The Weekly Probe

29th July 2016 **Volume 13 Issue 24**

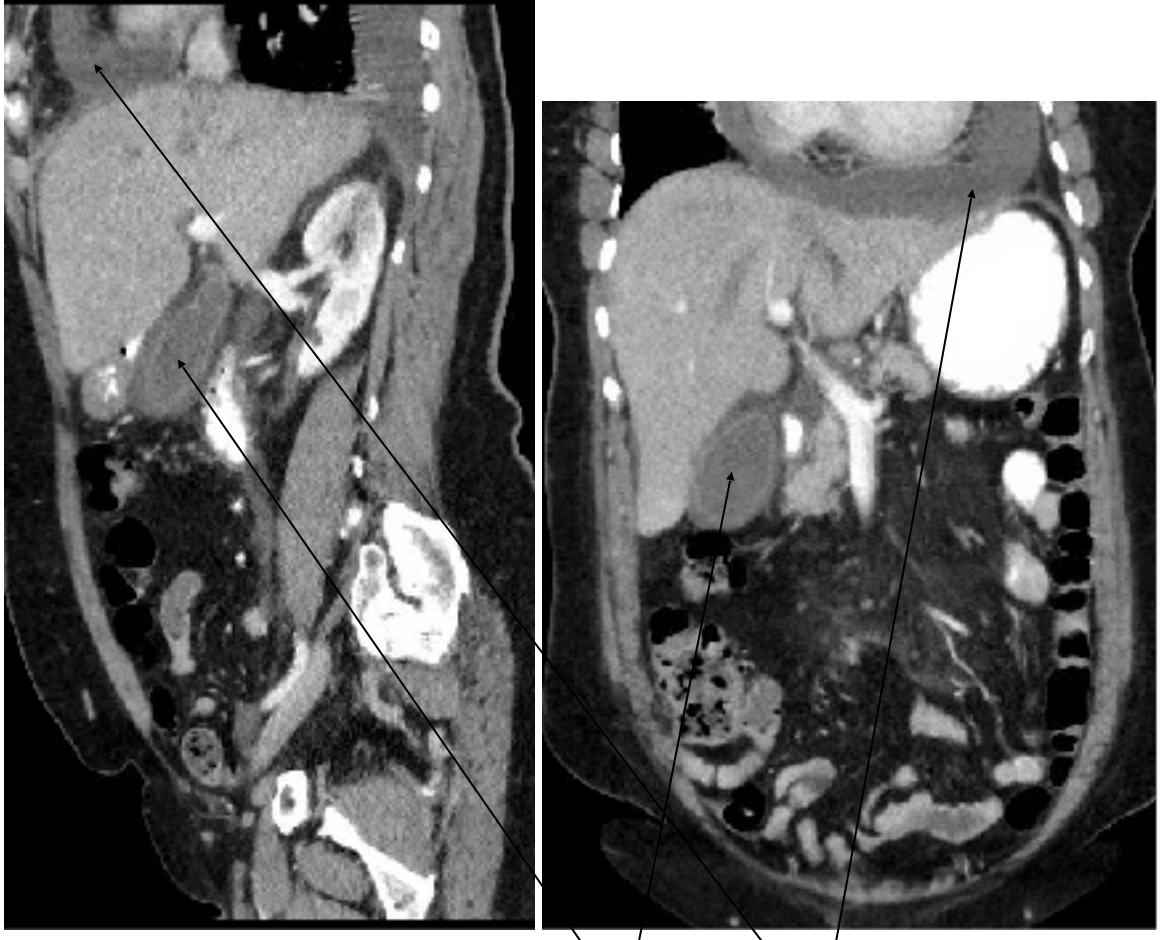
Farewell – Farewell to Marjan who moves after 5 years at Sutho down to “the Gong”. Thanks for all your hard works and all the best for the future.

