Anaesthetic challenges in a patient with inferior vena cava and bilateral ileofemoral vein thrombosis posted for renal transplant surgery.

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- 43 year old male,
- K/C/O chronic kidney disease (CKD stage-V) for 2.5 years on conservative medical management
- presented with c/o generalized body weakness and periorbital edema during his follow up on Jan 2023.

CHRONIC KIDNEY DISEASE x 2.5 years

HD initiated 3-4/wk via Rt IJV HD cath for initial 6months.

Thereafter, HD was stopped and patient was kept on conservative management.

HYPERTENSION x 2.5 years

T. Clonidine 100mcg 1-1-1

T. Prazosin 5mg 1-0-1

T. Amlodipine 5mg 1-0-1

T. Labetalol 100mg 1-0-0

DIABETES x 2.5years.

T. Vildagliptin 50mg 1-0-1

- Patient was asymptomatic for 1 year on above treatment.

- On his regular check up, for c/o Lt lower limb pain, USG Doppler was done and **Deep vein thrombosis** was diagnosed. Patient was started on oral anti-coagulants T. Warfarin 10mgBD

- Patient had no history of NSAIDs or any drug abuse, ayurvedic/ homeopathic treatment.
- No h/o cough/cold/fever at present.
- No h/o nausea/ vomiting.

Past history:-

H/o COVID-19, 2 years ago. Home quarantined, no hospital admission required.

Patient was not a K/C/O Bronchial Asthma, COPD, TB, IHD, Hypo/Hyperthyroid disorders.

Personal history:-

H/o tobacco chewing x 12years. Stopped since 2 years.

H/o alcohol intake x 10years (occasional). Stopped since 2 years.

Family history:

Not significant

General examination:-

- Conscious, co-operative, oriented to time, place and person.
- Afebrile.
- Weight= 54kg, Height= 170cm, BMI=19.1 Kg/sqm
- Pallor + ++
- Bilateral lower limb pedal oedema + (pitting)
- No icterus, clubbing, cyanosis, lymphadenopathy.
- JVP- Normal.

Vitals:-

- PR-104/min regular , good volume , no radioradial or radiofemoral delay.
- BP-160/98mmHg. Measured in right upper limb in sitting position.
- RR-16/ min regular.

Airway examination:-

- Finger mouth opening- Adequate
- MPC grading-II
- T.M Joint & neck mobility- No restrictions.

