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Case Study: The use of Renastart™ as a modular feed as part of the dietary management of paediatric Chronic Kidney Disease (CKD)

Written by a Paediatric Renal Dietitian, Specialist Paediatric Renal Centre, UK

Patient Details & Medical History

Age:
6 years

Gender:

Diagnosis:
CKD stage 5

Medical History:

Initially presented at age 4 with vomiting, diarrhoea and anaemia. Echogenic kidneys on ultrasound, diagnosis of nephronophthisis, CKD stage 4. Progressed to CKD stage 5 at 5 years of age.

Relevant history:

Anthropometry: History of growth faltering between -4SD and -5SD on centile chart[1] for weight. Height fell from 0.4th centile to -4SD from age 4 to 6 years. Now on -3SD for both weight and height.

Biochemistry while on haemodialysis:

Urea	Potassium	Phosphate	Creatinine
28 mmol/L ↑	6.0 mmol/L ↑	1.93 mmol/L ↑	515 umol/L ↑

Feeding history: Unsafe swallow. Initially fed via a nasogastric tube (NGT) and then had a gastrostomy inserted. Currently receiving an amino acid formula due to chronic vomiting. Phosphate binders given during gastrostomy feed.

Medication	Reason for use
Calcium acetate	Phosphate binder
1-alfacalcidol	Vitamin D supplement
Cholecalciferol	Vitamin D supplement
Lactulose	To manage constipation
Erythromycin	Prokinetic
Lansoprazole	Anti reflux medication – to manage retching

Dietetic Assessment

Anthropometry:

Weight 12.5 kg (<0.4th centile)[1]
Height: 103 cm (<0.4th centile)[1].

Overall aim/goal:

To improve nutritional status and increase weight and height towards the 0.4th centile whilst managing serum urea, potassium and phosphate levels.

Nutritional Requirements/assessment:

Minimal oral intake. Majority of nutritional requirements fed via enteral tube.

Requirements based on a height age of 4 years.

Estimated Average Requirement (EAR)[2]:

81 kcal/kg + 20-50% for catch up growth: 97 kcal/kg-120 kcal/kg = **1200 kcal-1500 kcal**

Protein Reference Nutrient Intake (RNI)[2]:

20 g protein per day (+0.1 g/kg for HD losses[3]) = **21 g or 1.68 g/kg protein**

Dietetic Intervention:

Moved to jejunal feeding due to poor growth and ongoing vomiting. A low potassium feed was trialled for a short period of approximately 7 days as a means of reducing dietary potassium intake due to hyperkalaemia. Bloods were checked regularly throughout this period and the feed was tolerated well.

A modular feed was then devised consisting of a low potassium feed, a high energy paediatric feed and a glucose polymer as shown in the table below. This feed was devised to ensure nutritional requirements were met whilst still continuing to manage serum potassium and phosphate levels. This feed provided 1.81 kcal/ml and 3.1 g protein / 100 ml.

Feed	Quantity	%
2.4 kcal/ml high energy paediatric feed	288 mls	36
Low potassium feed (Renastart)	80 g	10
Glucose polymer powder	86 g	12
Water	up to 800 mls	42
Total	800 mls	

The patient managed 500 ml - 600 ml of the feed per day, providing 80 kcal/kg and 1.4 g/kg protein. The phosphate binders were discontinued due to serum phosphate levels being managed via dietary means i.e. the use of a low electrolyte feed.

Monitoring:

The patient was reviewed regularly and the amount and proportions of the low potassium feed, the high energy paediatric feed and the glucose polymer were adjusted based on serum potassium, phosphate and urea levels. This ensured additional calories were provided without exceeding protein requirements and whilst managing serum potassium and phosphate levels.

Results

Monitoring/review:

Once stable, the patient attended hospital monthly for regular monitoring of urea and electrolyte levels, height, weight, nutritional intake, medications and clinical status.

Outcome measures:

- ✓ Weight was maintained along her growth trajectory during end stage kidney disease.
- ✓ Serum urea, potassium and phosphate levels were managed within acceptable limits when Renastart was used as part of a modular feed.
- ✓ Support was provided to the patient and parents by ensuring the dietetic plan was as simple as possible, to aid overall quality of life.

Discussion

Main findings: Renastart can be used in conjunction with a 2.4 kcal/ml high energy paediatric feed to ensure protein intake is not exceeded, and serum potassium and phosphate levels are managed.

Limitations / challenges: The child struggled with gastro-intestinal tolerance to the feed and the desired volume (of approximately 800 mls) could never be achieved. Although oral intake was minimal, the types of food consumed varied (for example some high in phosphate vs nil phosphate) which potentially affected her blood results.

Identified learning: When a child is in end stage kidney disease, it is difficult to achieve the desired weight gain with catch up growth. It can be more realistic to aim to maintain their nutritional status, manage symptoms and optimise biochemistry. This child started to gain weight and grow successfully following a renal transplant at 7 years of age.

Conclusions

Devising a modular feed including a low potassium feed can help ensure energy and protein requirements are met whilst managing serum potassium and phosphate levels in those children with CKD. Growth maintenance is achievable in patients with end stage renal disease but achieving catch up weight gain and growth can be more challenging.

Key Learning Points

- Have realistic goals for weight and height in children with CKD stage 5.
- Regular reviews both in the hospital setting and via telephone are essential to ensure optimal monitoring and support for the family.
- Regular review of oral intake and medications is important as a child's intake and adherence with both can vary.

References

1 RCPCH. 2012. UK-WHO growth charts - 2-18 years. [online]. Available from: **https://www.rcpch.ac.uk/resources/uk-who-growth-charts-2-18-years**

2. Great Ormond Street Hospital for Children NHS Trust. 2018 Nutritional Requirements for Children in Health and Disease. Great Ormond Street.

3. National Kidney Foundation. KDOQI Clinical Practice Guideline for Nutrition in Children with CKD: 2008 Update. American Journal of Kidney Diseases. 2009; 53(S2): S1-S124.

This information is intended for use by Healthcare Professionals only.

Renastart is a Food for Special Medical Purposes. Must be used under strict medical supervision with regular monitoring of nutritional status and electrolyte levels. For enteral use only. Not suitable as a sole source of nutrition.

Vitaflo™

A Nestlé Health Science Company

Vitaflo International Ltd, Suite 1.11, South Harrington Building,
182 Sefton Street, Brunswick Business Park, Liverpool, L3 4BQ, UK.

Tel: +44 (0)151 702 4937

www.vitafloweb.com

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