calcitriol (kal-si-trye-ole)
1,25–dihydroxycholecalciferol, Calcijex, Rocaltrol

Classification
Therapeutic: vitamins
Pharmacologic: fat-soluble vitamins

Pregnancy Category C

Indications
Management of hypercalcemia in patients undergoing chronic renal dialysis (IV and PO). Treatment of hypercalcemia in patients with hyperparathyroidism and resulting metabolic bone disease in predialysis patients with incident to severe chronic kidney disease (2G 15–55 mL/min) (PO only).

Unlabeled Use: Rickets.

Management of hypocalcemia in premature infants.

Action
Calcitriol is the active form of vitamin D. Promotes the absorption of calcium and decreases parathyroid hormone concentrations. Therapeutic Effects: Treatment and prevention of deficiency states, particularly bone manifestations. Improved calcium and phosphorous homeostasis in patients with chronic kidney disease.

Pharmacokinetics
Absorption: IV administration results in complete bioavailability; well absorbed following oral administration.

Distribution: Crosses the placenta and enters breast milk.

Protein Binding: 99.9%.

Metabolism and Excretion: Undergoes enterohepatic recycling and is excreted in bile.

Half-life: 5–8 hr (with normal renal function); 16–22 hr (chronic renal failure).

TIME/ACTION PROFILE (effects on serum calcium)

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<th>ROUTE</th>
<th>ONSET</th>
<th>PEAK</th>
<th>DURATION</th>
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<td>IV</td>
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Contraindications/Precautions
Contraindicated in: Hypersensitivity; Hypercalcemia; Vitamin D toxicity; Concurrent use of magnesium-containing antacids or other vitamin D supplements; Faintness; Potential for serious adverse reactions in infant.

Use Cautiously in: Patients receiving digoxin; OB: No adequate, well-controlled studies; use only if benefit outweighs potential risk to fetus.

Adverse Reactions/Side Effects
Seen primarily as manifestations of toxicity (hypercalcemia)

CNS: headache, somnolence, weakness.

EENT: conjunctivitis, photophobia, rhinorrhea.

CV: arrhythmias, hypertension.

GI: abdominal pain, anorexia, constipation, dry mouth, liver function test elevation, metallic taste, nausea, pancreatitis, polyphagia, vomiting, weight loss.

GU: albuminuria, azotemia, decreased libido, nocturia, polyuria.

Derm: pruritus.

F and E: hypercalcemia.

Local: pain at injection site.

Metab: hyperthermia.

MS: bone pain, metastatic calcification, muscle pain.

Misc: allergic reactions (pruritis, rash, urticaria).

Interactions
Drug-Drug: Cholestyramine, colestipol, or mineral oil [absorption of vitamin D analogues]. Use with thiazide diuretics may result in hypercalcemia. Corticosteroids [effectiveness of vitamin D analogues]. Use with digoxin [risk of arrhythmias]. Concurrent use of magnesium-containing drugs may lead to hypermagnesemia. Calcium-containing drugs may [risk of hypercalcemia]. Concurrent use of other Vitamin D supplements [risk of hypercalcemia].

Drug-Food: Ingestion of foods high in calcium content may lead to hypercalcemia.

Route/Dosage

**Hypocalcemia During Dialysis**

**PO (Adults):** 0.25 mcg/day or every other day; if needed, may be increased by 0.25 mcg/day at 4–8 wk intervals (typical dosage 0.5–1 mcg/day).

**PO (Children 10 kg):** 0.05 mcg/kg/day; 10–20 kg 0.1–0.15 mcg/kg/day; >20 kg 0.25 mcg/kg/day.

**IV (Adults):** 0.01–0.05 mcg/kg every other day, 0.05–0.1 mcg/kg 3 times weekly during dialysis. May be increased by 0.25–0.5 mcg/kg at 2– to 4-wk intervals (typical maintenance dose 0.5–1 mcg/kg 3 times weekly).

**IV (Children):** 0.01–0.05 mcg/kg 3 times weekly during dialysis.
Hypoparathyroidism

PO (Adults and Children ≤6 yr): 0.25 mcg/day initially; if needed, may ↑ dose by 0.25 mcg/day at 2–4 wk intervals (typical dosage: 0.5–2 mcg/day).

