserted on right hand side over stylet
Tip lying nicely in pelvis
Inner cuff lying above peritoneum
Catheter tunnelled to marked exit site on right hand side
insertion 5mm port for Johanns and 10-12 port for Harmonic as large finger-shaped epiploic appendices on sigmoid need to be romoved:
Epiploiectomy x 5 (Harmonic). During this procedure we noticed that one long thin stretch of omentum was in the pelvis-> partial omentectomy done.
Removed from abdomen in endocatch

PD Catheter in/outflow well, fluid filling abdomen uniformly in pelvis and both paracolic gutters

Haemostasis intraabdominally

Closure with J vicryl to port sheaths.
Local anaesthetic 20mls of 0.5% injected in wounds.
Monocryl to skin
Dermabond

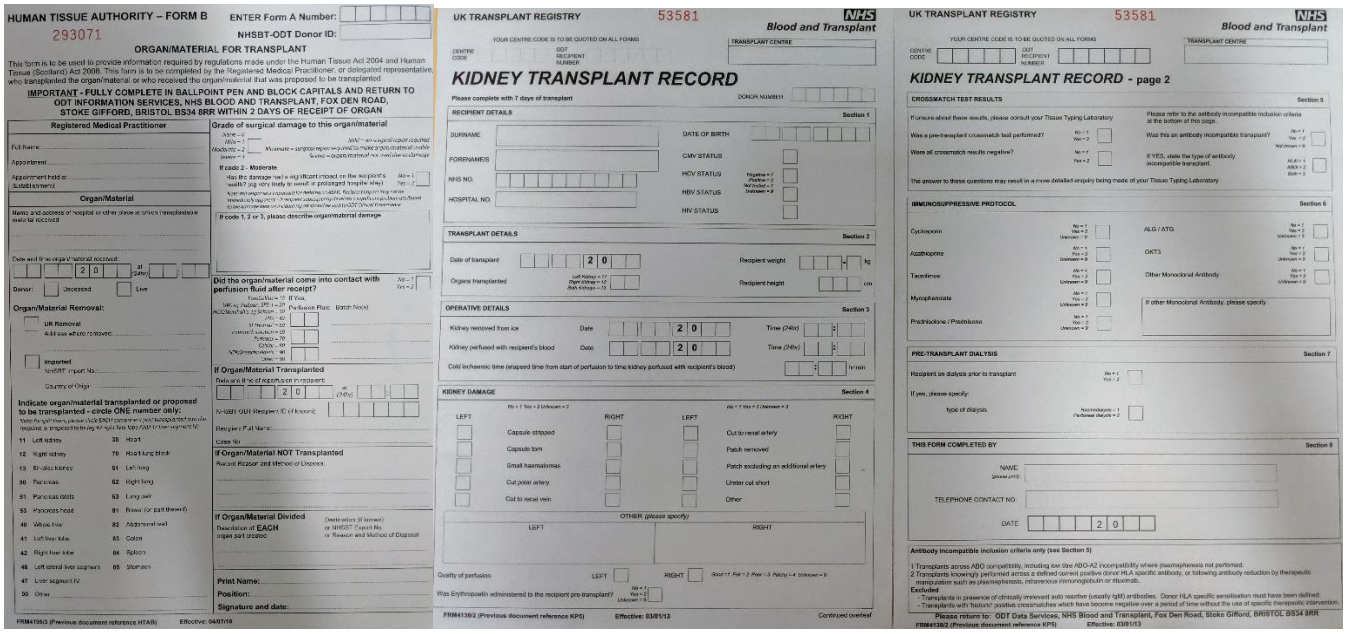
Bladder catheter removed

Outcome and Complications

Home today if well
Eat and drink
PD catheter can be used if needed

Paperwork after transplantation

- There are 3 pages of forms to fill in (attached at back of this booklet)
- Do this in theatre after doing the operation note so that the forms can go to recovery with the patient
- Forms are kept in theatre
    - If they run out you can collect more from the sisters office on De Wardener (next to the doctors office)
- Key timings recorded on the forms are
    - Kidney removed from ice
    - Kidney perfused with recipients blood (CLAMPS OFF)
    - Cold ischaemic time
        - Initiation of cold perfusion – this is found in an envelope containing documentation from the retrival centre
        - Up until clamps off



Eventually these will be at back of booklet

CONSENTING

Below is a guide of what to write on each consent form. Transplant patients (live donor and recipient) will have been seen many times in clinic to discuss surgery already but be prepared to go through risks and benefits and answer questions on the day of surgery.

Deceased (or live) donor renal transplantation

- Some consultants like the side to be specified so remember to mark the patient if requested
- Technically the kidney can be implanted on either side (unlike e.g. knee replacement surgery where side is essential) and if for some reason intra-operatively one side cannot be used then the kidney would still be transplanted on the other side.
- Benefits
    - Increase life expectancy
    - Increase quality of life
- Risks
    - Pain, bleeding, infection, scar, seroma / haematoma / lymphocele, hernia, delayed graft function, primary non function, damage or stenosis to vessels or ureter, urine leak clots in vessels, rejection, GA risks – DVT/PE
- Other procedures
    - I usually tick transfusion and drain insertion may also be required

Live donor nephrectomy (either open or laparoscopic or HARP) LEFT / RIGHT

- Remember to mark the patient. Side is essential for this operation

- Benefits
    - For the recipient
- Risks
    - See specific form (there is a specific form pre discussed with patients in live donor clinic)

Familiarise yourself with this form although it is usually a consultant who has been through this with the patient in detail.

