SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr MGR Medical University, Chennai

DEPARTMENT OF CARDIOPULMONARY PERFUSION CARE TECHNOLOGY

COURSE NAME : PATHOLOGY

TOPIC : COMPLICATION AND MANAGEMENT ON CKD

UNIT : 1

FACULTY NAME : Ms. NIVETHA RAJA

PATIENT PRESENTATION - Mr.JK

DEFINITION {DEFINE STAGE } :

- Demographics: 68-year-old Male.
- Diagnosis: Severe Triple-Vessel CAD & Severe Aortic Stenosis (AS).
- Procedure: CABG x3 + Aortic Valve Replacement (AVR).
- Major Comorbidities:
  - CKD Stage 3b (Baseline eGFR: 35 mL/min)
  - Type 2 Diabetes (HbA1c 8.5%)
  - Hypertension

RFT REPORT
IDEATE

Test	Result	Reference	Clinical Significance
Creatinine	2.1 mg/dL	0.6–1.2	Confirming Stage 3b CKD
eGFR	35 mL/min	> 90	Reduced filtration; High AKI risk
Potassium (K+)	5.3 mEq/L	3.5–5.0	Mild Hyperkalemia (Arrhythmia risk)
Hemoglobin	10.5 g/dL	13.5–17.5	Anemia of Chronic Disease
BNP	550 pg/mL	< 100	Volume overload / Heart Failure

MEDICATION MANGEMENT STRATEGIES

Stop ACE Inhibitors

Lisinopril held 24-48hrs prior to prevent refractory hypotension (vasoplegia) upon induction and bypass.

Hold Diuretics

Furosemide held morning of surgery to avoid hypovolemia, which exacerbates pre-renal injury.

Stop Metformin

Discontinued 48hrs prior to mitigate the risk of Lactic Acidosis should acute kidney injury develop.

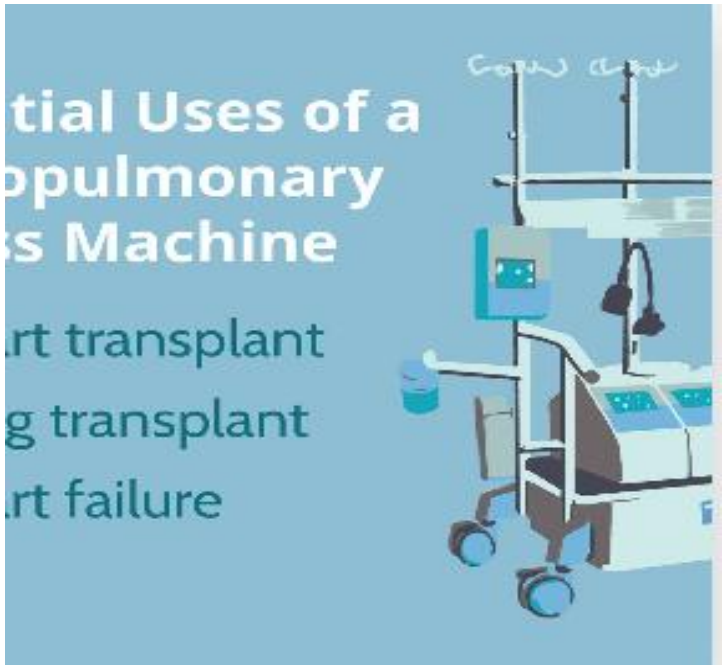
PREOPERATIVE OPTIMISATION

CAUSES AND MANAGEMENT

- **Electrolyte Correction**: Treated K+ of 5.3 with Insulin/Glucose to target < 5.0 mEq/L before incision.
- **Fluid Balance:** Strict I/O monitoring to ensure euvolemia. Avoided dehydration (nephrotoxic) and overload (pulmonary edema).
- **Blood Conservation: Hb 10.5** accepted. "Cell Saver" set up intra-operatively to wash and re-transfuse shed blood, minimizing donor exposure.
- **Pacing Plan:** External pads placed; high risk of conduction block post-AVR in CKD setting.