Spine- Inter-vertebral space palpable

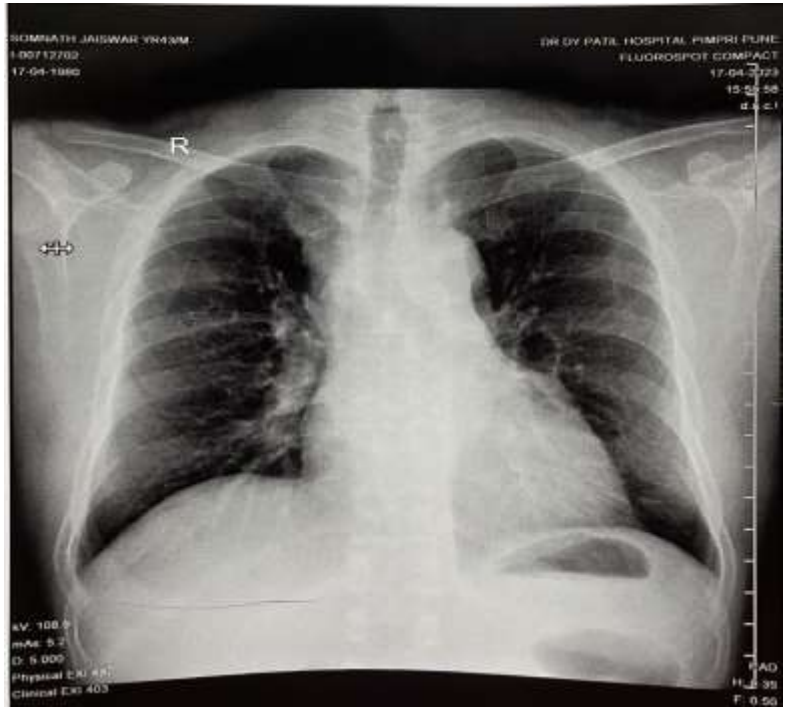
Skin over the spine-normal

Systemic examination:-

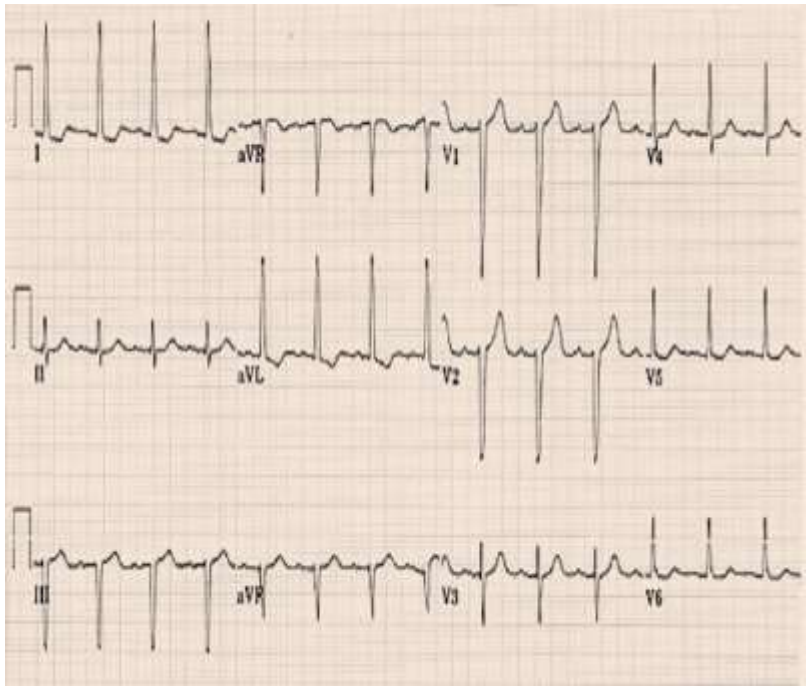
- CVS- S1S2+. No murmurs.
- RS- B/L air entry +. Normal vesicular breath sounds heard. No added sounds.
- PA- soft, no organomegally.
- CNS- No focal neurological deficit.

LABORATORY INVESTIGATIONS IN JANUARY 2023.

Investigation	Values	Investigation	Values
Haemoglobin	7.2 g% (11.6-15.0)	Serum Calcium	6.30mg/dL (8.6-10.2)
Total Leukocyte Count	12000 (4000-10000)	Serum Magnesium	1.80mg/dL (1.8-2.40)
Platelets	1.3 Lakhs (1.5-4.1L)	Phosphorous	6.20
Blood Urea Nitrogen	97 mg/dL (17-49)	LFT(Total Bil, SGOT, SGPT)	0.64, 20U/Lt, 16U/Lt.
Serum Creatinine	8.8mg/dL (0.6-1.35)	BSL	177mg/dL
Sodium (Na)	130mmol/L(136-145)		
Potassium (K)	5.8mmol/L (3.5-5.10)	Blood Group-	O+
Prothrombin time	15.70 (10.83-13.17)	Serum protein	4.0g/dL (6.4to8.3)
INR	1.32 (0.85-1.15)	Serum albumin	2.20g/dL (3.5to5.2)
aPTT	32.20 sec	Serology(HIV, HBsAg, HCV)	Non reactive



CXR- B/L Lung fields normal.



ECG- Normal sinus rhythm, LVH+

2D echo-
EF 50-55%,
Moderate conc. LVH,
Grade-1 DD, No RWMA.
No pulmonary embolism/clot.
IAS/IVS intact.
Arch of Aorta-normal

USG abdomen-

- Right kidney measures 68x32mm. Small in size and normal in position. Raised renal cortical echogenicity. Cortico-medullary differentiation lost.
- Left kidney measures 70x34mm. Small in size and normal in position. Raised renal cortical echogenicity. Cortico-medullary differentiation lost.

- **Impression:-** Bilateral renal parenchymal disease.