Creation of arteriovenous fistula

- Benefits
    - Dialysis access
    - Reduced chance of central venous stenosis compared to line
    - Reduced infection risk compared to line
- Risks
    - Pain, bleeding, infection, scar, arm swelling, clots in fistula, primary failure of fistula, steal syndrome, need for further procedure, damage to vessels or nerves
    - (explain steal as too much blood flow into fistula which steals blood from hand, may mean fistula needs to be reduced in size or removed)

WARD ROUND

Patients on De Wardener are the most unwell and the ward round should start here. It is nice to see the patients with the medical team where possible.

Start the ward round when you get in at 8am and either the consultant will join you then or you can go round again when they arrive.

Things to take note of

- Look at blood results for every patient (I usually did this first and wrote them down before seeing all the patients)
    - In particular Hb and PLT (campath can drop these), creatinine, Tacrolimus levels
    - Glucose and amylase for pancreas transplants
- Any ultrasound results
    - As a minimum the patient has an USS of the new kidney in recovery
    - The medical team have quite a low threshold for USS imaging and patients are sometimes scanned several times a week
    - If anything 'goes off' an USS is often requested
- How is the patient feeling
    - Eating and drinking?
    - Encourage them to mobilise and do deep breathing exercises
    - Pain well controlled?
        - Can the PCA be converted to orals
- Does the patient have a catheter still?
    - Urine output – volume and clarity
    - TWOC usually takes place on day 5 post transplant
- Any drains in situ?
- Central line still in situ?
    - Can be removed when pt stops fluids etc.
- Examine the abdomen, check the wound
- Make decisions about any heparin

HEPARIN

Post operative patients are on a variety of heparin regimes. Keep on the list what each patient is having. Each consultant differs in their preferences so it is best to ask and discuss before changing anything.

- Heparin infusion
    - Usually 100 units/h or 200 units/h
    - This is unfractionated heparin
    - Usually for patients in the initial few post operative days
- Unfractionated heparin
    - 2500 units subcut BD
    - Converted to this when pts Hb and PLT are more stable
- LMWH
    - Enoxaparin 20mg or 40mg
    - Dalteparin, Tinzaparin
    - Can convert to this when renal function improves and stabilises

TRANSPLANT CLINIC

In this clinic you will either see pre-op patients who require work up for transplant or post-op patients for monitoring after their transplant

Whenever you attend clinic you are well supported by consultants and you should discuss each case with them.

Pre-operative

- Each patient with end stage renal disease will have an allocated consultant nephrologist
- When transplantation is being considered (ideally pre-emptively, before the patient is on dialysis) the nephrologist will refer to us for surgical work up
- After work up is fully completed and we are happy the patient is surgically ready for transplant, they can be made active on the transplant waiting list

Surgical work up

- History of renal disease, cause of failure, previous management of this
- Medications
    - Especially aspirin and clopidogrel
- Bloods
    - Look at creatinine trend, Hb, Platelets
    - Viral serology screen, syphilis etc
    - Lupus anticoagulant and anti cardiolipin antibodies
        - It is extremely important to know if patients have these abnormal clotting antibodies as they can lead to a clot in the transplanted vessels if not managed appropriately
        - These patients may require additional heparin
- Any previous operations
- If polycystic kidney disease
    - Will nephrectomy be required to make space for transplant?
    - Request imaging either CT or MRI to look at size
- Smoking and alcohol intake
- General anaesthetic fitness / fraility
- EXAMINATION
    - Feel femoral pulses and distally to dorsalis pedis
    - The kidney will be anastomosis to external iliac vessels so if pulses are difficult to palpate or absent this raises concerns
    - General abdo exam ?obestiy ?previous surgical scars
- CXR and ECG for every patient

Cardiology review

- Most patients will require a cardiology review to ensure they are optimized for transplantation
- This will involve an angiogram and echo usually
- Young patients without HTN / diabetes / non -smokers may not need review
- The cardiologist is usually Dr Baker

CT imaging

- Most patients will require non contrast CT imaging of their iliac vessels to assess suitability of the vessels to receive an anastomosis
- Look at the actual imaging pictures yourself not just the report
- Very heavily calcified vessels
    - You may not be able to implant on the external iliac
    - Alternative options are the common iliac or aorta
    - Or the other side may be better e.g. left external iliac artery
- After transplantation there is a risk of limb ischemia in very heavily calcified vessels

Absolute contraindications to transplantation are few, but include untreated malignancy, active infection, untreated HIV infection or AIDS, or any condition where life expectancy is under two years.

Post-operative

After discharge from the inpatient service, patients are followed up very frequently in clinic and are seen by both medical and surgical teams at approximately the following times:

Time post op	Clinic frequency
0-6 weeks	2 x per week
7-12 weeks	1 x per week
4-6 months	1 x every 2 weeks
7-12 months	1 x per month
13-18 months	1 x every 2 months
19 months onwards	1 x every 3 months

Things to check in follow up clinic

- How is the patient generally? Feeling tired / SOB? Any issues to report?
- Are they drinking enough water?
- They may want to discuss any immunosuppression side effects
- Examine them
    - Check ankle swelling (fluid overload)
    - Check abdomen
    - ? Any sign of collection / seroma around kidney
    - ? Any issues with wound healing
- Blood pressure
    - Mr Herbert likes to do a manual check
- Urine dip
    - If proteinurea do urine PCR
- Bloods
    - Creatinine
    - Hb

    - Tacrolimus levels
        - Checked every 3 months
- BK levels
- Check weight
- Check DM and glucose control
    - Refer to DM specialist nurse if any issues

