AMU Clinical Reasoning Session Key Learning Points (22.5.26)

Case 1 Summary

75-year-old lady with dementia & frailty from a care home presented generally unwell with delirium & ?urinary symptoms. She had been treated recently with 2 courses of antibiotics for a suspected UTI in the community. She had a low-grade pyrexia (37.9) with a 3L O2 demand on presentation but otherwise stable obs. Bloods showed WCC 14 & CRP 90. CXR was clear. On examination, she had a clear chest and soft abdomen.

She was treated in ED as for presumed UTI with septic screen and referred to the medical take. The medical team promptly assessed the patient (within 1 hour of referral) and requested CTPA with anticoagulation (given concerns re PE inc. D-dimer 4000). CTPA reported large bilateral PE. Unfortunately, the patient passed away the next morning.

Heuristics (thinking tools) from this case

1. Disproportionate signs

   *Always look for any signs that are **disproportionate to the rest of the clinical context** which can be the first clue / pointer towards the diagnosis. In this case – it was the **3L O2 demand**. Although she may be hypoxic from sepsis – it does not fit neatly with her clear chest & unremarkable CXR prompting a wider think…*

2. Cognitive biasing / anchoring

   *It is human nature to **bias / anchor to a pre-formed diagnosis in our minds.** In this case, the fact that the GP treated the patient with two courses of antibiotics may anchor us to a diagnosis of UTI. From then on, we filter / fit information with a bias towards UTI – we then risk not focusing on the information that may otherwise be pertinent in the diagnostic process.*

3. For & Against Approach

   Using this can show that UTI is not the only diagnosis to consider:

<u>For UTI:</u> recent antibiotic treatment, low grade pyrexia, raised inflammatory markers

<u>Against UTI:</u> 3L O2 demand despite nil chest signs, soft & non-tender abdomen, no objective signs of sepsis on presentation

From this approach, it becomes apparent that UTI is not as likely as it initially appeared. Apply this to the differential of PE and its likelihood is apparent:

*<u>For PE:</u> 3L O2 demand without chest signs**, relative prothrombotic state** (dehydration, recent reduced mobility with infections), no other explanation for hypoxia (assuming nil acute MI on ECG / trop)*

<u>Against PE:</u> infection is more common / statistically more likely than PE, low grade pyrexia & raised WCC / CRP – although this can also occur in PE given its inflammation / infarction.

*The clinical features are **much more hallmark for PE than UTI.***

4. <u>XYZ formula (investigations should change management)</u>

   'I will do X which will show me Y and I will do Z – if you can't get to the Z then reconsider if you need to do X'

   In this case, we discussed whether an ABG (X) would be useful. I would argue it is because it will show us whether the patient is truly hypoxic & how severe (Y) which will influence / help determine the need for CTPA (Z).

   Personally, I am not a fan of D-dimers. It has its limited use in some clinical contexts and also as part of the DIC screen but the problem is virtually anything can raise the D-dimer (and a negative D-dimer does not completely rule out VTE). So, in this case, if the D-dimer (X) was negative / marginal (Y) – would it stop you from requesting a CTPA (Z) – probably not so I would not do it in the first place!

5. <u>Trajectory focus rather than diagnostic obsession</u>

   Often in medicine, it is difficult to predict the diagnosis (it may even be outside of our differential list). It is more important to ask ourselves – what is the patient's trajectory?