PO (Children >6 yr): 0.25–0.75 mcg/day.

Predialysis Patients

PO (Adults and Children): 0.25 mcg/day; if needed, may ↑ dosage up to 0.5 mcg/day.

Rickets

PO (Adults and Children): Vitamin D-dependent—1 mcg daily; Vitamin D-resistant—initial 0.015–0.02 mcg/kg daily; range: 0.03–0.06 mcg/kg daily; maximum dose: 2 mcg daily.

PO (Children): 1–5 yr—0.25–0.75 mcg/day.

Hypocalcemia in Premature Infants

PO (Neonates): 1 mcg daily for first 5 days of life.

IV (Neonates): Tetany—0.05 mcg/kg daily for 5–12 days.

NURSING IMPLICATIONS

Assessment

● Assess for symptoms of vitamin deficiency prior to and periodically during therapy.

● Assess patient for bone pain and weakness prior to and during therapy.

● Observe patient carefully for evidence of hypercalcemia (paresthesia, muscle twitching, Laryngospasm, colic, cardiac arrhythmia, and Chronitis or Tromatia’s sign). Protect symptomatic patient by raising and padding side rails; keep bed in low position.

● Children: Monitor height and weight; growth arrest may occur in prolonged high-dose therapy.

● Lab Test Considerations: Serum calcium and phosphorus concentrations should be drawn twice weekly during initial therapy. Serum calcium, phosphorus, magnesium, alkaline phosphatase, and intact PTH concentrations should then be monitored at least monthly.

● The serum calcium times phosphate product (Ca X P) should no exceed 70 mg²/dL² (patients may be at ↑ risk of calcification).

● May cause ↑↑↑ Holter evidence.

Phosphorus and Overdose: Toxicity is manifested as hypercalcemia, hypercalciuria, and hyperphosphatemia. Assess patient for appearance of nausea, vomiting, anorexia, weakness, constipation, headache, bone pain, and musculoskeletal pain. Late symptoms include polyuria, polydipsia, photophobia, diarrhea, irritability, and cardiovascular arrhythmia. Notify physician or other health care professional immediately if these signs of hyperparathyroidism (D) occur. Treatment usually consists of discontinuation of calcitriol, a low-calcium diet, use of calcium-dioxyapatite in peritoneal dialysis patients, or administration of a bisphosphonate. Hypercalcemia may be ordered to increase urinary excretion of calcium. Hemodialysis may also be used. If patient has hyperparathyroidism, treatment with an oral phosphate-binding agent (e.g. calcium acetate, vesidate, lanthanum carbonate) may be needed.

Potential Nursing Diagnoses

Imbalanced nutrition: less than body requirements (Indications)

Implementation

● PO: May be administered without regard to meals. Measure solution accurately with calibrated dropper provided by manufacturer. May be mixed with juice, cereal, or food, or dropped directly into mouth. Capsules and solution should be protected from light.

● PO: Liquid may be withdrawn from capsules with a needle and syringe. Both the 0.25 mcg and 0.5 mcg capsules contain 0.17 mL.

● Direct IV: Administer by rapid injection through the catheter at the end of a hemodialysis period.

Patient/Family Teaching

● Advise patient to take medication as directed. Take missed doses as soon as remembered, unless almost time for next dose; do not double up on doses.

● Review diet modifications with patient. Renal patients must still consider renal failure diet in food selection. Health care professional may order concurrent calcium supplement.

● Encourage patient to comply with dietary recommendations of health care professional. Explain that the best source of vitamins is a well-balanced diet with foods from the 4 basic food groups and the importance of sunlight exposure.

● Patients self-medicating with vitamin supplements should be cautioned not to exceed RDA. The effectiveness of megadoses for treatment of various medical conditions is unproved and may cause side effects.
CONTINUED

calcitriol

- Advise patient to avoid concurrent use of antacids containing magnesium.
- Review symptoms of overdose and instruct patient to report these promptly to health care professional.
- Emphasize the importance of follow-up exams to evaluate progress.

Evaluation/Desired Outcomes

- Normalization of serum calcium and parathyroid hormone levels.

Why was this drug prescribed for your patient?