- When should you consider renal artery stenosis (RAS)?
    - If there is HTN / increasing creatinine / fluid overload
    - MRA imaging
    - Or CTA (if patient already has stent)

- If a patient has rising creatinine
    - Are they drinking enough?
    - Could there be any rejection?
    - Could there be RAS?
    - Check TAC levels
    - Any other cause of AKI?
    - You may need to consider biopsy / MRA

- Biopsy
    - Biopsy of the kidney can show types of rejection
    - Rejection can be treated with MMF + steroids (e.g. 30mg OD prednisolone)

- Repeat prescriptions
    - You may need to give repeat outpatient script for Tacrolimus
    - Trade names include adoport and prograf
    - You need to give the same brand as the patient is currently taking otherwise pharmacy will flag this and ring you to change the prescription

LIVE DONOR CLINIC

This clinic takes place on a Wednesday and Thursday afternoon in the home treatment centre. It is conducted with the live donor coordinators and the renal physician Dr Loucidou.

The clinic consists of seeing pre-operative patients for their donor work up and post-operative patients for their follow up after nephrectomy.

Not all patients needing a transplant have anyone who might be a live donor for them, but patients should be encouraged and supported to reach out and look for live donors. Mr Dor is head of the live donor programme and it is advisable to sit in with him in clinic to observe these complex discussions with patients.

The process of live donation assessment and work up can take several months. During this time there are several appointments.

Types of donation

- Living related
- Living unrelated
- Pooled and paired (P&P) exchange
- Altruistic donation

Types of operation

- Open
- Laparoscopic
- HARP

Summary of Key Points of Importance in the Medical +/- Family History of a Potential Kidney Donor	**Points of Particular Importance when Undertaking Clinical Examination of a Potential Kidney Donor**
Haematuria/proteinuria/urinary tract infection Difficulty in passing urine, including urgency, frequency, dysuria History of peripheral oedema Gout Nephrolithiasis Hypertension Diabetes mellitus, including family history Ischaemic heart disease/peripheral vascular disease/other atherosclerosis Cardiovascular risk factors Thromboembolic disease Sickle cell and other haemoglobinopathies Weight change Change in bowel habit Previous jaundice Previous or current malignancy Systemic disease which may involve the kidney Chronic infection such as tuberculosis Family history of a renal condition that may affect the donor Smoking Current or prior alcohol or drug dependence Mental health history Obstetric history Residence abroad Previous medical assessment e.g. for life insurance Previous anaesthetic problem History of back or neck pain and trauma Results of national screening programme tests e.g. cervical smear, mammography, colorectal screening	Abdominal fat distribution Blood pressure Body mass index Dipstick urinalysis Evidence of self-harm Examination for abdominal masses or herniae Examination for scars or previous surgery Examination for lymphadenopathy Examination / history of regular self-examination of the breasts Examination / history of regular self-examination of the testes Examination of the cardiovascular and respiratory systems Mental health

Investigations

General	Cardiac	Bloods	Imaging
BP Urine dip and MCS (at least twice) Urine PCR BMI	CXR ECG ECHO Stress test	Haemoglobin and blood count Coagulation screen (PT and APTT) Thrombophilia screen (where indicated) Sickle cell trait (where indicated) Haemoglobinopathy screen (where indicated) G6PD deficiency (where indicated) Creatinine, urea and electrolytes Isotopic or other reference test for measurement of GFR Liver function tests Bone profile (calcium, phosphate, albumin and alkaline phosphatase) Urate Fasting plasma glucose Glucose tolerance test (if family history of diabetes or fasting plasma glucose >5.6 mmol/L) Fasting lipid screen (if indicated) Thyroid function tests (if strong family history) Pregnancy test (if indicated) Hepatitis B and C HIV HTLV1 and 2 (if appropriate) Cytomegalovirus Epstein-Barr virus Toxoplasma Syphilis Varicella zoster virus (where recipient seronegative) HHV8 (where indicated) Malaria (where indicated) Trypanosoma cruzi (where indicated) Schistosomiasis (where indicated)	USS kidneys CT AP DMSA

Follow up appointments

- Donors are followed up twice shortly after surgery, then every six months and eventually once a year for a lifetime
    - This is an added benefit in that health issues unrelated to the nephrectomy can be picked up
- If a donor was ever to need a kidney transplant they would have a priority on the waiting list

- They get a blood pressure and urine dip on the day
- Patients with hypertension and / or proteinuria should be referred to the renal team too

Lifestyle advice for donors

- Weight management
- Reduce risk factors for HTN and T2DM
- Drink plenty of water
- Avoid nephrotoxic drugs

NSAIDs
Chemotherapeutic drugs
Aminoglycosides
Amphotericin B
Calcineurin inhibitors
ACE inhibitors
Loop and thiazide diuretics
Penicillins and cephalosporins
Angiotensin II-receptor blockers
Methotrexate
Warfarin
Anticholinergic drugs

Suitable donor age

- There is no upper age limit
- <18 is a contraindication in most centres and 18-21 a relative contraindication
- Younger donors, even without risk factors for kidney disease at the time, may still develop diabetes, hypertension, obesity, immunologically mediated disease or other renal risk factors, and have more time for these risk factors to progress to CKD and ultimately ESRD.

In the last five years there has been a significant increase in the number of living donations in the UK from the 60-69 and >70 year groups. Donors above 60 years need careful consideration with respect to the increased risk of peri-operative complications, existing comorbidities and residual function post-donation, and also the long-term transplant outcome in the recipient associated with reduced donor

What are the consequences of live kidney donation for the donor?

