The Anuric Child

David V Milford

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Definition

Oliguria

• urine output <300 mls/m^2/day
• urine output <0.6 mls/kg/hour (infants)

Anuria

• urine output < 100 mls/day (adults)
• urine output < 1 ml/kg/day (child)
Causes of anuria

• The same as causes of AKI
  • Pre-renal - normal tubular and glomerular function; GFR is depressed by compromised renal perfusion (potentially reversible/transient).
  • Intrinsic - vascular catastrophe; diseases of the glomerulus or tubule; secondary to ischaemia or toxic agents/drugs (may be treatable)
  • Post(obstructive) - increase in tubular pressure decreases filtration driving force (potentially reversible/transient).
  • Acute on chronic – acute decline in function superimposed on pre-existing CKD, may or may not be reversible
Causes of anuria

• Disease progression
  – Sclerosing glomerular lesion
Causes of anuria

• Disease progression
  – Sclerosing glomerular lesion

• Iatrogenic
  – Bilateral nephrectomy (cancer, congenital nephrotic, trauma, etc)
The anuric child

• Main tasks for the clinician
  – Make the child safe
  – Take specialist advice
  – Diagnose the cause
  – Treat if necessary and appropriate
  – Arrange safe transfer
Make the child safe - assess

- Chemistry
  - Sodium, potassium, bicarbonate
  - Creatinine, urea, phosphate
- Fluid balance
  - Hypo/hypervolaemia
  - Blood pressure
- Urinary tract – USS is urgent (within 24 hours)
Take specialist advice

• What we want to know
  – History
    • HPC, drugs, family history
  – Current medical condition
    • Hydration, BP, perfusion, focus of illness, urine testing
  – Biochemistry, haematology
  – IMAGING (ultrasound scan, preferably including doppler)
Diagnose the cause

• USS
  – obstruction eg urethral calculus, solitary kidney +PUJO
• Best discriminant AKI v CKD: renal USS
  – CKD: small kidneys, scarred kidneys, cysts, calculi
  – AKI: big, bright kidneys
  – Dilated urinary tract: CKD or AKI
Diagnose the cause

• Obstruction
  – USS eg urethral calculus, solitary kidney +PUJO
• Pre-renal – commonest cause in paediatrics
Oxygen delivery

- Plasma skimming ensures low haematocrit (10%) in vasa recta
- $O_2$ undergoes countercurrent exchange
- Consequence is low $O_2$ delivery to medulla
Oxygen delivery - $pO_2$ from cortex to medulla
Aetiology of AKI 3 in children by age

Diagnose the cause

- Obstruction
  - USS eg urethral calculus, solitary kidney +PUJO
- Pre-renal - commonest
- Renal eg HUS, drug toxicity, immunological disease, interstitial nephritis......
- Acute on chronic
Treat if necessary and appropriate

• Volume depletion
  – 0.45% saline, 10 mls/kg and consider repeat

• Hypoxia

• Hypotension
  – Fluids, inotropes

• Hypertension
  – Usually fluid overload
  – Fluid restriction 30 mls/kg/day
  – Diuretics probably ineffective, try if pulmonary oedema present
Treat if necessary and appropriate

- Hyperkalaemia > 6.0 mmol/L
  - Dietary restriction/exclusion from iv fluids
    - Beware dioralyte!
  - Fully correct acidosis (deficit x weight x 0.6)
  - Potassium shift
    - Salbutamol (inhaled or iv)
    - insulin + dextrose (0.5u/ml in 50% dextrose 1 ml/kg)
  - Increase excretion
    - Furosemide – won’t work if anuric!
    - Calcium resonium 1gm/kg rectally
  - Calcium gluconate if ECG changes present
Treat if necessary and appropriate

• Hyponatraemia
  – Fluid restriction

• Bladder drainage

• Drug therapy
  – Steroids for immunological conditions
  – Use high doses intravenously (10-30 mg/kg)
  – Avoid NSAID, ACEi, ARB
Arrange safe transfer

- Potassium and sodium safe
- Acidosis corrected
- Fluid balance satisfactory
- Blood pressure and oxygenation stabilised
Detection workstream
Report without alert
Send to authorisation Q
If creatinine has increased > 26 umol/L
In < 7 days, consider requesting repeat if CKD unlikely

Is age < 18 years?
YES
NO

Serum creatinine > x3 ULRI?
YES
NO

Has change occurred within 48hrs?
YES
NO

Is D > 26 umol/L?
YES
NO

Serum creatinine > 354 nmol/L?
YES
NO

Is higher RV ratio ≥ 3.0?
YES
NO

Alert! ?AKI 3

Alert! ?AKI 2

Is higher RV ratio ≥ 2.0 and < 3.0?
YES
NO

Alert! ?AKI 1

Is higher RV ratio ≥ 1.5 and < 2.0?
YES

ULRI = upper limit of reference interval

D = difference between current and lowest previous result within 48hrs
BAPN guidelines