In this patient's case, if her ABG showed significant hypoxia and she appeared poorly with her O2 demand, given her age & frailty – she has a poor trajectory. Hence, ***updating her NOK of her guarded prognosis with a DNAR & ward-based care is as important as prescribing anticoagulation and requesting a CTPA.*** *Retrospectively, we can see that she passed away despite timely treatment (decision was made not to thrombolyse her PE prior to her passing due to her prognosis) – this further reinforces the importance of updating her NOK - trajectory planning.*

Imagine, however that the patient was a young 30-year-old lady with bilateral PE – your trajectory planning would be vastly different which demonstrates the ***importance of considering the individual clinical context & ceiling of care.***

6. *Acute vs chronic pathology*

   There are two ways of looking at this case. The first is focusing on the large PE as the acute pathology. The second is perceiving the ***large PE as a consequence / reflective of the patient's overall frailty & poor physiological reserve*** *– I would argue that this is far more accurate / insightful.*

   This is very important as the ***majority of patients we see in ED / AMU / GP are frail & multi-morbid patients whose acute pathology is a consequence of their poor physiological reserve.*** *As such, our focus should be on recognition of their frailty with early discussions on ceiling of care and a conservative approach.*

   Interestingly, I asked if hypothetically the patient in this case had a delay in receiving her first dose of anticoagulation and she passed away – would this have affected the outcome? I would strongly argue that it would not have as this case demonstrates that even with timely anticoagulation the patient still passed away which shows that ***it was not the PE which killed her but her limited reserve to fight the PE (which in turn is the consequence of her limited reserve)***

Structured Teaching from this case

A common theme in this case is frailty and **consideration of ceiling of care.**

Ceiling of care can sometimes be difficult to determine but the following **are 5 key points to consider in its decision-making:**

1. Age & functional status (WHO performance status, CFS)
2. Co-morbidities burden (esp. organ dysfunction / failure)
3. Reversibility of the acute pathology (severity of pathology & reserve to fight)
4. Specific treatment & potential outcome (i.e. I&V, vasopressor, RRT, NIV)
5. Patient / NOK's known wishes

It is **important that all 5 points are considered together** in ceiling of care decisions (none should ever be left out). One point may be the difference between whether you escalate care or not.

For example, if a 78-year-old patient with CFS 4 with co-morbidities presented with decompensated T2RF due to COPD exacerbation – NIV could be considered, whereas if the same patient had T2RF due to severe pneumonia (with COPD) then NIV may not be considered as the potential outcome would be much poorer.

Case 2 Summary

37-year-old gentleman usually fit and well (not overweight) presented with high BP (220 – 230 systolic). Significantly he had AKI 3 (creatinine 400 with GFR 10) with ECG showing LVH. CXR was unremarkable. Asides from a generalised headache for 1/52 (CT head NAD), he was otherwise stable with no focal neurology, systemic signs nor clinical features of organ decompensation. He had normal Hb with nil signs of bleed and was producing urine.

He was initially considered for IV labetalol but due to lack of bed capacity on level 2 care – he was transferred to AMU where he was treated with IV GTN infusion in addition to amlodipine. His BP improved to around 180 systolic and he remained clinically stable. His urine dip showed protein +4 and blood +1 but with normal albumin and nil oedema.

Cardiology reviewed & advised for echocardiogram – continue plan as per Renal with nil need for CCU or transfer. Renal reviewed & advised for renal screen, doppler USS of kidneys and accepted for transfer. Echocardiogram reported cardiac amyloid appearances by the technician.

Heuristics (thinking tools) from this case

1. Problem Representation (PR)

   *This is a very interesting case. Starting with **problem representation** with the 3 questions of Who? When? What? provides a helpful structure:*

   - ***Who** is the patient – demographics, epidemiology, risk factors*
   - ***When** did this happen – pattern of illness inc. duration & temp*
   - ***What** is the clinical syndrome – signs, symptoms, findings*

   *This approach helps to **structure a concise summary** with the key features from which we can formulate appropriate differentials and the steps in management.*

   PR summary of this case:

   A 37-year-old gentleman (ethnicity, background RFs for HTN if known) presented with malignant HTN with 220 systolic (duration unclear) causing AKI & LVH but otherwise no other organ failure or clinical / biochemical / haemodynamic decompensation. The lack of an obvious nephritic or nephrotic process at present would point towards primary HTN with secondary nephrosclerosis +/- hypertensive cardiomyopathy as the root cause, although investigations for secondary causes with renal & endocrine screen is in progress (given urine dip showing proteinuria).