DIFFICULTIES IN HEMODIALYSIS

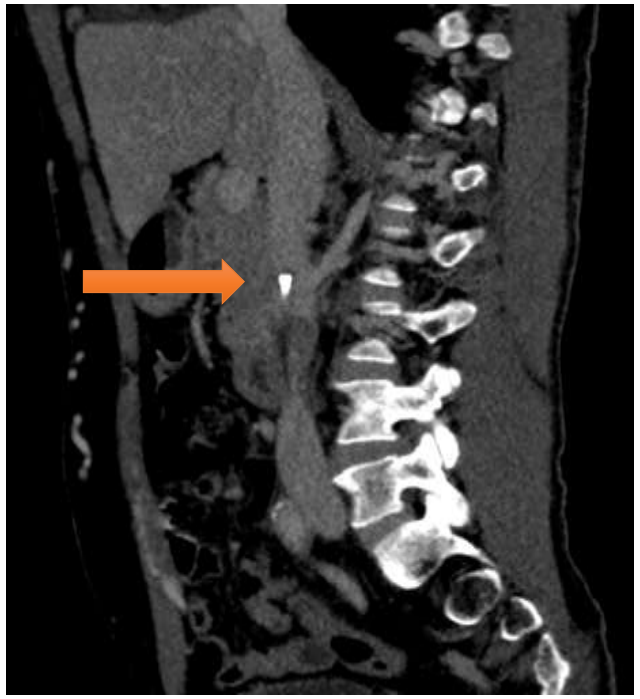
- Patient was planned for HD thrice a week and HD catheter insertion was attempted. (**January 2023**)

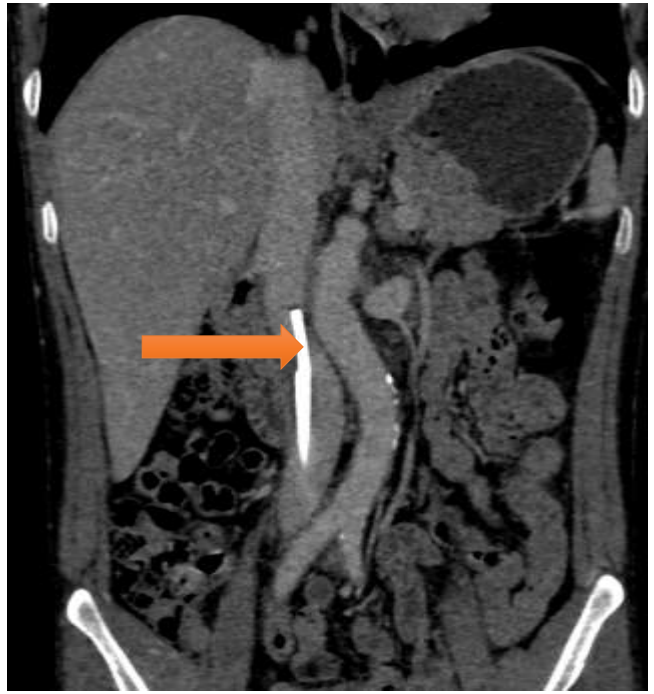
- Right IJV uncuffed was accessed for HD which failed to pass.
- Left IJV uncuffed (failed)
- Left radio-cephalic AV fistula (failed)
- Right femoral uncuffed (failed)
- Left femoral uncuffed (failed)
- **Left femoral tunnelled cuff catheter. (successfully passed)**

Further radiological investigations in view of difficulties in HD CATHETER cannulation,

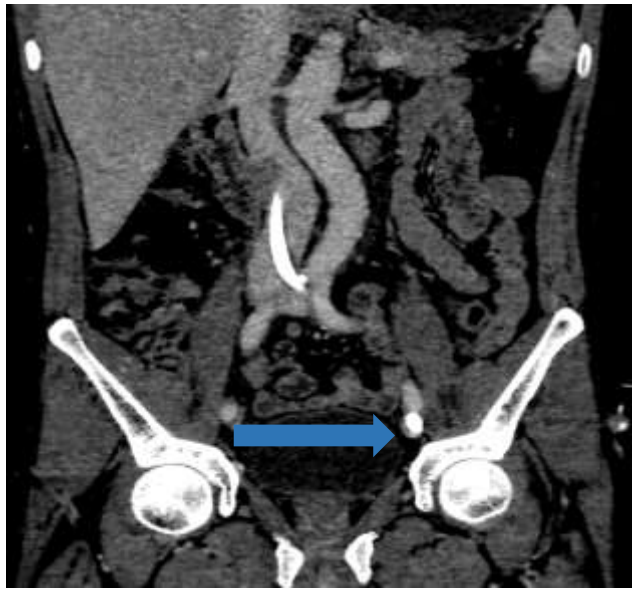
- **<u>CT Abdomen & Pelvis + abdominal angiogram</u>** (plain + contrast):-
  - **Partial thrombosis of inferior vena cava** (approx. 40% occlusion).
  - **Chronic thrombosis** of right common iliac and external iliac veins.
  - **Partial thrombosis** of right common femoral and superficial femoral veins.
  - Partial thrombosis of left external iliac vein and left common femoral vein.