- There should be no major adverse consequences
- There is no increased risk of developing end stage renal failure
- The lifespan of someone donating a kidney is similar to that of the general population
- There may be a 25% reduction in GFR which is not clinically significant
- There may be non-clinically significant proteinuria

VASCULAR ACCESS CLINIC

This is a very busy clinic, held on Friday mornings in the renal outpatients department.

Mr Crane, Mr Herbert and Mr Muthusamy are the main surgical consultants in this clinic. There is also a renal physician Dr Damien Ashby and a specialist nurse Liz Dalby who are very experienced with vascular access.

Try to learn to perform your own Doppler USS assessments of vessels by the end of the rotation. Patients can also be sent for formal scanning upstairs in the vascular imaging department.

The main types of patient you will see

- Pre-fistula patients
    - Patients who are expected to end up on dialysis soon
    - Patients who have recently started dialysis and have a Tesio line but ideally need a fistula
    - Patients who are switching dialysis modality from peritoneal dialysis to haemodialysis

These patients need to be assessed for suitability for fistula creation. Examine the arms and decide which side will be considered for a fistula – usually LEFT arm for right handed patients. You can perform your own scan or ask for help to do this to measure : brachial artery diameter, cephalic vein diameter, (+/- basilic vein diameter) radial artery diameter and cephalic vein at wrist diameter.

The general order of fistula creation options:

Ideally a radiocephalic arteriovenous fistula is created at the wrist. This allows for further fistulas to be created higher up the arm at a later date if this fistula fails. If the radial artery or cephalic vein are too small or are far apart, a brachiocephalic fistula at the antecubital fossa can be created.

Sometimes patients are basilic vein dominant or the cephalic vein is very small and a brachiobasilic fistula can then be made. Since the basilic vein dives deep in the upper arm, this is a two stage procedure. The first to create the fistula under local anaesthetic and the second to elevate (make more superficial) the fistula under general anaesthetic.

If a patient has no good size vessels to use then you could look at the other arm or discuss graft options. In general using the patient's own vessels is preferred where possible.

- Post op fistula patients
    - Post op patients are seen at 1 week and 6 weeks after surgery
    - 1 week check of wound, thrill over fistula should be present
    - 6 week check to assess maturation of fistula
- Graft patients
    - Patients with synthetic grafts for access need regular monitoring as grafts have a finite lifespan
- Problems with fistula
    - Needling problem, dialysis nurses unable to needle
    - No thrill present
    - Infection

- Arm swelling
- Prolonged bleeding post cannulation
- Clots aspirated
- Difficulty achieving good flow rates on dialysis machine

Ideally:

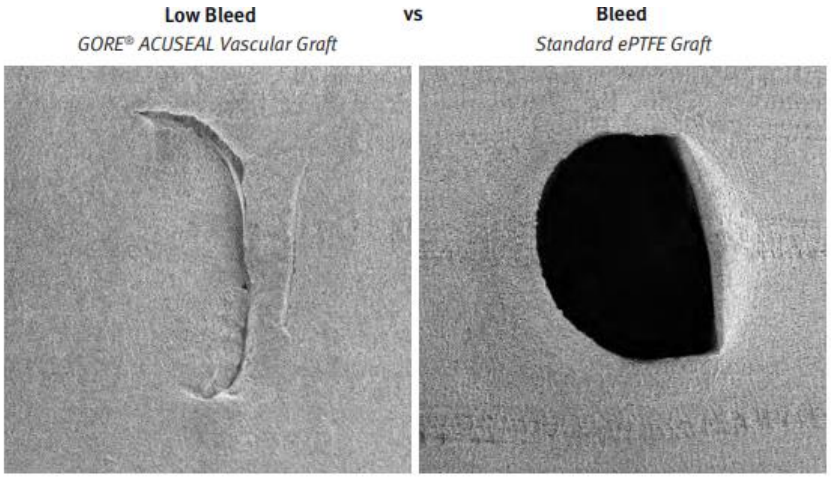
- Vascular access should be constructed 1 y in advance of anticipated need
- A new fistula should be matured for 6 weeks and preferably 3-4 months before needling
- Grafts should be placed 3-6 weeks before anticipated need

It is better for patients to have a fistula rather than a Tesio line. There is less risk of infection, patients can swim and shower, and there is no risk of central venous stenosis (more info later).

Grafts

Not all patients have an option for 'native vessel access' from the start e.g. vessels are too small (1 or 2mm). Or if a fistula is already present but there are complications with it a graft can be inserted instead or used to bypass a segment of the fistula.

- Grafts are made of PTFE
- They are anastomosed to an artery distally and a vein proximally
- They do not need to mature but can usually be used after 2-4 weeks
- There is a type of graft called 'early stick' e.g. Gore Acuseal which allows early needling within 24hours
    - It has an inner lining which means that after needling the graft is less likely to bleed from the needling site



Meticulous aseptic methods are required in graft surgery, as with all prosthetics used in surgery infection must be avoided at all costs

Problems with fistulas/grafts

One of the most common issues you will deal with on call is clotted or failing fistulas and grafts.