INTRA OP CPB STRATEGY

- **High Flow Perfusion:** Cardiac Index maintained > 2.4 L/min/m^2 to ensure renal oxygen delivery.
- **Perfusion Pressure (MAP):** Target MAP > 70 mmHg (higher than standard 60). Vasopressors used liberally as renal autoregulation is impaired.
- **Temperature:** Mild hypothermia (34°C) only. Deep cooling avoided to reduce coagulopathy and rewarming shock.



INTRA OP RENAL MANAGEMENT

Hemodilution Management

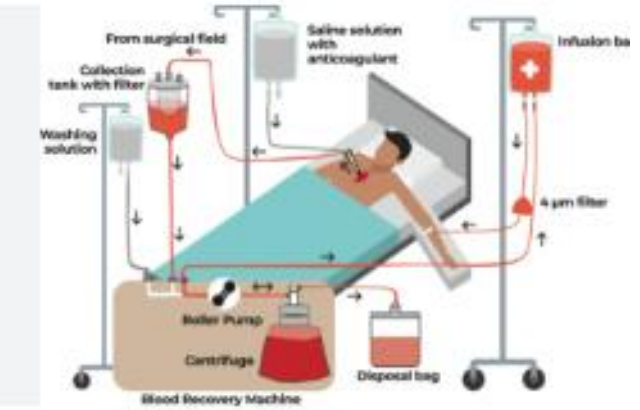
Goal Hct > 24%: Severe hemodilution is poorly tolerated by ischemic kidneys.

Strategy: Minimized circuit priming volume. Ultrafiltration (Hemoconcentrator) used throughout the run to remove excess crystalloid while preserving red cells.

Pharmacologic Support

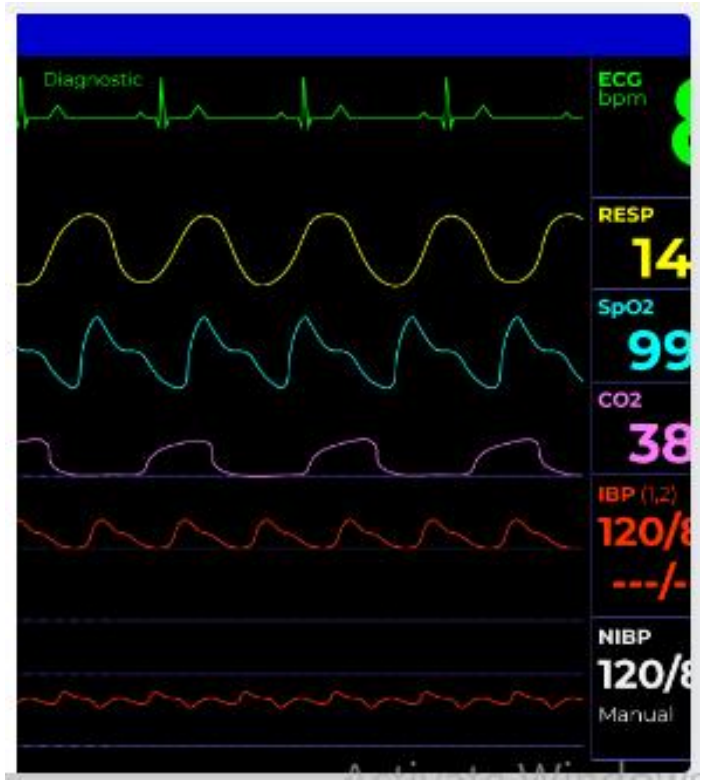
Mannitol: 12.5g administered before CPB initiation to scavenge free radicals and promote osmotic diuresis.

Furosemide: Administered during rewarming to maintain Urine Output > 1 mL/kg/hr, preventing tubular stasis.



POST OP - “THE GOLDEN HOUR “

- The transition from OR to ICU is the highest risk period for Acute-on-Chronic Kidney Injury.
- Hemodynamics: Strict MAP > 75 mmHg. Norepinephrine titrated to maintain renal perfusion pressure.
- Fluid Balance: Aim for Negative Balance. Aggressive diuresis once stable to unload the heart.
- Nephrotoxins: NSAIDs strictly contraindicated. Renally adjusted doses for all antibiotics.



