

USCOM in the Medical Ward – Clinical Case Study 1













The measure of life.

USCOM in the Medical Ward. Clinical Case 1. Breathlessness? Cardiac or pulmonary.

There are a large number of haemodynamic problems that may arise in inpatients, from the point of view of diagnosis, from guiding their therapy, and also for explaining unexpected eventualities.

A 63 year-old man was admitted to the ward with a history of increasing breathlessness over two days. In the past he had suffered a myocardial infarction some four years previously and had been on digoxin and diuretics since that time for treatment of mild to moderate cardiac failure. He also had a history of hypertension for which he was on an ACE inhibitor. In the past he had been a miner and had a long-standing history of chronic obstructive pulmonary disease.

His admission observations are shown below:

-  BP 116/68
-  Pulse 104
-  Resps 28
-  SpO₂ of 88% on 4 l/min O₂ via Hudson mask
-  Temp 37.1
-  He was using his accessory muscles of respiration
-  JVP was clinically elevated
-  The liver appeared enlarged and slightly tender
-  Auscultation revealed widespread crackles throughout both lower and mid zones. There were also widespread rhonchi in all areas
-  CXR showed increased lung markings and a general fluffiness bilaterally
-  Blood gas analysis showed a pH of 7.28, PaO₂ of 68, PaCO₂ of 32, BE -8

This is a typical example of the clinical problem of "is it pulmonary or is it cardiac?"



USCOM in the Medical Ward – Clinical Case Study 1



The measure of life.

If we look at his Uscom results then things begin to make more sense.

		V	ΔV	Avg
11/05/2007 - 4:37:48 PM				
Transducer: 2.2MHz				
Mode: AV				
2	Vpk (m/s)	1.1	0.00	1.1
	SV (cm ³)	67	0.00	59
	FTc (ms)	423	0.00	364
	MD (m/min)	23	0.00	18
	CO (l/min)	6.4	0.00	5.6
	CI (l/min/m ²)	3.5	0.00	3
	SVR (ds cm ⁻⁵)	1310	0.00	1546
	SpO2 (%)	89	0.00	89
	DO2 (ml/min)	1024	0.00	892

His cardiac index is 3.5 which very strongly suggests that this is not cardiac failure.

His stroke volume is a reasonable 67 ml and his Vpk is 1.1 which again suggests that this is not cardiac failure.

His FTc is 423, which is entirely normal, while his MD at 23 suggests a borderline hyperdynamic circulation.

There is no evidence of vasoconstriction as his SVR is 1310.

It is far more likely, therefore, that what we're dealing with here is a primary pulmonary condition. In fact, over the next 24 hours, he developed typical lobar pneumonia.



USCOM in the Medical Ward – Clinical Case Study 1



The measure of life.

In contrast, let's look at a second example with a very similar clinical presentation. If we look at the results they are very different from those of the case above.

		V	ΔV	Avg
1	19/08/2006 - 10:06:29 PM Transducer: 2.2MHz Mode: AV			
2	Vpk (m/s)	0.72	0.00	0.84
	HR (bpm)	86	0.00	83
	MD (m/min)	10	0.00	12
	SV (cm ³)	42	0.00	50
	SVI (ml/m ²)	20	0.00	24
	CO (l/min)	3.6	0.00	4.2
	CI (l/min/m ²)	1.7	0.00	2
	SVR (ds cm ⁻⁵)	2193	0.00	1960
	SVV (%)	49	0.00	38

Perhaps the most obvious finding is that the cardiac index is 1.7 and the cardiac output just 3.6.

The Vpk is only 0.72 which suggests a low myocardial contractility, whilst the MD of only 10 indicates a hypodynamic circulation.

The stroke volume at 42 is clearly low, and when we look at the SVR it is quite apparent that the patient is markedly vasoconstricted. This is very typical of low cardiac output states.

But what about the stroke volume variation?

What does an SVV of 49% mean in this case? Surely it cannot indicate that the patient is severely volume depleted? His FTc was raised at 526 (normal at this age is about 450) indicating a higher than normal preloading. In fact the patient had pulsus alternans, a classical finding in cardiac failure. Again, this is a case of taking the whole clinical picture into account rather than laying too much emphasis on just one single parameter.

