

CASE TWO

Short case number: 3_28_02

Category: Renal & Urinary Systems

Discipline: Paediatrics

Setting: General Practice_Rural

Topic: Renal disease_ glomerulonephritis

Case
<p>Indiana Kramer is a 6 year old who has recently completed a course of penicillin for acute tonsillitis. She presents today with her mother. Indiana doesn't seem to have recovered from her tonsillitis. Her fever has settled, but she is lethargic and not eating much. This morning she told her mother that her urine was a different colour and dark. Her mother thinks that she might have an infection and has brought a sample into the surgery. Urinanalysis is positive for blood and protein.</p>

Questions
<ol style="list-style-type: none">1. You are concerned that Indiana has glomerulonephritis, what are the clinical features of acute glomerulonephritis and what is the underlying pathophysiology?2. Indiana's blood pressure is 115/80. Is this normal?3. You decide that Indiana needs further investigation and management and you organise to meet her at the local hospital. In the meantime you ring the visiting paediatrician who recommends investigating for post-streptococcal glomerulonephritis. What investigations would be recommended and what results would suggest post streptococcal GN?4. Outline the management plan for Indiana.5. What are the major complications of acute post streptococcal glomerulonephritis, and outline the underlying pathophysiology?6. Indiana's condition deteriorates with an elevation in her urea and creatinine. The decision is made to transfer Indiana to the Children's hospital as dialysis may be required. Discuss the impact that access to dialysis services can have on the management of children and their families in rural areas.

Suggested reading:

- South M, Isaacs D editors. Practical Paediatrics. 7th edition. Edinburgh: Churchill Livingstone;2012.
- McTaggart SJ. Childhood urinary conditions. Australian Family Physician, vol.34, no 11, Nov 2005. pg 937-941
<http://search.informit.com.au.ipacez.nd.edu.au/documentSummary;dn=365827792516395;res=IELHEA>

ANSWERS

1. You are concerned that Indiana has glomerulonephritis, what are the clinical features of acute glomerulonephritis and what is the underlying pathophysiology?

Clinical features of acute glomerulonephritis (nephritic syndrome):

- macroscopic haematuria
- proteinuria
- acute fluid overload (presenting as oedema/pulmonary oedema/CCF)
- renal impairment (presenting as oliguria/ elevated plasma creatinine)
- hypertension (potentially presenting with headache).

Acute presentation with these clinical features is seen most frequently in post-streptococcal glomerulonephritis and follows 7-14 days after a group A haemolytic strep throat infection and 3-6 weeks after streptococcal skin infection. It is hypothesized that streptococcal antigens deposit in glomeruli with activation of the complement system. Pathological appearance is of proliferation of mesangial and endothelial cells with neutrophil infiltration.

2. Indiana's blood pressure is 115/80. Is this normal?

This is a high reading, at the upper limit of normal, for her age. However normal blood pressure for children varies with gender, age and height and a child should not be regarded as being hypertensive unless three recordings give levels above the 95th percentile for age and height. Range age 5 – 2 years 90-110. Normal upper limit at rest 4 – 7 years 115.

Approximate normal upper limit for pulse, respiratory rate and systolic blood pressure, at rest; resting measurements consistently above these values should arouse suspicion³

Age group	Pulse rate (beats/min)	Respiratory rate (breaths/min)	Systolic BP (mmHg)
0-8 weeks	160	50	70
2-12 months	145	40	85
1-3 years	130	30	100
4-7 years	115	20	115

3. You decide that Indiana needs further investigation and management and you organise to meet her at the local hospital. In the meantime you ring the visiting paediatrician who recommends investigating for post-streptococcal glomerulonephritis. What investigations would be recommended and what results would suggest post streptococcal GN?

Laboratory urinalysis which would show red cell casts and dysmorphic red cells.

³ Roberton DM, South M (Ed). Practical Paediatrics, 6th Edition. Churchill Livingstone Elsevier.2008. McTaggart SJ. Page 518

Elevation of serum urea, creatine and potassium concentrations. Mild normocytic normochromic anaemia is common due to haemodilution due to fluid overload. The results that would suggest post streptococcal GN would be elevated streptococcal markers: ASOT (antistreptolysin O titre) and antistreptococcal DNAase B (anti-Dnase B) are elevated in 90% of cases, can be associated with low serum levels of C3 and possibly C4.

4. Outline the management plan for Indiana.

Indiana should have oral penicillin for 10 days to eradicate any existing streptococcal infection, although this does not alter the natural history of the condition. Then management involves treatment of overload with diuretics and control of hypertension (mild with furosemide and fluid restriction, moderate to severe oral nifedipine or nitroprusside rarely parenteral hydralazine or nitroprusside). Bed rest if elevated blood pressure.

5. What are the major complications of acute post streptococcal glomerulonephritis, and outline the underlying pathophysiology?

Increased glomerular cellularity restricts glomerular blood flow and therefore filtration is decreased this leads to:

- *acute renal failure* with decreased urine output and volume overload,
- *hypertension* which may involve seizures (hypertensive encephalopathy associated with papilloedema and a temporary cortical blindness),
- *oedema*, characteristically around the eyes,
- *haematuria* and *proteinuria* and potentially left ventricular failure related to hypertension and fluid overload.

6. Indiana's condition deteriorates with an elevation in her urea and creatinine. The decision is made to transfer Indiana to the Children's hospital as dialysis may be required. Discuss the impact that access to dialysis services can have on the management of children and their families in rural areas.

The lack of availability of dialysis services can mean having to uproot families in order to obtain necessary medical care. Financial barriers as well as the time involved in travel can increase difficulty of keeping appointments. Can affect general well-being as well as finances. Relocating home and family may solve this access problem but is extremely disruptive, further hindering their quality of life.

While it may not be cost-efficient to distribute chronic care services, such as dialysis, more widely in rural areas there is an argument for doing so to overcome travel barriers.