THIS WEEK

LAST WEEK’S CASE – PERICARDIAL EFFUSION

70yo lady presents with RUQ pain . T 37.7C PR 100 BP 130/80 . Tender RUQ. Bloods then CTs as shown below
What could be going on? Lactate 2.3 bicarb 21 – other bloods normal

Creatinine	H 114 µmol/L
Estimated Glomerular F	* L 42 mL/min/1
Glucose Random	6.4 mmol/L
Bilirubin Total	6 µmol/L
Albumin	39 g/L
Protein	69 g/L
ALP	H 247 U/L
Gamma GT	H 373 U/L
ALT	H 145 U/L
AST	H 138 U/L
Amylase	66 U/L
Lipase.	52 U/L
Haematology	
WCC	8.3 x10^9/L
HB	L 106 g/L
PLT	281 x10^9/L



The CT was reported as showing evidence of “cholecystitis with a thickened GB wall and pericholecystic fluid”. However it also showed a large pericardial effusion with maximal thickness of 2cm.
An echo was performed showing a large pericardial effusion with atrial diastolic collapse and early ventricular diastolic collapse c/w tamponade .
In retrospect the ECG showed low voltage- CXR – cardiomegaly
Her upper abdo US showed pericholecystic fluid with no gallstones and a normal GB wall - the hepatic vv and IVC were dilated. All these changes were consistent with right heart failure.
A pericardial drain was inserted with drainage of 600ml + bloody fluid. DEspoite multiple investigations no cause was found ? viral.

It brings up a couple of points worth discussing.

LIVER CHANGES with HEART FAILURE

Impaired perfusion and oxygenation (including left heart failure) may result in a “ischaemic hepatitis”. Abnormalities in AST / ALT, LDH , PT and associated renal dysfunction are seen and these reach their maximum at ~ 1-3 days

However any cause of right heart failure (eg pericardial effusion, PE , cor pulmonale) results in hepatic congestion which can be associated with:

- Dull right UQ pain associated with liver capsule distension
    - Peripheral oedema, ascites and hepatomegaly (may be pulsatile)
    - Not normally associated with splenomegaly
    - LFT abnormalities can be elevated transaminases (AST or ALT) , or hyperbilirubinaemia yet most important / more common abnormalities are the **GGT** and **SAP** (indicative of cholestasis)- note the mixed picture in this patient

PSEUDOMUPHY’S
Although not relevant to this case, another not uncommon “red herring” is when there is pleural inflammation involving the lower anterior chest eg PE.
On inspiration pain occurs yet as this deep inspiration is often during the assessment of the abdomen, the pain is often described as a positive Murphy’s sign. However when you remove your hand and get the patient to take a deep breath the same pain occurs ie it is not your hand.

Editor: Peter Wyllie

Tying in both points “If there is an abdominal symptom consider the chest and if there is a chest symptom consider the abdomen”.

PERICARDIAL EFFUSION

Lists of causes vary according to the study location yet as a guide from one European study of 322 pts with moderate to large effusions

- ●Idiopathic – 20%
- ●Iatrogenic – 16%
- ●Malignancy – 13 %
- ●Chronic idiopathic effusion – 9 %
- ●Post-acute myocardial infarction – 8%
- ●Uraemia or dialysis – 6 %
- ●Collagen vascular disease – 5 %

(other causes include trauma, heart failure, post pericardiotomy, radiation, hypothyroidism)

Two THP – if you are considering PE , consider pericardial effusion- many have the same risk factors. A significant number have no risk for an effusion

PERICARDIAL TAMPONADE

Tamponade is a life threatening compression of the heart due to pericardial accumulation of blood, fluid, pus or air.

The key factors are :

- The amount and rate of fluid accumulation relative to
- The pericardial stretch +
- The effectiveness of the compensatory mechanisms

With rapid accumulation eg post trauma, the pericardium is unable to stretch before compensation can occur c/w
Slow increase in fluid accumulation may allow 2L + before tamponade occurs

However with any effusion there is a “last drop” phenomena where there is a slow increase in pericardial pressures initially- this develops up to a point where the pressure rapidly increases, and the haemodynamics deteriorate. Similarly there is a rapid decline in pressures (and haemodynamics) during the early stages during pericardial drainage.