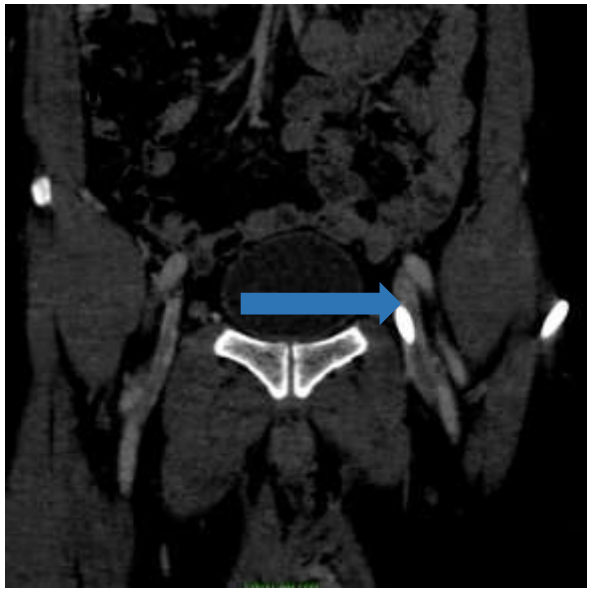
IVC THROMBOSIS IN CT ABDOMEN



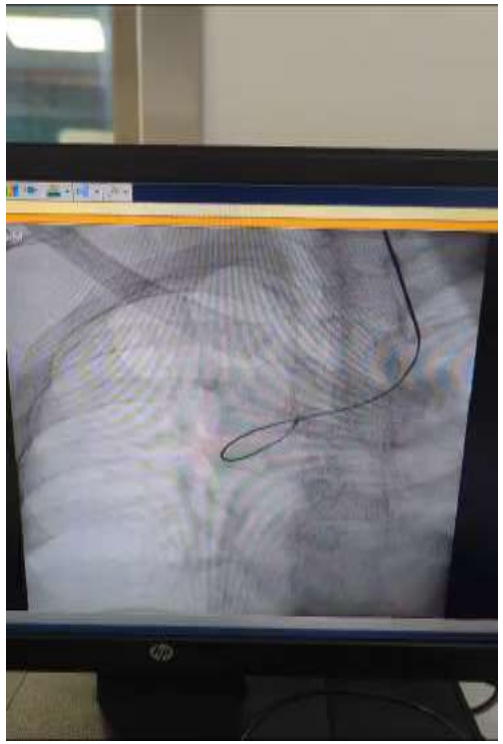


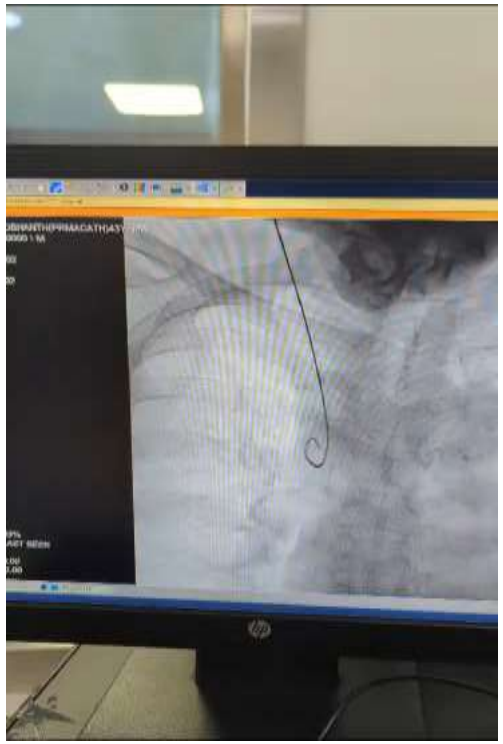
EXT ILIAC AND COMMON FEMORAL VEIN THROMBOSIS





While trying to catheterize bilateral internal jugular veins under fluoroscopy guidance in cardiac lab, dye failed to pass the superior vena cava (SVC) due to **? SVC thrombosis** and collateral neck veins were visualized.