What to do:

- Take a history
    - What type of fistula is this
    - When was it made
    - Any history of fistulogram / fistuloplasty
    - Look for recent vascular access clinic notes on cerner
    - Where and how frequently do they have dialysis
    - What is the problem
        - Needling issue, unable to needle
        - Slow flow rates on machine
        - Clots being aspirated
        - Prolonged bleeding after needling
    - How long has the problem been there for?
        - Just one episode of dialysis or several weeks
- Examine the patient
    - Signs of infection, erythema
    - Is there a thrill anywhere
    - Is it more thumping
- Get some imaging
    - Request formal vascular USS by vascular department (second floor on the way to theatres)
    - Or use a portable USS machine to have a look yourself
- Assess if patient needs urgent treatment
- Assess if patient needs urgent dialysis
    - If so they will need to be admitted to have dialysis via a vascath or Tesio
- Assess if the patient needs to be admitted
    - For heparin infusion
    - For antibiotics
    - To await surgical intervention
    - For urgent vascath and dialysis

Steal syndrome

Also known as distal hypoperfusion ischaemic syndrome
More common in radiocephalic fistulas than brachiocephalic
Causes

- Excess blood flow through fistula (reduce the risk of this by making the anastomosis <5mm)
- Arterial occlusive disease either proximal or distal to anastomosis
- Lack of adaptation by distal artery or lack of collateral flow reserve

Symptoms of steal may necessitate reduction in size of the fistula flow (e.g. plication) or removal of the fistula entirely

Vascular USS

The vascular department on the second floor (on the way to theatres) is run by vascular technicians, many of who are very experienced

They can provide a detailed imaging map of arteries, veins, fistulas and grafts describing vessel diameter, flow in each vessel including volume, rate and direction, presence of clots (and age of clots sometimes), branches, stenosis etc.

Patients can be sent from vascular access clinic on Fridays upstairs for a scan and then back to clinic with the results.

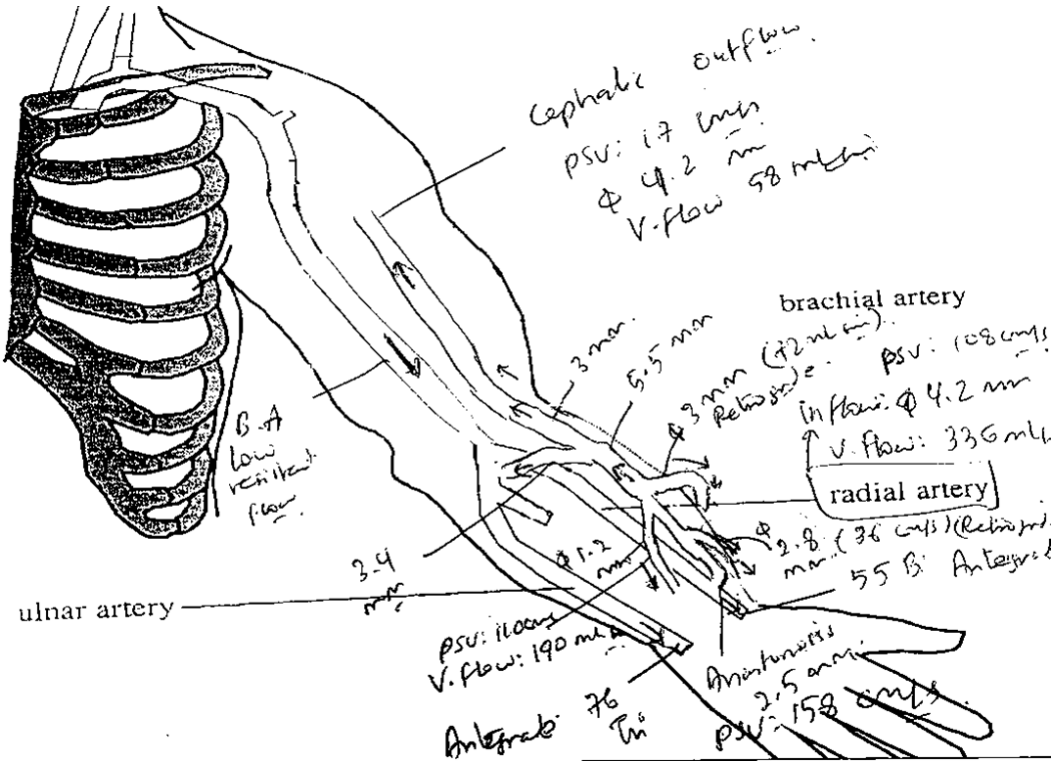
Outpatients and ward patients can also be scheduled for imaging.

Scanning times: MONDAY / TUESDAY / FRIDAY 9AM – 5PM

CONTACT NUBMER 32081 / 31541

Request forms can be found in vascular access clinic rooms or outside vascular imaging department.

On Wednseday and Thursday scans can be obtained if urgent at St Marys (23739) or Charing Cross (17322) vascular labs.



Example vascular imaging department scan

Fistulogram

To assess patients with fistulas in more detail, a fistuogram is often performed

Areas of stenosis can be diagnosed with a **fistulogram** and dilated at the same time if needed by **fistuloplasty** (angioplasty balloon). This is an interventional radiology procedure done as a daycase

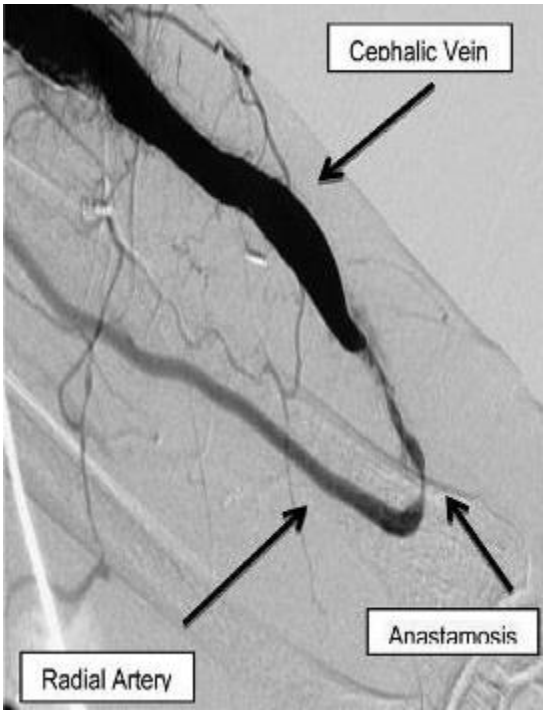
Requests are made on Cerner. For outpatients you also need to request an admission on Cerner.