Symptoms and Signs

- Early symptoms are often non-specific- including anorexia, cough, dysphagia
- Tachypnoea and dyspnoea on exertion – not an oxygenation issue ie sats normal
- Initial symptoms may relate to one of the complications of the tamponade such as in this case

- Tachycardia is common unless the effusion is secondary to hypothyroidism and with uraemia/ hyperK
- Pericardial rub may be heard with inflammatory effusions
- Quiet heart sounds
- May have shock – absolute or relative to pre-existing hypertension
- JVP distension (without diastolic collapse) with venous distension in the face, head or neck
- Pulsus paradoxus > 10mmHg – get a manual sphyngomanometer- inflate the cuff above systolic and as you deflate the cuff, note when you hear the systolic sounds during expiration only **and** when you hear it both in inspiration and expiration - measure the difference between both these levels. Note that it is not specific to tamponade and certain conditions make it undetectable eg hypotension.
- Beck’s Triad – hypotension , raised JVP and muffled heart sounds – 90% have one ofr more signs yet triad seen in ~ 1/3 of cases – Also note it is a late sign.

Variant Forms

- Low pressure Tamponade – occurs at lower pressures- seen in patients with hypovolaemia (haemorrhagic, post dialysis) – occurs at low pericardial pressures 6-12mmHg
- Localised cardiac Tamponade – due to loculated effusions
- Combined effusions – constrictive pericarditis – may occur with small effusions – mixed clinical, imaging and haemodynamic signs

Investigations:

CXR

- May have cardiomegaly yet need at least 200ml before the cardiac silhouette is affected.
- Tamponade does not cause alveolar pulmonary oedema
- On lateral film , definite pericardial – fat lines are uncommon but are highly specific for large effusions

ECG

- May have low voltage or changes of pericarditis
- Electrical alternans – reflect the swinging of the heart in the pericardial fluid - may affect any or all of the waves or only the QRS. If the QRS is affected, every other QRS complex is of smaller voltage often with reversed polarity

Echo- lots of videos out there esp sites such as **sonospot and ultrasound podcast**

- Moderate to large effusion usually seen – see caveats mentioned above
  - Small effusions (50-100 mL) are only seen posteriorly, typically less than 10 mm in thickness, and only cause minimal separation between the epicardial pericardium and the thicker parietal pericardial sac.
  - Moderate effusions (100 to 500 mL) tend to be seen along the length of the posterior wall but not anteriorly; the echo-free space is 10-20 mm at its greatest width.
  - Large effusions (>500 mL) tend to be seen circumferentially, the echo-free space is greater than 20 mm at its greatest width.
  - Though size is relevant, as mentioned earlier, the hemodynamic consequence of a pericardial effusion is also related to the rate of fluid accumulation.
- Chamber collapse – when intrapericardial pressure exceeds intracardiac pressure there may be collapse of any cardiac chamber. However as the RA and to a lesser extent, the RV are lower pressure and more compliant chambers, they are more susceptible to rises in intrapericardial pressure. As a chamber normally contracts during atrial or ventricular systole, we should focus on what is happening during diastole when the chamber if normally filling
  - •Diastolic collapse of the RA – At end-diastole (during atrial relaxation), the RA volume is minimal, but pericardial pressure is maximal, causing the RA to collapse- when it persists for more than one-third of the cardiac cycle, is highly sensitive and specific for cardiac tamponade.
  - •Diastolic collapse of the RV – RV diastolic collapse occurs in early diastole when the RV volume is still low. Apparently RV diastolic collapse is less sensitive than RA diastolic collapse, but it is very specific for cardiac tamponade
  - •LA chamber collapse – Less common yet more specific
  - •LV collapse – less common due to hiher pressures and muscular wall
- Respiratory variation in volumes and flows – Reciprocal changes in left and right ventricular volumes occur with respiration and, during inspiration, the ventricular and atrial septa move leftward, a process reversed with expiration.
  - Respiratory variation of mitral and tricuspid flow velocities- beyond the scope of this discussion. Go to the US podcast for a demo on this.
- IVC dilatation with lack of respiratory variation

Cardiac Cath- measurement of respiratory pressure changes- on inspiration there is a rise in pressures on the right with a concomitant decrease on the left

TREATMENT

Supportive Mn

- Volume – increasing the volume may help those with hypovolaemia (yet may increase intracardiac pressures worsening haemodynamics)
- Inotropes – theoretically dobutamine can be used to increase contractility and reduce afterload may help yet remember that endogenous adrenergic stimulation is often already maximal.
- Ventilation – avoid positive pressure ventilation as it may reduce cardiac output further
- Chest compressions – minimal effect pre-drainage as there is little room for filling