DIAGNOSIS

A 43 year old male, K/C/O hypertension, diabetes and End stage renal disease with central vein thrombosis on maintainence hemodialysis.

PLAN

Orthotopic living donor kidney transplant surgery.

MULTI-DISCIPLINARY APPROACH

- **Multi-disciplinary** meeting was held between transplant surgeon, nephrologist, anaesthesiologist, urologist and vascular surgeon prior to the surgery.
- The **risks and possible outcome** of the surgery was explained to the patient – including that of being unable to perform the surgery due to risk of thromboembolism or thrombosis of the graft.
- The patient and family both were well prepared and **video consented** for the anaesthesia and surgery.
- T. Warfarin was stopped 1 week before surgery and **Bridging therapy** with Inj. LMWH 0.6ml s/c BD was initiated.
- Since the CT Angio had shown extensive thrombosis of B/L ileofemoral veins with thrombosis of the IVC, **it was decided to start with the recipient operation first** to ensure feasibility of the vascular anastomosis.

DONOR DETAILS

- The donor was patient’s wife, a 42 year old healthy female weighing 64kg with no known comorbidities.
- Her CT renal angiography showed two renal arteries on left side of which one was accessory renal artery.
- DTPA renal scan reported bilaterally normal functioning non obstructed kidney.
- GFR 113 ml/min
- As a protocol for renal transplant, HLA typing and ABO matching was done.

PERI-OPERATIVE ANAESTHETIC MANAGEMENT

2D ECHO was done a day prior and findings were same as earlier.

ON THE DAY OF SURGERY

- Patient underwent HD 5 hours prior to surgery
- W/H morning dose of anti-hypertensives, OHA and Inj. LMWH.
- 18G peripheral IV cannula and Left femoral HD cath were insitu.

GENERAL EXAMINATION & VITALS:-

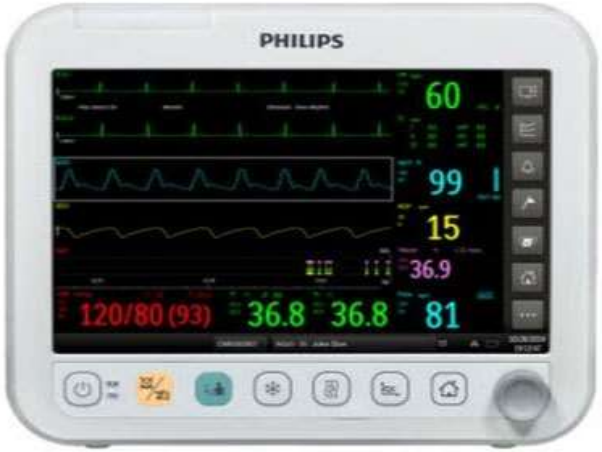
Conscious , oriented. Afebrile
Pallor ++
BP-150/92mmHg
PR- 96/min
SPO2- 99% @RA
RR- 17/min

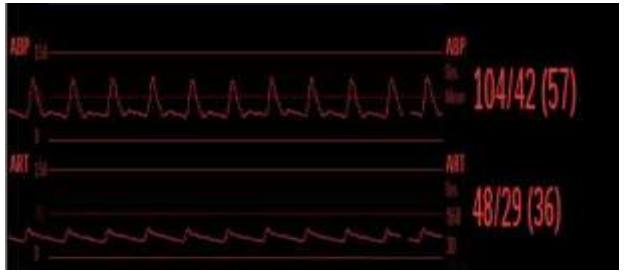
LABS:-

Hb- 7.7gm/dl
TLC- 6700/
Platelet-1.75 lakhs
Na-144 mmol/L
K- 5.10 mmol/L
INR-1.11
Urea- 27 mg/dl
Creat- 2.33 mg/dl

MONITORS USED

- ECG, non-invasive BP, SpO2, temperature probe, EtCO2, Bi-spectral index, arterial line setup for IBP.





