A case of renal tubular potassium loss

HOSP #		WARD	Internal Medicine Ward
CONSULTANT	Heleen Vreede	DOB/AGE	86 year old lady

Abnormal Result

Hypokalemia in a 86 year old lady.

Presenting Complaint

Muscle weakness for the preceding 3 weeks.

History

Known with hypertension, dyslipidaemia and chronic kidney disease.

Presented at a private practice with symptomatic hypokalemia. Patient gave a history of 3 weeks body weakness and dizziness and said she hasn’t been eating well for the prior three weeks.

No other symptoms. No previous medical admissions or procedures.

The patient has just had persistent hypokalemia in hospital despite supplementation. The consultant in Internal Medicine attributed her persistent CMP disturbances to refeeding type syndrome.

In the hospital admission the patient was receiving:

- Simvastatin 20mg dly PO
- Calcium carbonate (1g elemental Calcium) q8h PO

- SlowMag 2 tabs daily PO
- Metoclopramide 10mg q8h PO

Examination

Not available

Laboratory Investigations

Test Set	Test Item	SA03801810 20/03/2020 11:32	SA03801444 20/03/2020 09:10	SA03798028 19/03/2020 10:26	SA03795423 18/03/2020 19:02	SA03792676 17/03/2020 22:41	SA03792001 17/03/2020 15:35	XD02468263 08/04/2019 19:38	XD02422201 11/03/2019 19:55	XD01027026 07/02/2017 23:36
NA	Na	138	RCLOT	137	δ+ 137	132 L				
K	K	●δ+ 3,4 L	RCLOT	2,6 L	δ+ 2,7 L	2,2 L				
UREA	Urea	● 10,5 H		13,7 H	16,8 H	19,2 H				
CRT	Creat	150 H	RCLOT	184 H	193 H	210 H			69	65
CRT	MDRD	29	RCLOT	23	21	19			>60	>60
CRT	CKDEPI	27	RCLOT	21	20	18				
CRT	Comment	CM	RCLOT	CM	CM	CM			MDRD1	MDRD1
HBA1C	HbA1c (NGSP)									5,6
HBA1C	HbA1c (IFCC)									38
HBA1C	Est. ave glu									6,3
HBA1C	Comment									GHBC3
OSMO	Osmolality			298 H						
CA	Ca	1,97 L		2,08 L		2,23				
MG	Mg	●δ- 0.73		δ+ 1,12 H		0.80				
PO4	Phos	● 0.49 L	RCLOT	0.61 L		0.73 L				

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UNA	U Na		● 99				48			
UK	U K		● 37,1				53,1			
UCL	U Cl		● 114							
UPO4	U phos		● 2,24							
CCOM	Comment		♦	♦						

Other Investigations

Transtubular Potassium Gradient (TTKG)

TTKG (Transtubular potassium gradient)…… 8.16

TTKG values between 8 and 9 are considered normal in patients with a normal diet.

TTKG >/= 3 in hypokalemia suggests renal potassium wasting.
Ref: Ethier JH et al. Am J Kidney Dis. 1990 Apr;15(4):309-15. The transtubular potassium concentration in patients with hypokalemia and hyperkalemia.

Values used for calculation:

Urine K…… 37.1 mmol/L
Serum K……. 3.4 mmol/L
Urinary Osmol …… 396 milliosmoles
Plasma Osmol ……. 296 milliosmoles

Fractional Excretion of Potassium (FEK)

FEK ……. 45 %
Tubular reabsorbtion of potassium (1-FEK)….. 55 %

Values used for calculation:
Urine K…….. 37.1 mmol/L
Serum K…… 3.4 mmol/L
Urine Creatinine ……. 3.6 mmol/l
Serum Creatinine ……. 150 umol/l

Final Diagnosis

Take Home Message

A study by Elisaf, M & Siamopoulos, KC (Postgrad Med J 1995; 71: 211-212), clearly showed that in patients with hypokalaemia of extrarenal origin FEK is less than 6.5%, i.e. a FEK more than 6.5% is indicative of inappropriate potassium loss. FEK was more than 9% in all patients with hypokalaemia of renal origin.
The study concluded that in hypokalaemic patients with normal renal function, FEK is a useful tool in the diagnostic approach of hypokalaemia.

Limitations: A random urine sample was used to determine these values. Ideally a 24 hour urine collection should be used and theoretically should provide a more accurate estimation of tubular function. The fractional excretion of potassium is however inherently normalized to creatinine.
No clinical info / medication history was supplied. The most likely cause of inappropriate potassium loss in the urine is medication (iatrogenic) like diuretics and some antihypertensives. Ideally, if a pathogenic, rather than iatrogenic cause of potassium loss is suspected, the patient needs to be free of potassium supplementation and all medication which could influence tubular function must be stopped before analysis of the renal tubular electrolyte handling.