The fistula is cannulated and dye used to delineate the vessels

Herald signs for stenosis may be patients reporting prolonged bleeding after needling, difficulty needling, poor flow rates or patients presenting with acute clots.

Common areas of stenosis:

- Near or at the anastomosis of an AV fistula
- Cephalic arch
- At the venous anastomosis of a graft
- Central veins



Aneurysmal fistulas

You will probably have seen patients with very large, dilated and tortuous arteriovenous fistulas

The exact mechanism of this developing is unknown and it is hard to predict which patients will develop this.

Repeated needling in the same site may contribute

Patients with unsightly fistulas often come to access clinic in the years after transplantation requesting excision of their fistula.

SAVE YOUR VEIN

This is a campaign set up by Mr Crane and Christine Hall (F2 at the time) in 2014.

It aims to increase knowledge and awareness among patients and healthcare staff to improve vein preservation for dialysis access.

"If kidney failure patients have multiple blood tests from the veins that we need to make a fistula, it lessens the chance of creating a successful fistula for dialysis"

Patients should have blood tests from the back of their hand where possible

Visit https://www.saveyourvein.org/ for more information or speak to Mr Crane.

IMAGING

These are the various imaging modalities you will use

- USS
    - To assess fistulas and grafts
    - In recovery and as follow up for transplanted kidney
        - Global perfusion
        - Can see if evidence of stenosis / clots in vessels
        - Collections
        - Measure resistive index (see below)
- CT AP
    - Non contrast to assess patients vessels in transplant work up (as calcium shows up on vessel wall without contrast)
    - Renal pts can have contrast CT as dialysis can be used to help clear
- MRI
    - For polycystic kidneys this can be useful to look at size and location of cysts, to see if there is any splenic or liver involvement and to see if there is room for a transplant kidney or if nephrectomy of polycystic kidneys will be required
- Fistulogram
    - Performed by interventional radiology
    - Book on cerner + need to also request admission on cerner
    - Pt attends PIU as daycase
    - PT MAY ALSO HAVE FISTULOPLASTY AT THE SAME TIME IF EVIDENCE OF STENOSIS

Resistive index

The renal arterial resistive index (RI) is a sonographic index to assess for renal arterial disease.
It is measured as

RI = (peak systolic velocity - end diastolic velocity) / peak systolic velocity

the normal value is ≈ 0.60
with 0.70 being around the upper limits of normal

<u>Reasons for elevated values in a transplant kidney</u>
acute tubular necrosis (ATN)
acute or chronic transplant rejection
renal vein thrombosis
drug toxicity
renal artery stenosis (if measured upstream from the stenosis)
ureteric obstruction
perinephric fluid collection

There is thought to be little correlation between the RI and the quantitative extent of renal dysfunction (measured by serum creatinine values)

DIALYSIS BASICS

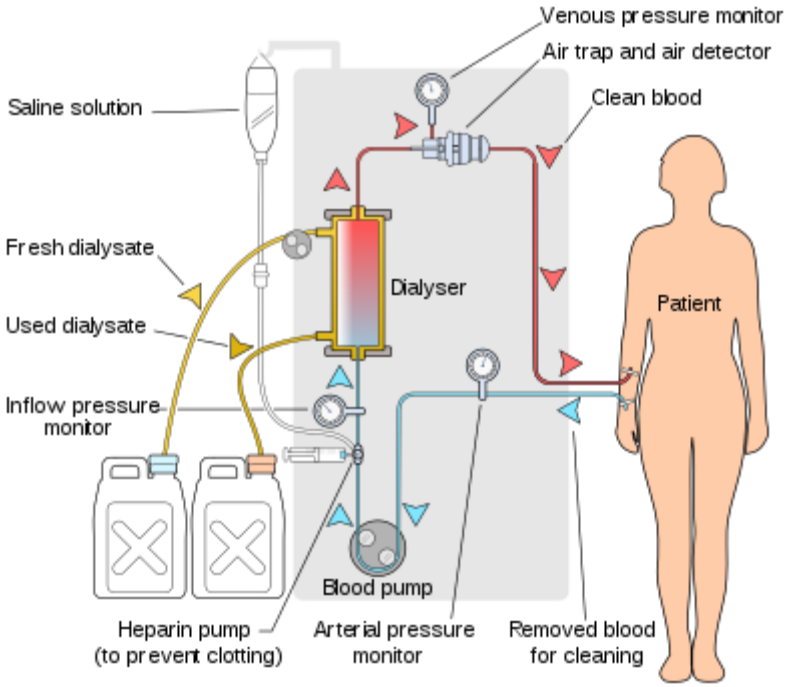
There is a 50% mortality in 5 years for patients on dialysis

Indications for dialysis

- Intractable hyperkalaemia
- Acidosis
- Uraemic symptoms (nausea, pruritus, malaise)
- Therapy resistant fluid overload
- CKD stage 5

Haemodialysis

- Blood is circulated through a dialysis machine
- The vascular access of choice is an AVF
    - The fistula requires suitable peripheral veins and needs 6 weeks to mature
- If there are no suitable veins a graft can be used
- Performed in 4 hour sessions, three times a week