GOALS OF ANAESTHESIA MANAGEMENT

- Good renal perfusion by monitoring and preventing hypotension to achieve target MAP and SBP.
- Surviellance for thromboembolism & arrhythmias.
- Maintain normothermia & avoid nephrotoxic drugs.

INDUCTION OF ANAESTHESIA

Premedications:-

- Inj Glycopyrrolate 0.2mgIV
- Inj Midazolam 1mg IV
- Inj Fentanyl 100mcg

Induction :-

- Inj Propofol 160mg in graded dose

Muscle relaxant:-

- IV Cisatracurium 0.2mg/kg and intubated uneventfully. 8.5 ETT fixed after confirming bilateral air entry and EtCo2 graph.

Ventilation:-

- Mechanical ventilation by Volume control mode with oxygen and air (50:50)

Maintenance:-

- Sevoflurane(1-2%) and top up cisatracurium (0.04mg/kg)

Radial artery was cannulated for beat to beat BP and ABG monitoring.

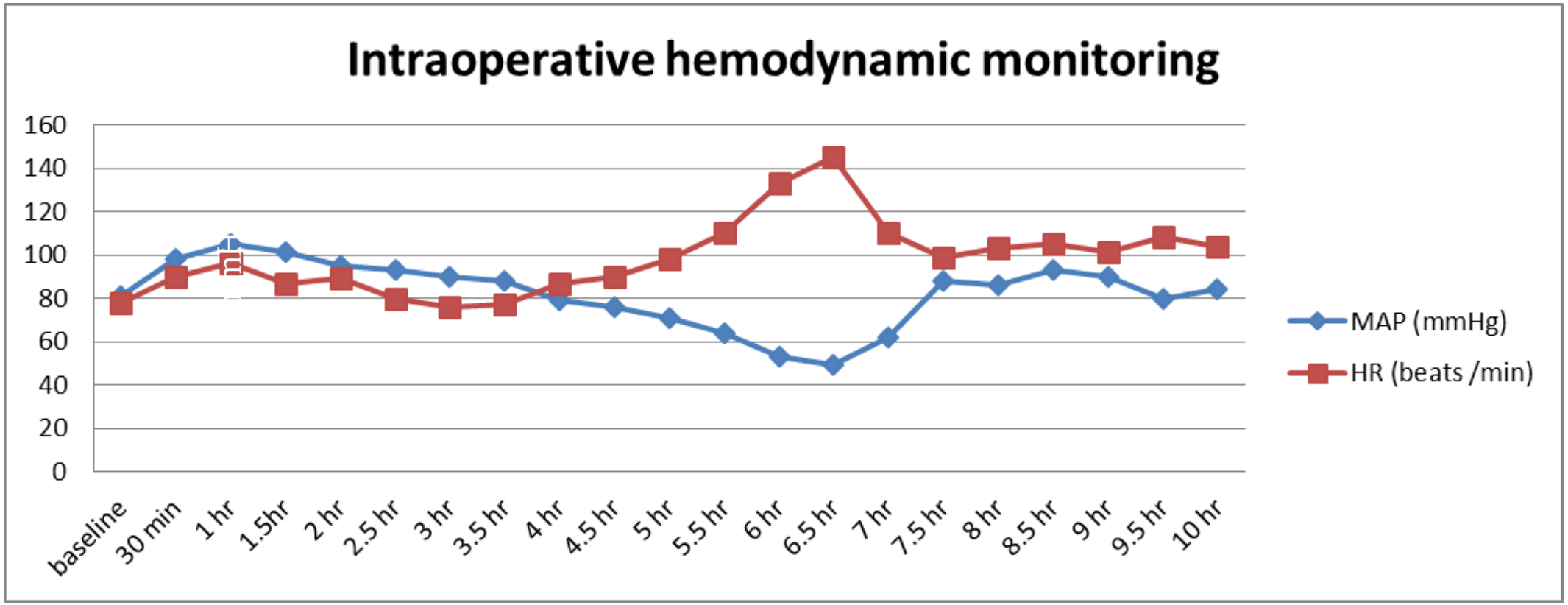
Other drugs

- Inj. Thymoglobulin 75mg was started as immunosuppressant.
- Inj. Hydrocortisone 100mg IV
- Inj. Methyprednisolone 1g IV started prior to the anastamosis

FLUID MANAGEMENT AND MONITORING.

