Indications & Acute Complications of Hemodialysis

By

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Indications

- Male pt., 21 yrs., no significant medical Hx. admitted to ER with:

1. DCL
2. Severe tachypnea & cyanosis
3. HR 130, BP 240/120
4. ABG: Hypoxia – Severe acidosis
5. K 7.4, Sr Cr. 21

THEN?
Contd.,

- Male pt., 45yrs., HTNsive, CKD (base CR3-4), admitted to ER with:
  1. Easy fatiguability
  2. Mild bil. LL oedema
  3. Chest, CV ex----> NAD
  4. Sr Cr 7
  5. BP 150/90
  6. ABG & electrolytes are accepted

THEN?
We deal with **PATIENTS** not Lab
Contd.,

**Clinical**
- Pul. Oedema*
- Encephalopathy & fits
- Pericarditis
- Anuria for >48h*
- Persistent N&V
- Resistent HTN
- Asthma*

**Chemical**
- Hyper K with ECG changes
- Severe metabololic acidosis
- Cr***
complications

- IDH
- Cramps
- Arrhythmia
- Chest & back pain
- Itching
- Seizures
- Dialyzer reaction
- Hemolysis
- Air embolism
- Disequilibrium syndrome - N&V - Headache

Itching
Dialyzer reaction
Disequilibrium syndrome - N&V - Headache
Arrhythmia
Chest & back pain
Seizures
Hemolysis
Air embolism
complications
IDH

- Definition:
  A fall in nadir (lowest) syst. Pr < 90
  OR
  A fall of ≥ 20 mmHg in syst. pr
Volume-related
• Large IDWG****
• Short dialysis time*****
• Low target BW****
• Low dialysate Na

Defective V.C
• High dialysate temp.
• Autonomic neuropathy
• Anti HTNsives***
• Eating***
• Anemia
• Acetate-based dialysate

Cardiac
• Diastolic Dysfunction*****
• Pericardial tamponade
• MI
• Arrhythmia

Others
• Hemorrhage
• Hemolysis
• Air embolism
• Dialyzer reaction*
• Adenosine release
• Hypo Mg, Ca
• Decreased ADH response
Although occasionally asymptomatic, patients with hypotension may suffer from:

- light-headedness.
- muscle cramps.
- Nausea & vomiting.
- dyspnea.
# PREVENTION

## Volume-related

<table>
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<tr>
<th>Avoid large IDWG</th>
<th>Increase treatment time (every other day)</th>
<th>Stick to 4h (EBPG)</th>
<th>Increase urine volume by diuretics if possible</th>
<th>Determine target BW HOW?</th>
<th>Dialysate Na</th>
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### Defective V.C

| Lower dialysate temp.  | Avoid intradialytic food intake(within 2h) | *Treat anemia  
  *Supply O2 | *Midodrine 10mg(1-2h before session)  
  *Sertraline(4-6w), 50mg  
  *Stop antiHTNsives before session | Dialysate K | *Fludrocortisone  
  *ADH |
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<td>To what extent?</td>
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### Other factors

<table>
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<tr>
<th>Control diastolic dysfunction</th>
<th>Dialysate Ca</th>
<th>ECG for MI, arrhythmia</th>
<th>Hypoglycemia</th>
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NO Acetate-based dialysis
Treatment

1. Normal saline 0.9% (100 ml)
2. Nasal O2
3. Slowing BL. Flow rate????????
Muscle Cramps

- Common complication of hemodialysis treatments and mostly involves the muscle of the lower extremities.

- Usually occur near the end of hemodialysis treatments.

- High serum CPK is frequent finding.
Etiology

- Plasma volume contraction.
- Hypotension
- Tissue hypoxia
- Hypo Na.
- Hypo Mg.
- Hypo K.
Treatment.