Peritoneal dialysis

- The peritoneum is used as a dialysis membrane
- Fluid is instilled into the abdomen via a peritoneal dialysis catheter (you may have heard of this being called a Tenckohoff catheter)
- Continuous
- Ambulatory

Complications

- Related to insertion e.g. bleeding, injury to viscera
- Peri catheter leak
- Cuff or tunnel site infection
- Peritonitis
- Scelorising peritonitis

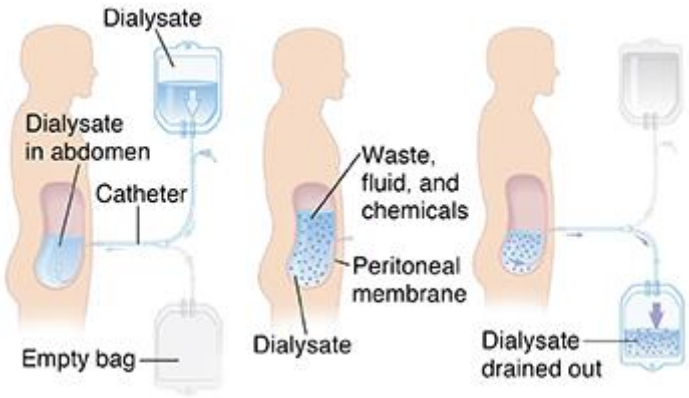
Diagnosis of peritonitis:

At least two of the following are present:

1) Clinical features consistent with peritonitis
2) Dialysis effluent WCC >100 or with >50% polymorphonuclear leukocyte
3) Identification of infectious organisms from dialysis effluent by culture

Contraindication to PD

- Loss of peritoneal function
- Extensive abdominal adhesions that will limit dialysate flow
    - Previous abdo surgery is no longer a contraindication and we regularly perform laparoscopic adhesiolysis and PD catheter insertion in patients who have had previous surgery
- Uncorrectable hernias
- Massive central obesity
- Incapacity to carry out dialysis at home



The peritoneum undergoes structural and functional changes over time with PD which limits patients being able to use the modality of dialysis indefinitely.

LINES / TUBES / DRAINS

Vascath

- A vascular access catheter
- Placed either in neck (subclavian or internal jugular) or groin (femoral)
- Renal registrars insert at Hammersmith under USS guidance
- They are non tunneled (higher infection rate) – should be kept for minimum time as possible (less than 3 weeks)
- For patients requiring urgent dialysis with no other access options
    - Either because they are newly starting as an emergency
    - Or fistula / graft has not been made yet or has clotted or failed
    - There is a long waiting list for Tesio line insertion

Robinson drain

- Passive closed drain (no suction / negative pressure)
- Sometimes used after nephrectomy or transplant case
    - Consultants differ about use of drains

Redivac drain

- Active suction closed drain
- Used after transplant case by some consultants

3 way urinary catheter

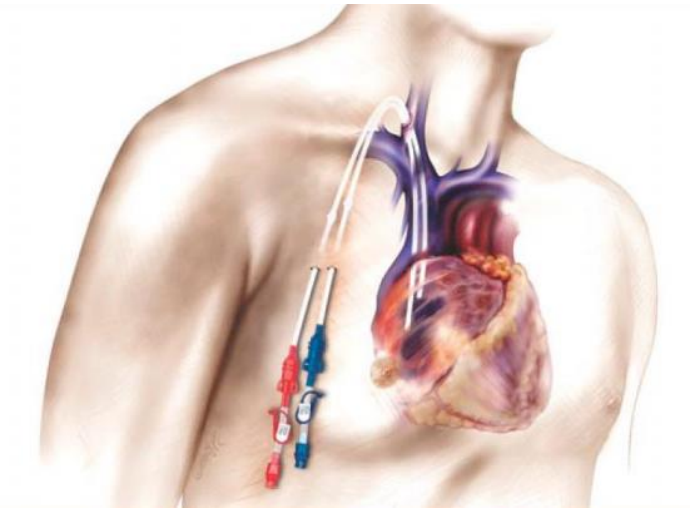
- For transplant patients
    - Insert at the start of the case
    - Irrigation solution connected to inflow
        - This solution contains antibiotics
    - You MUST be as sterile as possible (remember that you will open the bladder in a transplant in order to anastomose the ureter, the irrigation solution will rush in, so any contamination could ascend into the space where the kidney lies)

2 way urinary catheter

- For donor nephrectomy patients
    - Insert at the start of case
    - TWOC the following morning at 6am
- For laparoscopic peritoneal dialysis catheter placements
    - Keeps bladder empty whilst looking in the pelvis
    - TWOC before patient goes home (daycase surgery)

Tesio line

- A central line (usually internal jugular)
- 2 separate lines which are tunneled under the skin (reduces infection) and also have "cuffs" which cause them to scar and adhere into place
- Used for dialysis (one red line for inflow, one blue line for outflow)
- Can be kept for years
- Less preferred access option as causes central venous stenosis
- Higher infection rates compared to fistula
- Patients cannot go swimming with these and have to cover them for showering
- Removed after a transplant when renal function normalized / stabilised



Tesio line removal procedure

You will be asked to remove Tesio lines from inpatients and patients attending PIU (sometimes 3 in one day). Indications are either because of an infected line or because the patient is post-transplant and no longer needs dialysis.

Get one of the fellows to show you how to remove a line or watch several if you have not removed tunneled cuffed lines before.