- Fluid used:- Plasmalyte (balanced salt solution).
- Fluid was administered according to patients hemodynamic parameters.
- As CVP could not be measured, MAP of 80-110mmHg and SBP of 130-160mmHg was targeted to optimize cardiac output and renal blood flow.

Electrolyte (mmol/L)	Plasma	0.9% Saline	Plasma-Lyte 148
Sodium	140	150	140
Potassium	5	0	5
Chloride	100	150	98
Calcium	2.2	0	0
Magnesium	1	0	1.5
Bicarbonate	24	0	0
Acetate	0	0	27
Gluconate	0	0	23


Intraoperative hemodynamic monitoring
160
140
120
100
80
60
40
20
0
baseline
30 min
1 hr
1.5hr
2 hr
2.5 hr
3 hr
3.5 hr
4 hr
4.5 hr
5 hr
5.5 hr
6 hr
6.5 hr
7 hr
7.5 hr
8 hr
8.5 hr
9 hr
9.5 hr
10 hr
MAP (mmHg)
HR (beats /min)

SURGICAL STEPS

- Mid line incision was taken and right colon and small bowel reflected medially and upwards to expose IVC in its entire length.
- **Intraoperative doppler was done** and thrombus was seen in the cava from infra renal area onwards to the pelvis.
- The left renal vein and IVC above the renal vein found patent.
- In renal transplant usually kidney will be placed in right iliac fosaa and donor renal artery anastomosed with external iliac artery and vein anastomosed with external iliac vein of recipient.
- Surgeons proceeded with the plan of **left native nephrectomy and implanting the donor kidney in orthotopic left side**.

- Donor renal artery anastomosed with aorta,
- Renal vein anastomosed with left renal vein.
- Ureter anastomosed to urinary bladder mucosa.
- Inj. Heparin 5000 units IV given.

- **During anastomosing renal artery to aorta, sudden blood loss of 300-400ml occurred. MAP dropped.**

- Blood loss managed with bolus of Plasmalyte 250ml + Hydroxy ethyl starch 250ml till blood arrives.
- IV. Noradrenaline 4mg in 50ml NS started at 0.08mcg/kg/min and continued throughout the surgery. 1 pint PCV was given.

- **Target MAP maintained.**

- Warm Ischemia time- 20minutes. Cold ischemia time- 25 minutes.
- IV Furosemide 160mg (2mg/kg) and
- IV Mannitol 100ml (2ml/kg) given after anastomosis for promoting diuresis.
- Hemostasis was achieved and confirmed.
- Kidney doppler was done which showed good flow and vascularity of the transplanted kidney.
- The kidney showed good urine flow during ureteric anastomosis.
- Prior to the closure Inj. Paracetamol 1gm IV was given.
- Dry dressing done.

- Total duration of surgery **10 hours**.
- After assessing patient metabolic parameters by ABG, patient was reversed with Inj glycopyrrolate (0.008mg/kg) IV + Inj neostigmine (0.05mg/kg) IV.
- Extubation done on OT table after adequate spontaneous respiration and power and tone.
- Transdermal Fentanyl patch 25mcg/hr applied for post operative analgesia.
- Patient shifted to KTICU for further observation.

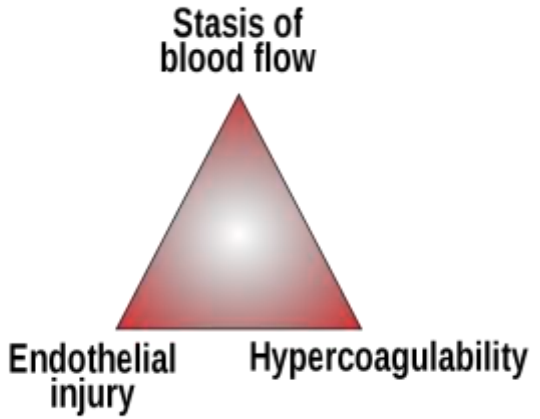
POST OP COURSE

	POD-0	POD-1	POD-2
VAS- Pain score	3	2	1
INPUT/OUTPUT	4969/4085 ml	2730/2435 ml	2770/2325 ml
BP	160/98 mmhg	160/100 mmhg	150/94mmhg
Hb	7.6g%	7.4g%	8.4g%
Serum Creatinine	8.08mg/dl	5.03mg/dl	4.36mg/dl
Serum Potassium	4.34mmol/L	3.56mmol/L	4.12mmol/L
ABG(pH/pCO2/HCO3/ Lac)	7.37/37/21.4/1.6	7.36/29.7/16.2/1.1	7.33/30/22.1/1.2