- **Symptomatic:**
  1. Forced stretching of afflicted ms.
  2. Treat hypotension
  3. Normal saline OR D10%
Prevention

- IDH
- Stretching exercises
- Dialysate Na
- Dialysate Mg (1mEq/L)
- Biotin, carnitine, vit.E
- Compressive devices
- Quinine (FDA warning)
- Oxazepam (5mg, 2h before session)
Dialyzer Reactions

Type A
- Memb(EO,AN)
- Contaminated dialysate
- Reuse
- Heparin

Type B

AE

Symptoms
- From coryza to cardiac arrest
- Start within 2 min.
- OR delayed 15-30 min. After start of session

mild

TTT & prevention
- Stop session
- TTT according to presentation
- Change dialyzer
- Sterilization

? complement
Uremic pruritus

Thomas Mettang¹ and Andreas E. Kremer²

*T Mettang and AE Kremer: Uremic pruritus*

Figure 4 | Schematic synopsis of potential pathogenic factors in chronic kidney disease-associated pruritus (CKD-aP). CNS, central nervous system.
Cont.,

Exclusion of other causes for pruritus

Assessment of severity of pruritus
- Weak
  -> Moisturing ointment/oil bath
- Severe
  -> Quality of dialysis (Kt/V)

  Kt/V < 1.2
  -> Increase dose of dialysis
  Persisting
  -> Moisturing ointment/oil bath
  and
  Gardapentin 100-300 mg or UVB phototherapy or Charcoal (6g/die) or Nalifurafine 2.5 – 5.0 mg p.o.

  Persisting
  -> Naltrexone or Tacrolimus ointment or (Electro- )acupuncture

  Persisting
  -> Consider kidney transplantation

Figure 5 | Therapeutic algorithm in chronic kidney disease-associated pruritus (CKD-αP). Kt/V, urea clearance in relation to urea distribution volume; UVB, ultraviolet light B.
The longer treatment times together with large degree of urea removal and/or ultra filtration significantly enhance the incidence of headache, nausea, and vomiting during dialysis.

These symptoms may be apart of dialysis disequilibrium Syndrome (DDS)
Patients who have headaches on dialysis in the absence of hypotension should be investigated about:

- Caffien use, which can sometimes precipitate headache
- Metabolic disturbances (eg, hypoglycemia, hypernatremia, hyponatremia),
- Subdural hematoma
Dialysis disequilibrium Syndrome

- Neurological disorder described in dialysis patients characterized by neurological symptoms of varying severity that are thought to be due to cerebral edema.
- Usually occurs in new patient started on hemodialysis especially with high BUN.
- Other risk factor, severe metabolic acidosis, extremes of age, presence of other CNS diseases like seizure disorders.
Pathogenesis

- A reverse osmotic shift induced by urea removal.
- Fall in intracellular pH.
Clinical Manifestation

- The classic DDS develops **during or immediately after hemodialysis**. Early findings include
  - Headache
  - Nausea
  - Disorientation
  - Restlessness
  - Blurred vision
  - Asterixis
- More severely affected patients progress to confusion, seizures, coma, and even death.
Differential Diagnosis

- Uremia
- Subdural hematoma
- CVA
- Meningitis
- Metabolic disturbances
- Drug induced encephalopathy
Prevention

1. Don’t be enthusiastic
2. Dialysate Na never low even if pt. hyper Na
Treatment

- In general, symptoms of mild DDS are self-limited and usually resolve within several hours.

- Severe forms:
  1. Stop session
  2. I.V mannitol
  3. I.V steroids
  4. Assure patency of airway
  5. Manage fits
Chest and back pain

AE:

- Hypotension
- Dialyzer reaction
- DDS
- Angina
- Hemolysis
- Air or pulmonary embolism (rare).

The decision to continue or stop the dialysis treatment because of chest pain is based upon clinical findings.
Hemolysis

## Causes

- Blood line narrowing
- Dialysate problem (overheating-hypotonic-contaminated)

## Symptoms & Signs

- Chest tightness
- Back pain
- Skin pigmentation
- Ms. Weakness, arrhythmia (hyper K)
- Port-wine blood in venous line with pink plasma
- Fall in hematocrite

## Management

- Stop session, DON’T return blood
- Treat hyper K, anemia
- Hospitalize for observation
Air embolism

- Disconnection of connecting caps and/or blood lines can also lead to air embolism in patients being dialyzed with central venous catheters.

- In the *seated* patient, air tends to migrate into the cerebral venous system without entering the heart leading to loss of consciousness and seizure while in those who are *recumbent*, air tends to enter the heart and then the lungs leading to dyspnea, cough, and perhaps chest tightness.
Treatment:

1. Clamping the venous line and stopping the blood pump
2. Positioning of the patient on the left side in a supine position with the chest and head tilted downward.
3. Cardio-respiratory support
4. The administration of 100 percent \( \text{O}_2 \) by either mask or endotracheal tube
5. The most important aspect of air embolism is prevention by the adequate function of monitoring devices on dialysis machines
THANK YOU