MANAGING COMPLICATIONS

PROTOTYPE

Uremic Bleeding

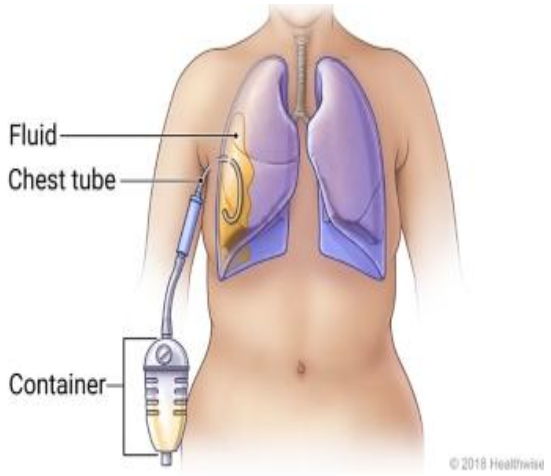
Problem: Platelet dysfunction common in CKD.

Management: If chest tube output > 200ml/hr, Desmopressin (DDAVP) administered to release Factor VIII/vWF. Platelets transfused if count < 100k.

Hyperkalemia

Problem: Post-CPB cell lysis + renal insufficiency.

Management: Frequent K+ checks (q2h). Shift agents (Insulin/D50) used aggressively. Dialysis team on standby if K+ > 6.0 refractory to meds.



