Bilateral adrenal vein sampling

HOSP #	Mr JB	**WARD**	Endocrine Department – CathLab – UCT private Hospital
CONSULTANT	Dr Jody Rusch	**DOB/AGE**	53y Male

Abnormal Result

Upon authorizing blood results I came across a aldosterone result of 23300 pmol/L.

After a moment of brief anxiety, luckily I realized this was part of a series of tests performed by my colleagues in the Department.

Presenting Complaint

Medical complaint: Suspected Conn's disease – right adrenal lesion/ irregular left adrenal gland.

History

The patient was confirmed to have primary hyperaldosteronism.

Unfortunately more information is not known. We were asked to assist with the sampling and the whole history weren't available.

Examination

Not available

Laboratory Investigations

Sample	Time	Episode	Aldosterone result pmol/L	Coritsol result nmol/L	Selectivity Index Cortisol AV/PV	ACR A/C	Lateralisation Index Dom A/C : nonDom A/C	Mean Aldo/Cort RAV	Aldo/Cort LAV
RAV 1	12:23	SA04663261	794	429	0.9	1.9			
RAV 2	12:39	SA04663254	887	520	1.1	1.7			
RAV 3	12:55	SA04663249	771	486	1.0	1.6			
Mean RAV			817.3	478.3	1.0				
LAV 1	12:50	SA04663243	22000	7325	15.3	3.0	1.8		3.0
LAV 2	12:51	SA04663239	23300	8449	17.6	2.8	1.6		2.8
LAV 3	12:51	SA04663234	17900	11550	24.1	1.5	0.9		1.5
Mean LAV			21066.7	9108	19.0		1.4	1.7	2.3
PIVC 1	12:53	SA04663214	865	480	1.0	1.8			
Peripheral 1	11:56	SA04663228	331	146	0.3	2.3			
Peripheral 2	12:35	SA04663189	850	518	1.1	1.6			

Key:	
RAV	Right Adrenal Vein
LAV	Left Adrenal Vein
PIVC	Peripheral Inferior Vena Cava
PFEM	Peripheral Femoral Vein
UTC	Unable to calculate
*	Not assayed in dilution
AV/PV	Adrenal Vein to Peripheral Vein Ratio
ACR	Adrenal to Cortisol Ratio

Mean peripheral	
Aldosterone	865
Cortisol	480

Table 1 – Results and calculations done in Excel.

Other Investigations

Not available for this patient.

Ideally one would need a CT with contrast beforehand to adequately visualize the positions of the adrenal veins, as this may aid in the canulation, especially of the right adrenal vein.

One needs to diagnose hyperaldosteronism (by an appropriate salt loading test) before proceeding to bilateral adrenal vein sampling.

Final Diagnosis

Interpretation

Definition	Formula	Clinical significance
Selectivity index	PCC(side) / PCC (ivc)	>cutoff **confirms canulation** of adrenal vein >3 stimulated >2 unstimulated

Lateralization index	PAC/PCC (dom) : PAC/PCC (non-dom)	>cutoff **confirms laterilization** of hyperaldo secretion >4 stimulated >2 unstimulated
Contralateral suppression index (used if inadequate canulation)	PAC/PCC (non-dom) : PAC/PCC (ivc)	<cutoff (<1 or <0.5 – sources differ) **indicate ipsilateral suppression** and suggest contralateral aldosterone overproduction.

Table 1 – Interpretation of bilateral adrenal vein sampling. PCC: plasma cortisol concentration, PAC: plasma aldosterone concentration, ivc: inferior vena cava or peripheral vein, dom: dominant side, non-dom: non-dominant side.

Selectivity index

Right: 1.0 (mean)

Left: 19.0 (mean)

These two results indicate that the left adrenal has been canulated adequately, but the right vein inadequately.

Lateralization index

Unable to comment because of the inadequate canulation of the right adrenal vein. If determined, it would very likely provide a false result.