PERICARDIOCENTESIS

- **Surgical -** advantages of permitting diagnostic pericardial biopsies to be taken and pericardiectomy / pericardial window to be performed- esp if anticipated drain problems eg purulent or haemorrhagic with clots
- **Percutaneous / Needle** – often performed by the cardiology team yet at times the patient may require earlier drainage
  - Echo guidance allows selection of the shortest route to the effusion along with location of the largest collection of fluid and shortest distance from the skin.
    - Apical- is directed under US control parallel with the long axis of the left ventricle towards the aortic valve- 1cm below and lateral to the apex beat.
    - Parasternal insertion- 5th ICS 3-4 cm lateral to the sternal edge to avoid the internal mammary artery and the lingual pneumothorax when too lateral.

    - Subxiphoid – between the xiphoid and left subcostal margin~ 30-45 degrees to the skin aiming for the left shoulder. Roberts quotes a distance of 6-8 cm to the pericardium in adults yet use the US to guide the procedure.
- Monitor the ECG during the procedure – ideally an alligator clip is attached to one of the praecordial (V) leads on the ECG machine (the standard strip monitor may not be sensitive enough)
    - Look for an injury pattern (ST elevation) when the needle contacts the epicardium)
    - PVCs or ventricular arrhythmias may be noted , as may PR elevation or atrial arrhythmias if the atrium is touched
- Pain may be noted during puncture of the pericardium if the patient is awake.
- For large effusions it is recommended to drain fluid in <1000 mL sequential steps to avoid acute right ventricular dilatation, a rare complication.
- **Relative contraindications to pericardial fluid drainage**
    - Severe pulmonary hypertension – In the setting of severe pulmonary hypertension, the pericardial effusion may be preventing significant dilatation of the RV , which may be crucial to supporting the RV. Drainage of the pericardial fluid may lead to loss of this support, causing worsening of RV function and more severe tricuspid regurgitation.
    - Bleeding diathesis/coagulopathy – Consider risks vrs benefits - the subcostal approach should be avoided as bleeding from liver injury can be life threatening.
- **Complications**
    - Dry tap, surgical need for drainage
    - Cardiac – cardiac arrest (2%), dysrrhthmias , vasovagal, venriculatr puncture (~ 1.2-9%)
    - Other organs - PTx, pneumoperitoneum
    - Death – up to 2%

Refs

- Alvarez A , Liver abnormalities in Cardiac Disease and Heart failure *Int J Angiol* 2011;11:135-142
- Up-to-date
- Spodick DH, Acute Cardiac Tamponade *NEJM* 2003; 349:684-90
- Roberts + Hedges , Clinical Procedures in Emergency Medicine

NEXT WEEK'S CASE

A 4yo fully vaccinated previously well girl presents with a non-pruritic rash on the legs. She is well looking with a temp of 37.4C –non-blanching petechial rash as ashown below- no other signs

What is going on ? DDs ? Plan?

JOKE / QUOTE OF THE WEEK

A wealthy and unusually idealistic merchant banker was pottering around the backyard of his mansion when an itinerant handyman came round and asked him if he had any work. Feeling sorry for the fellow, the banker produced 5L of enamel paint and a brush and told the handyman he would like him to go and paint the porch.
An hour later the handyman was back again to collect his earnings. The banker commended him on the speed of his work and handed him $50. As he was leaving the handyman remarked, "By the way it's not a Porsche, it's a Mercedes.

Editor: Peter Wyllie

Carmel tells me that she has joined a new self-help group formed for the treatment of compulsive talkers . It's called On Anon Anon.

Please forward any funny and litigious quotes you may hear on the floor (happy to publish names if you want)

THE WEEK AHEAD
Tuesdays - 12:00 – 13:45 Intern teaching -Thomas & Rachel Moore
Wednesday 0800-0900 Critical Care Journal Club. ICU Conf Room / 12.00-1.15 Resident MO in Thomas & Rachel Moore
Thursday 0730-0800 Trauma Audit. Education Centre / 0800-0830 MET Review Education centre / 1300-1400 Medical Grand Rounds. Auditorium.

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