CASE OUTCOME

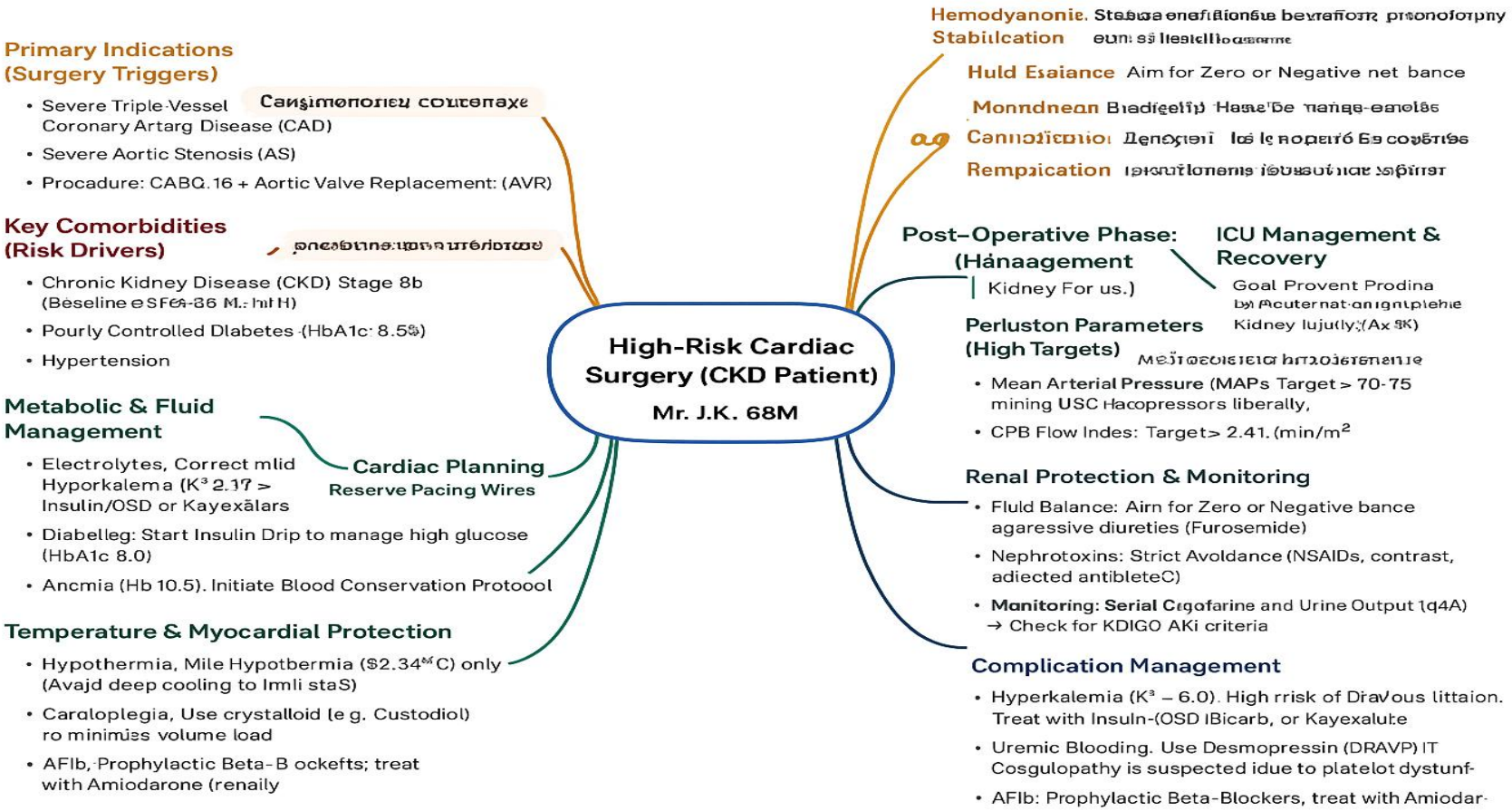
Successful Recovery

- Mr. J.K. experienced a transient rise in Creatinine (peaking at 3.0 mg/dL) on Post-Op Day 2.

- Through aggressive fluid management and maintaining high perfusion pressures, Dialysis was avoided.

- Discharge: Day 7 to home. Creatinine trended down to 2.4 mg/dL.

SUMMARY


High-Risk Cardiac Surgery (CKD Patient)
Mr. J.K. 68M
Primary Indications (Surgery Triggers)
• Severe Triple-Vessel Coronary Artarg Disease (CAD)
• Severe Aortic Stenosis (AS)
• Procadure: CABQ.16 + Aortic Valve Replacement: (AVR)
Key Comorbidities (Risk Drivers)
• Chronic Kidney Disease (CKD) Stage 8b
• Pourly Controlled Dlabetes (HbA1c: 8.5%)
• Hypertension
Metabolic & Fluid Management
• Electrolytes, Correct mlid Hyporkalema (K³ 2.17 > Insulin/OSD or Kayexălars
• Diabelleg: Start Insulin Drip to manage high glucose (HbA1c 8.0)
• Ancmia (Hb 10.5). Initiate Blood Conservation Protoool
Cardiac Planning
Reserve Pacing Wires
Temperature & Myocardial Protection
• Hypothermia, Mile Hypotbermia (2.34^{M}C) only (Avajd deep cooling to Imli staS)
• Caralоplegia, Use crystalloid (e g. Custodiol) ro minimıes volume load
• AFIb, Prophylactic Beta-B ockefts; treat with Amiodarone (renaily
Hemodyanonie. Stabilcation
Huld Esaiance Aim for Zero or Negative net bance
Rempication
Post–Operative Phase: (Hánaagement
Kidney For us.)
ICU Management & Recovery
Goal Provent Prodina
Perluston Parameters (High Targets)
• Mean Arterial Pressure (MAPs Target > 70-75 mining USC Hacopressors liberally,
• CPB Flow Indes: Target> 2.41. (min/m²
Renal Protection & Monitoring
• Fluld Balance: Airn for Zero or Negative bance agaressive diureties (Furosemide)
• Nephrotoxins: Strict Avoldance (NSAIDs, contrast, adiected antibleteC)
• Manitoring: Serial Cigofarine and Urine Output 1q4A)
→ Check for KDIGO AKi criteria
Complication Management
• Hyperkalemia (K³ – 6.0). High rrisk of Dravous littaion. Treat with Insuln-(OSD IBicarb, or Kayexalute
• Uremic Blooding. Use Desmopressin (DRAVP) IT Cosgulopathy is suspected idue to platelot dystunf-
• AFIb: Prophylactic Beta-Blockers, treat with Amiodar-

REFERNCES

- Kidney Injury Following Cardiac Surgery: A Review of Our Current Understanding, American Journal of Cardiovascular Drugs, 2025.
- Renal protection in cardiovascular surgery — PMC review.
- Results of protocol-based perioperative management in CKD patients undergoing off-pump CABG (non-dialysis-dependent CKD).
- Prevention and Treatment of Cardiac Surgery Associated Acute Kidney Injury — discussion of perfusion, dilution, CPB parameters.