Contralateral suppression index

1.5 : 1.8 = 0.8

This falls in between some of the referenced cutoffs (<1 and <0.5)

All of the other samples also fall somewhere in this range. Biochemically, these results suggests inadequate right sided venous sampling (a commonly described problem)

Take Home Message

- Procedure is done in the Cath Lab
- The patient received continuous synacthen infusion – as this improves the sensitivity (or perhaps rather specificity) of the test.
- Done under imaging with contrast used for the localisation of the adrenal gland and adrenal vein
- Sequential sampling technique used, generally > 20 mins infusion
- Multi-disciplinary: nurses, anaesthetist, radiographer, intervention radiologists, students, chemical pathologists
- Difficulty with sampling right side for both patients
- Difficulty with interpreting results – most likely due to inadequate canulation of the right adrenal vein

Some important learning points

1. Adrenal vein sampling may be a valuable tool that is underutilised
2. Careful selection of patients essential – also patient should consent to surgical removal of the affected adrenal before this invasive procedure is initiated
3. Inter-disciplinary approach is necessary
4. Obtaining cosyntroponin (aka synacthen) can be difficult (Section 21), but recommended.
5. Right adrenal access difficult: may require specific imaging. Recommended to start on the right or do simulataneous sampling.
6. Adrenalectomy may be curative or help achieve better control of BP thus decrease associated morbidity and mortality in those with unilateral adenoma

Hyperaldosteronism with Hyperreninaemia in a 15 year old

A case of hyperreninemia and hyperaldosteronism in a 15 year old. The cause will surprise you.

Hyperaldosteronism

HOSP #		**WARD**	Murraysburg Hospital, Female Ward
CONSULTANT		**DOB/AGE**	51 y female