   *You can see how I have used the PR pointers to help summarise the case as above. **PR is dynamic – it can evolve** as you gather more information. Try practicing this approach for future cases and you'll develop!*

2. Hallmark features in clinical context

   *Hallmark features refer to **signs specific to that disease.***

   In this case, ascertain if there are hallmark features of secondary HTN or intrinsic renal pathology such as vasculitis, multi-system signs, renal bruits, Cushing's.

3. Acute vs chronic pathology

   *The key question here is whether the **malignant HTN is the result of progressive untreated BP or an acute phenomenon from a secondary cause.** Hence, the*

*importance of ascertaining the **who and when** – patient's ethnicity, lifestyle and FH (RFs for HTN) and duration of any symptoms. If present then this would be very helpful in suggesting primary HTN with end organ damage.*

4. Hypothesis A vs Hypothesis B (where hypothesis A is the focus)

   *Another helpful way of looking at complex cases is **hypothesis A – which is the main focus as it is statistically & clinically most likely whilst hypothesis B are the rarer and less likely diagnoses.** This helps to structure your thought process & differentials in an orderly & tidy way.*

   In this case, hypothesis A would be primary HTN with end organ damage whilst hypothesis B would be the causes of secondary HTN including intrinsic AKI. You would still rule out hypothesis B but in your mind – hypothesis A would take predominance which is important for communicating & setting expectations to patients / NOK and handing over to healthcare professionals.

5. Disproportionate sign – a red flag or red herring?

   *The report of cardiac amyloid appearance on echo presents an interesting twist (or not) to the case. It is a **disproportionate sign** to the rest of the findings so far – the key question is whether it is a red flag or red herring in the clinical context:*

   - ***'Red herring'** – severe HTN with renal damage (nephrosclerosis) can cause cardiac damage (LVH / cardiomyopathy) that show echo findings that look 'amyloid-like' but is not true amyloidosis.*

   - ***'Red flag'** – if the patient had true amyloidosis, then it would have to be AL amyloidosis (immune / haematological) or ATTR amyloidosis (very rare genetic type). His clinical features and lack of nephrotic syndrome make this less likely (also statistically rare).*

   This leads us onto the next thinking..

6. Show your working (like A level Maths – management process > diagnosis)

   The patient is still awaiting urine PCR, immunoglobulins, myeloma screen (all part of the renal screen). His echo would likely be reviewed by a consultant cardiologist – they may choose to do a cardiac MRI which is more definitive for amyloidosis. Renal biopsy would be useful after renal screen. A strong collateral to see if he has FH of genetic disease / amyloidosis is pertinent.

If it turns out he has true amyloidosis – this is an unexpected finding hence reinforcing why ***'management steps are far more important than the diagnosis / differentials.'***

7. Trajectory focus rather than diagnostic obsession

   The question that was asked – why did Cardiology not want to take over the patient's care whilst Nephrology did? This can be explained ***by trajectory focus*** *– given the lack of decompensated HF and the fact that the BP was slowly settling; Cardiology did not feel the need to transfer the patient to CCU. The main issue of HTN & AKI then interests Nephrology for diagnostic thinking but also bearing in mind that the renal ward can provide dialysis if AKI worsens or patient develops secondary pulmonary oedema needing filtration, hence it is* ***an appropriate environment from both a trajectory & diagnostic point of view.***

   As we become more senior – it is important to focus on the ***patient's trajectory esp. in acutely unwell cases*** *– What is the pattern of decline? Where is the optimal environment for patient care & monitoring? Which specialties must be involved? Or if frail / multi-morbid – thinking of a conservative ceiling of care sooner rather than later.*

Structured Teaching from this case

ABCDE mnemonic for secondary causes of HTN:

- **A**pnoea – obesity related issues (OSA / OHS)
- **B**ruits & Bad kidneys – renal artery sclerosis (atherosclerosis or fibromuscular dysplasia), intrinsic renal disease
- **C**oarctation of the aorta
- **D**rugs & Diet – steroids, cocaine, high sodium intake etc
- **E**ndocrine – Cushing's / Conn's, phaeochromocytoma

When to **suspect secondary HTN** (ED / GP / AMU setting):

- Young age at onset (<40) esp. without obesity or FH
- Severe HTN – rapid progression or malignant HTN
- Resistant HTN – uncontrolled BP despite 3 anti-hypertensives
- Associated features – organ dysfunction (e.g. AKI), systemic signs of disease
- End organ damage out of proportion to duration of HTN

- Sudden AKI after ACEi suggestive of renal artery stenosis

Remember that secondary HTN accounts for only 5-10% of adult HTN but the prevalence is higher in early onset or resistant cases.

AKI (Rule of 3)

3 stages of AKI
Based on creatine rise & urine output:

- AKI 1 = x1.5-1.9 creatinine rise (<0.5ml/kg/ hr urine 6-1hrs)
- AKI 2 = x2-2.9 creatinine rise (<0.5ml/kg/hr urine 12hrs)
- AKI 3 = x3 creatinine rise (anuric for >12hrs)

3 steps of AKI on assessment

- ?Why AKI
- ?Fluid status
- ?Medication (esp. any recent / new)

3 types of AKI

Pre-renal AKI = always give IV fluids!

Due to reduced blood flow to the kidneys (e.g. dehydration, sepsis, D&V, haemorrhage)

Post-renal AKI = always do a bladder scan +/- catheter!

USS KUB if not resolving or AKI 3 and consider Urology review.

Intrinsic AKI = always send a urine dip!

Broadly **3** causes:

1. **Acute Tubular Necrosis (ATN)** – renal hypoperfusion from hypotension or nephrotoxic. Treat the underlying cause / withhold the offending agent. Cast cells can help in diagnosis (but largely clinical suspicion).

   Rule of **3** – 1/3 AKI fully recovers, 1/3 AKI requires dialysis, 1/3 AKI progresses to new baseline CKD (only time will tell!)

2. **Tubulo-interstitial Nephritis (TIN)** – inflammation surrounding the renal tubules. Most commonly due to meds – antibiotics, anti-virals, NSAIDS, PPI, diuretics. Usually good recovery of the AKI.

   Classical features of fever, skin changes, arthralgia, eosinophilia is only seen in 10-15% of cases

3. **Glomerulonephritis (GN)** – divided into **3** subtypes:

   - Nephritic syndrome (**triad** of AKI, haematuria, HTN) - major cause is RPGN (rapidly progressive glomerulonephritis) due to vasculitis. **3** features of rapidly progressive AKI, multi-system pathology, ANCA +ve status.

     IgA nephropathy – **3** features of classically young adults, days following LRTI with IgA levels.

   - Nephrotic syndrome (**triad** of proteinuria with PCR >300 mmol/L, oedema, serum albumin <20). **3** main causes are minimal change disease (commonest in children), membranous nephropathy commonest in adults) and focal segmental glomerulosclerosis (e.g. HIV, HTN, metabolic causes).

   - Mixed syndrome (nephritic & nephrotic) – lupus nephritis, post-streptococcus glomerulonephritis, viral such as hepatitis, amyloidosis are causes.

   Importantly, RPGN with creatinine >400 and pulmonary haemorrhage require urgent **3** treatment with total plasma exchange (TPE), IV immunoglobulins, IV pulsed steroids.

7 indications for urgent Renal referral:

- Hyperkalaemia (usually K >7)
- Uraemic complications (flap, encephalopathy, pericardial rub)
- Severe metabolic acidosis (usually bicarb <15)
- Anuria (>48hrs)
- Refractory pulmonary oedema (cardio-renal)
- RPGN (as stated above)
- AKI with a renal transplant on immunosuppressants