DISCUSSION

Venous thromboembolism(VTE)

- Incidence of symptomatic VTE is 117 per 100000 adults.
- VTE - deep vein thrombosis(DVT) and pulmonary embolism(PE) is a life threatening condition.
- **Mechanism of formation** of VTE episodes in CKD patient's might be due to **activation of procoagulant markers, decreased endogenous anticoagulants, enhanced platelet activation and aggregation, and decreased activity of the fibrinolytic system.**
- CKD patients have higher incidence of **catheter-related thrombosis** due to above mentioned reasons



- Appropriate thromboprophylxis T. Warfarin 10mg BD was started.
- One week prior to surgery, warfarin was stopped and was bridged with Inj. LMWH 0.6ml s/c.
- The incidence of intraoperative embolization is approximately 1.5% overall, with increasing risk among higher level thrombi, and is associated with a 75% risk of mortality
- Meticulous intraoperative monitoring was important to diagnose complications of VTE like pulmonary embolism, cardiac arrhythmias.

- Renal transplant surgery is the treatment of choice for End stage renal disease patients.
- The presence of IVC blockage & extensive thrombosis should not be a factor to delay/ avoid renal transplant surgery.
- Considering other sites for anastomosing donor kidney like portal system, ovarian veins, or collateral veins of recipient can make the surgery successful .

ANAESTHETIC CHALLENGES IN THIS CASE		STEPS TAKEN
1) Underlying **comorbidities** [**HTN, DM, DVT**] and its complications.	➤	Preoperative optimization.
2) A **new central venous line could not be performed** because of ? SVC thrombosis , 40% thrombosis of the inferior vena cava and extensive thrombosis in bilateral ileofemoral veins. Hence **intraoperative CVP monitoring could not be done**.	➤	Target **MAP of 80-110mmHg** and **SBP of 130-160mmHg** was aimed for adequate cardiac output and renal perfusion.
3) Patient was on oral anticoagulant **Warfarin** which increases the risk of intraoperative bleeding.	➤	**Bridging therapy** with Inj. LMWH 0.6ml s/c initiated after withholding oral anti coagulants before surgery.
4) Deep vein thrombosis complications like intraoperative pulmonary embolism/ arrhythmias can occur.	➤	Vigilant intraoperative monitoring
5) Limitations in epidural anaesthesia for pain management as post-operative anti-coagulants were required.	➤	Other modes of analgesia.

TAKE HOME MESSAGE.

- The presence of IVC blockage & extensive thrombosis should not be a factor to delay/ avoid renal transplant surgery.
- Alternatives for external iliac vein anastomosis should be considered.
- Extensive preoperative evaluation, optimization of comorbidities and meticulous intraoperative and post operative management with all the available resources make the anaesthesia and surgery successful.

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ACKNOWLEDGEMENT

- Transplant team
- Nephrology team
- Urosurgery team.

THANK YOU

OTHER CONSIDERATIONS

- **Loop diuretics in renal transplantation**
- Loop diuretics (Furosemide, Torsemide) counteract the increased response of antidiuretic harmone to surgical stress.
- Acts in the ascending loop of Henle.
- In renal transplantation, Furosemide is commonly given during the vascular anastomosis to stimulate diuresis, although it is unknown whether it actually improves early function.

Mannitol in renal transplantation

- Mannitol induces osmotic diuresis and also has a protective effect on the tubular cells of the transplanted kidney from ischemic injury.

- Mannitol enhances the release of vasodilatory prostaglandins in the kidney and may act as a free radical scavenger.
- 12.5 to 25 grams of 20% mannitol given immediately before vessel clamp removal reduces the incidence of ARF, as indicated by a lower requirement of post transplant dialysis.