Abnormal Result

Aldosterone: 1380 pmol/L

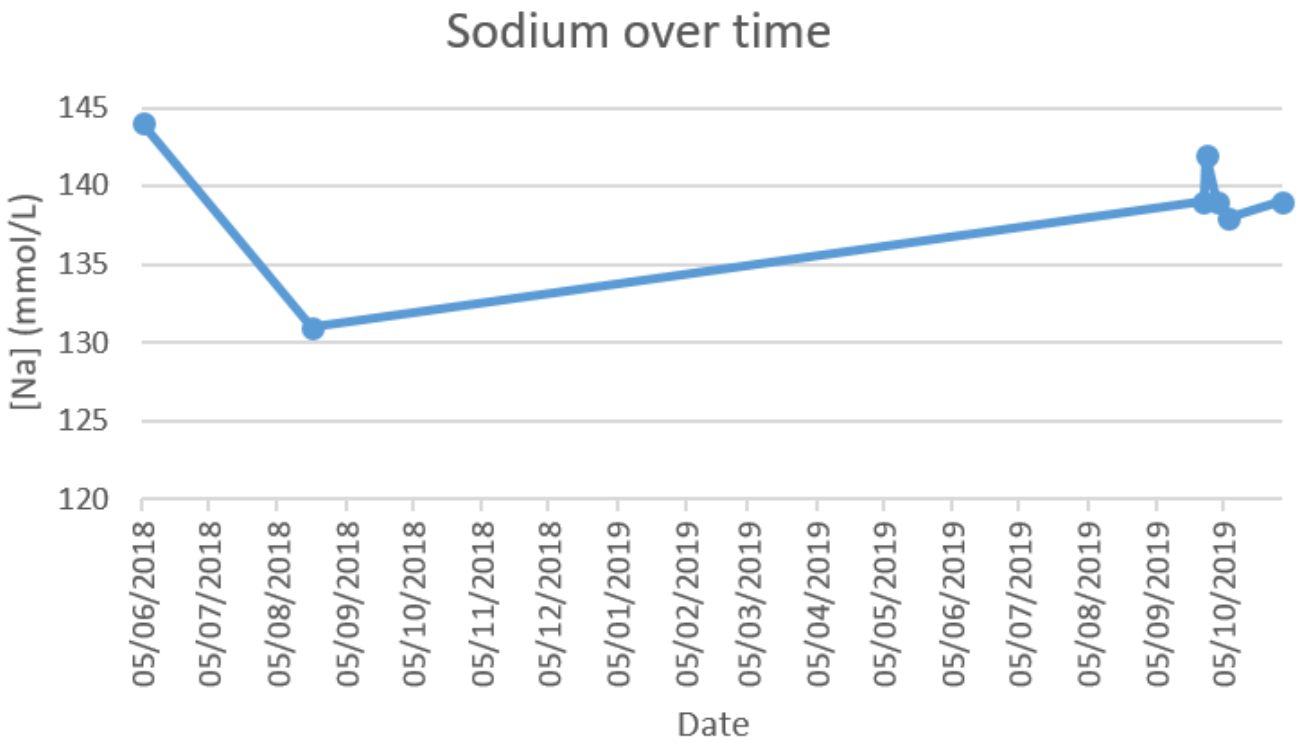
Renin: 2.1 ng/L

Aldosterone: Renin ratio: 657.14 pmol/ng

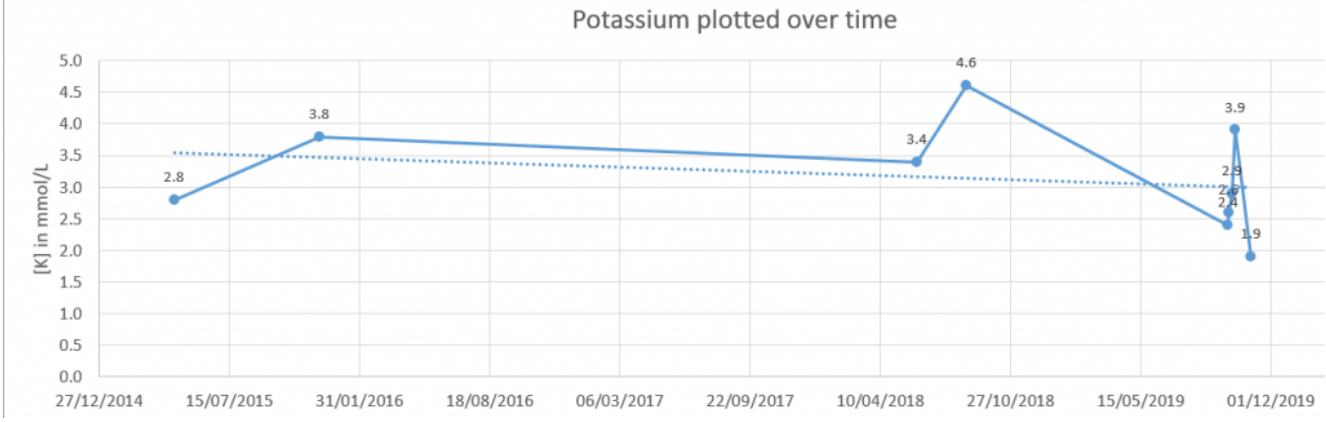
Presenting Complaint

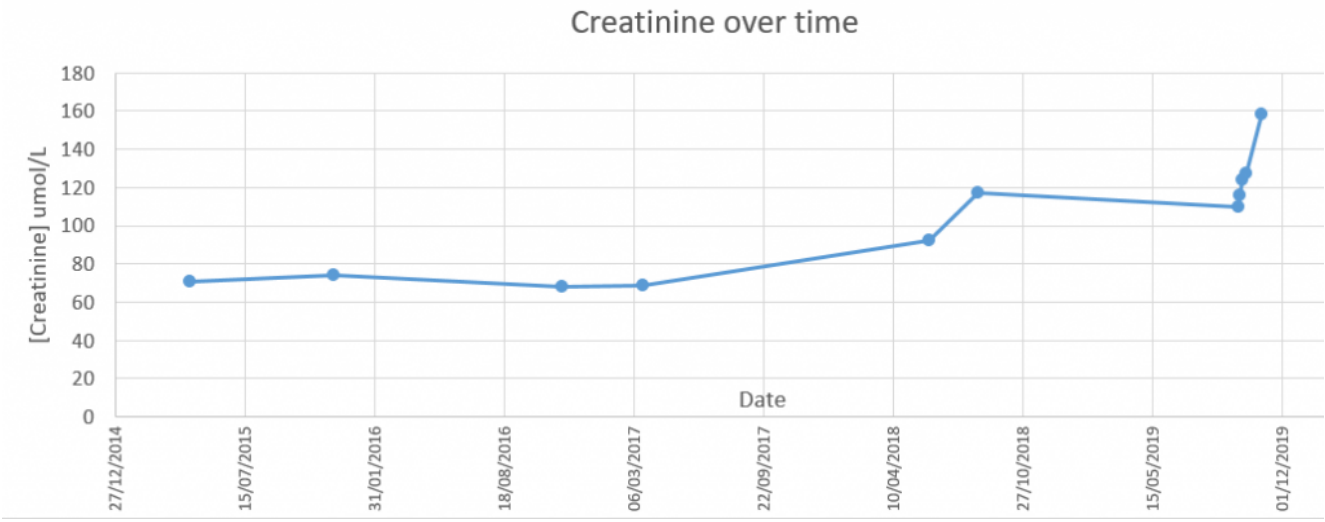
Uncontrolled Hypertension, unresolved on maximum dose of 3 antihypertensives.

