

The Use of Vitamin D (Colecalciferol) in Chronic Kidney Disease (CKD) stages 3-5

INTRODUCTION:

Vitamin D regulates calcium and phosphate absorption and metabolism, which is essential for healthy bones and muscle development. It may also help to maintain a healthy immune system and regulate cell growth and differentiation. The main source of vitamin D is from the action of UVB sunlight on the skin, which results in the formulation of vitamin D₃ (colecalciferol). The rest comes from the diet as either vitamin D₂ (ergocalciferol) from plant sources or vitamin D₃ from animal sources. Vitamins D₂ and D₃ must undergo hydroxylation, first in the liver to form 25-hydroxycholecalciferol (25OHD), then a further hydroxylation in the kidney to form 1 α , 25-dihydroxycholecalciferol (1 α ,25(OH)₂D).^{1,2}

Extensive covering with clothing or failure to spend time outdoors decreases skin synthesis of vitamin D and increases likelihood of primary vitamin D *deficiency*, as does a diet inadequate in vitamin D. In adults, vitamin D insufficiency can be asymptomatic or may present with onset of non-specific musculoskeletal aches, and deficiency is associated with generalised weakness, bone pain and fractures.^{1,2}

In CKD there is a greater prevalence of native vitamin D deficiency at stages 3 to 5^{1,2}

RANGES³

- Deficiency <30 nmol/L
- Insufficiency 30 - 80 nmol/L
- Replete 80-150 nmol/L
- Possibly toxic >150 nmol/L

Note there is debate nationally regarding the ranges for replete and insufficiency. These are the ranges used by the Renal Unit at Barts health.

Dosing for deficiency:

The regimen depends upon the patient and clinicians preference. The physician will take into account factors such as adherence and compliance.

Regimen 1:

20,000 UNITS weekly of colecalciferol, for 6 months and review⁴
Bone profile at month 3, repeat vitamin D level at 6 months.

Regimen 2:

4,000 UNITS daily of colecalciferol for 1 month, then reduce to 2000 UNITS daily thereafter.⁵
Review at 6 months. Bone profile at month 3, repeat vitamin D level at 6 months.

If at 6 months the patient is:

Replete:

- Continue colecalciferol 1000 UNITS daily indefinitely. Measure Vitamin D levels and bone profile at 6 months.

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Still Deficient:

- Check adherence with patient.
- Consider 40,000 UNITS weekly.

Bone profile at month 3, repeat vitamin D level at 6 months

MONITORING AND PRESCRIBING.

The Renal unit at Bartshealth will be responsible for monitoring the patient's biochemistry for patients with a eGFR <45mls/min. This guideline is only for use in patients with CKD 3 to 5, and is not applicable to other patient groups.

Primary care would be responsible for the prescribing.

The hospital are responsible for alerting the GP if the Vitamin D is to stop or the dose is to change.

The supplementation would be stopped if the following problems develop:

- Hypercalcaemia
- Kidney stones
- 25-hydroxyvitamin D is above 'replete' reference range-see advice from local nephrology services.

ADVERSE EFFECTS

- Early: weakness, headache, dry mouth, constipation, muscle pain.
- Late: polyuria, polydipsia, nocturia, weight loss, irritability, conjunctivitis (calcific), generalised vascular calcification, nephrocalcinosis.
- Symptoms of hypercalcaemia e.g. anorexia, nausea, vomiting, diarrhoea, confusion

CAUTIONS

- Concomitant treatment with phenytoin, barbiturates or corticosteroids can reduce the effect of colecalciferol by decreasing its half-life.
- The effects of digoxin and other cardiac glycosides may be accentuated by supplementation with calcium and vitamin D. Medical supervision will be provided by secondary care when needed where monitoring of ECG and calcium concentrations will be conducted.
- Increased risk of hypercalcaemia with concomitant thiazide diuretics.
- Careful assessment of risk versus benefit should be carried out before use during pregnancy and breastfeeding.

NOTE: The nephrologists will take into account any potential drug interactions, and adjust the doses accordingly.

The preparation of vitamin D (Colecalciferol) used will be up to the individual CCG. GPs should check their local CCG guidance regarding the recommended brand.

REFERERNCES

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Pearce and Cheetham. Diagnosis and management of vitamin D deficiency. BMJ (2010) vol. 340 pp. b5664

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