Equipment needed:
(There is a Tesio line removal trolley on PIU)

Sterile gloves, Inco pads, Wound pack, cleaning solution / chloroprep
1% lidocaine, Syringe + red needle to draw up anaesthetic + blue need to inject anaesthetic
Biopsy pack (contains knife, dissecting scissors and suture scissors, artery clip, needle holder)
Suture material – usually something non absorbable is kept on PIU
Dressings

Procedure:

- Obtain consent and check patient knows why line is being removed
- Ask how long the line has been there for
    - Lines present for several years can be very stuck and may need removal by IR

    - Sometimes lines present for years still come out very easily though
    - Explain to patient that line may be very difficult to remove
- Check patients Hb and PLT and any anticoagulation / antiplatelets
    - Although these are not necessarily contraindications to removal, discuss with a consultant if you are unsure
- Palpate for location of cuffs
    - Cuffs may be very close to skin exit site (in which case you may not need to make an incision and blunt dissection / spreading with a clip may be enough)
    - Usually cuffs are located midway up the chest and you need to cut down to them
- Inject local anaesthetic around the cuffs
- Prep and drape to create a sterile field where the cuff incision site will be
- Make a small incision directly over cuffs
- Use artery clip, dissecting scissors and knife to free the cuffs
- You need to expose the bare white line without any tissue around it
- Pull the line gently towards you out of the central vein
- Cut just below the cuff so that you can remove the external part of the line separately
- DO NOT drag the external dirty part of the line through the wound
- Place interrupted mattress sutures and dress
- Patients are kept for 1 hour of observation on PIU before going home
- Document the procedure on cerner

If you fail to remove a line because it is tethered higher up or somewhere internally:

- Close the skin and dress
- Book removal by interventional radiology

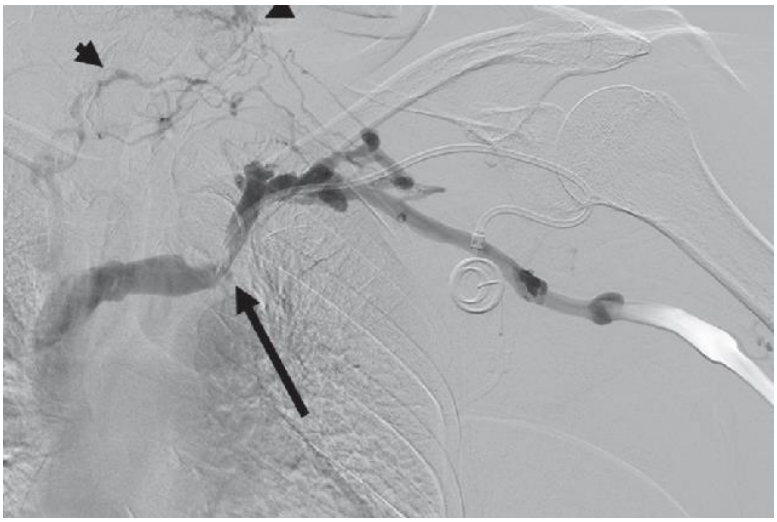
Remember to send the tip for culture if you are removing for suspected line sepsis!

Central venous stenosis

- This is a complication of lines placed in the central venous system (central lines e.g. Tesio) which are kept for years
- It is thought that direct physical irritation in the vessel lumen over a long period of time causes stenosis

- This can occur in the superior vena cava / left and right brachiocephalic trunks / subclavian

- Central venous stenosis complications
    - Multiple collateral formation (these can appear all over the chest wall and arm)
    - Arm swelling
    - Inadequate dialysis
    - Difficulty creating new dialysis access
    - Creating a fistula on the same side causes worsening of symptoms



Central venous stenosis due to a subclavian portacath, arrow heads also show collateral formation

It is better for patients to have arteriovenous fistulas made than to have a central line

CODES / BLEEPS

How to bleep – DIAL 456 – BLEEP NUMBER – YOUR EXTENSION - #

De Wardener Doctor's office code – 5905

On call room (3rd floor) – 123456

Most used phone numbers:

De Wardener nurses 36691

De Wardener renal reg 36695

Renal reg bleed 9977

Interventional Radiology 34943

Peters doctors office 36652

Kerr 36705

Handfield Jones 36676

RHTU 31255, 31034

RAU 36603, 36604

Tissue typing 33226

Theatre 6 32711

Blood transfusion 34772 / 34790

Anaesthetic SHO bleed 9313

ABBREVIATIONS

ODT – organ donation and transplantation

EOS – electronic offering system

DBD – donation after brain death

DCD – donation after circulatory death

RAU – rapid assessment unit

RHTU – renal haematology triage unit

PIU – planned investigation unit

PD – peritoneal dialysis

APD – ambulatory peritoneal dialysis

CPD – continuous peritoneal dialysis

DGF – delayed graft function

DSA – donor specific antigen

CRF – calculated reaction frequency

TP - transplant

HD - haemodialysis

HARP – hand-assisted retroperitoneoscopic

ESRD / ESRF – end stage renal disease / failure

P&P – pooled and paired

AVF – arteriovenous fistula

SPK – simultaneous pancreas kidney

PAK – pancreas after kidney

FSGS – focal segmental glomerulosclerosis

TRAS – transplant renal artery stenosis

PRA – panel reactive antibody

PSV – peak systolic veolocity

VF – volume flow

PCR – protein creatinine ratio

NODAT – new onset diabetes after transplant

T2DM – type 2 diabetes mellitus

RC - radiocephalic

BC - brachiocephalic

BB – brachiobasilic

SPK – simultaneous pancreas kidney

PAK – pancreas after kidney