History



	31/10/2019	07/10/2019	02/10/2019	27/09/2019	26/09/2019	20/08/2018	05/06/2018	30/11/2015	21/04/2015
K	**1.9**	**3.9**	2.9	2.6	2.4	4.6	3.4	3.8	2.8





Examination

Laboratory Investigations

Hos	Murraysburg Hospital wc MBH	☎ 049 844 0053	Received	07/10/2019	17:57
Wrd	Female Ward	☎	Registered	07/10/2019	17:58
Doc	DR HUMAN	☎		ePR	I Deta

Test Set	Staff Notes	Test Item	Result	Units	Normal Values	Previous Result 1
ALDOS	✓	Aldosterone	1,380.0	pmol/L		
		Patient condition				
		Aldosterone auto comm	ALDO4			
RENIN		Renin mIU		mIU/L		
		Renin ng	2.1	ng/L		
		Aldosterone : renin ratio	657.14	pmol/ng		

Other Investigations

Urine electrolytes

	01/10/2019 15:32
UNa	59
UK	27,5
Ucreat	4,1
Uprotein	0,27
Uprot:creat	0,066

Serum Results

Date	Sodium mmol/L	Potassium mmol/L	eGFR ml/min	GGT U/L	Chol mmol/L	TSH mIU/L	T4 pmol/L	FreeT3 pmol/L	Cort nmol/L
21/04/2015		2,8	>60		5,07				
30/11/2015		3,8	>60		4,53				
15/11/2016			>60		4,04				
20/03/2017			>60		4,36				
05/06/2018	144	3,4	56		4,39	1,79	11,9	5	394
20/08/2018	131	4,6	42						
21/08/2018									
24/08/2018									
26/08/2018									

26/08/2018									
26/09/2019	139	2,4	45			0.81			
27/09/2019	142	2,6	43						
01/10/2019									
02/10/2019	139	2,9	40			CEGK			
03/10/2019									
07/10/2019	138	3,9	38						
31/10/2019	139	1,9	30	28					

Urine metanephrines

Urine collection period	24 h	Reference value
Urine volume	3080 ml	
Ucreat	2,2 mmol/L	
Umetadren	160 nmol/L	
Unormetadren	870 nmol/L	
dUmetadren	493 nmol/24h	152-913
dUnormetadren	2680 nmol/24h	699-2643
Umetadren:cr	73 nmol/mmol creat	17-91
Unormetad:cr	395 nmol/mmol creat	75-309

Final Diagnosis

Primary hyperaldosteronism causing secondary hypertension with accompanying renal injury.

Take Home Messages

Reference Ranges for Aldosterone:

- Upright 70 – 1066 pmol/L
- Supine 49 – 643 pmol/L

Screening for primary hyperaldosteronism: most sensitive when

>350 pmol/L

Reference Ranges for Renin:

- Upright: 2.7 – 27.7 ng/L
- Supine: 1.7 – 23.9 ng/L

Beta-blockers suppress renin levels and should be stopped 2 weeks before testing.

Aldosterone: Renin Ratio:

Most sensitive when the ratio is **>118** pmol/ng.

Effects of hyperaldosteronism

- One's expectation is a high serum sodium, but since it normalizes with an increase in fluid volume, hence hypertension as in this case, there is normal sodium.
- Low serum potassium due to loss in urine, although this can also be normal.
- Increased urine potassium concentration (>30 mmol/L) in a random urine specimen suggests increased mineralocorticoid effect.
- The renin:aldosterone ratio is used to compensate for the increase in aldosterone which is caused by an increase in renin (for instance which is caused by hypovolemia or low blood pressure).
- Some studies recently published are suggesting that the prevalence of hyperaldosteronism are significantly more than was (and is) thought, and hence urinary (24 hour) aldosterone measurement may be more accurate to screen for hyperaldosteronism. The authors of recent estimates of the prevalence of hyperaldosteronism are of opinion that hyperaldosteronism may be the cause of around 10% of unexplained "essential" hypertensives (see attached articles).

Hyperaldo-prevalence-2020Download
Primary-hyperaldo-Editorial-2020Download