

# Supplementary File

Supplementary 1, joint protocol for perioperative calcium management:

## Prevention and treatment of hypocalcemia following total or completion thyroidectomy in children, joint protocol for perioperative calcium management UMC Utrecht, UMC Groningen and Amsterdam UMC

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### Introduction

The most common complication of thyroid surgery in children is postoperative hypoparathyroidism, causing hypocalcemia (incidence 10.0% - 34.5%)<sup>1-4</sup>. Postoperative hypocalcemia can be transient or permanent.

Symptoms of hypocalcemia develop around a concentration of ionized calcium of <0.9mmol/L. However, the threshold for developing symptoms is variable and is also dependent on the rate of decline.

Neuromuscular symptoms are typically prominent:

- ☐ Paresthesias (tingling sensations in hands, feet, around the mouth), spasms, and cramps.
- ☐ Prolonged QT interval
- ☐ Tetany
- ☐ Seizures, laryngospasm, arrhythmia, and heart failure (in severe cases)

To prevent deep hypocalcemia warranting intravenous calcium supplementation or admission to the ICU, all children undergoing total or completion thyroidectomy are prescribed alfacalcidol three days preoperatively and at least until day 4 postoperatively<sup>5</sup>. **Additionally, 25OH-vitamin D levels should be monitored timely in the outpatient setting** to allow for supplementation if necessary.

Postoperative ionized calcium levels are assessed using capillary blood rather than total calcium to enhance patient comfort. Be aware that ionized calcium is sensitive to other factors, such as hyperventilation. In case of doubt, consider measuring and monitoring total calcium.

### Definition of postoperative hypocalcemia:

Postoperative hypocalcemia is defined as ionized calcium below 1.10 mmol/L.

## Perioperative laboratory assessments

Note: Outpatient assessment of 25OH vitamin D levels is required, and supplementation should be provided in case of deficiency (see below for supplementation schedule). Additionally, it is advised to consume at least two dairy products per day.

**Main laboratory test** = 25OH vitamin D, phosphate, corrected total calcium, ionized calcium, PTH, TSH, FT4. Additionally, for cases of thyroid carcinoma, thyroglobulin and thyroglobulin antibodies should be tested, and for MEN syndrome, calcitonin should also be included.

**Minor laboratory test** = ionized calcium

### Sampling moments:

- |                                                                                      |                                          |
|--------------------------------------------------------------------------------------|------------------------------------------|
| • Preoperative:                                                                      | Main lab                                 |
| • Immediately postoperative:                                                         | Minor lab + PTH (from IV line in the OR) |
| • At least 3, 6, 12, 24 hours postoperative:<br>(subsequent tests only if indicated) | Minor lab                                |
| • Before discharge:                                                                  | Minor lab                                |
| • Day 5 - 10:                                                                        | Minor lab + phosphate + PTH + FT4 +TSH   |

In case of postoperative hypocalcemia requiring additional supplementation, adjust calcium monitoring in consultation with the attending pediatric endocrinologist.

## Medication

### Preoperative (after outpatient main lab sampling):

In case of **vitamin D deficiency**:

Vitamin D < 30 nmol/L: Start supplementation with cholecalciferol 3000 – 6000 IU once daily.

Vitamin D 30-50 nmol/L: Start supplementation with cholecalciferol 800 IU once daily.

Vitamin D > 50 nmol/L: No supplementation needed.

Ensure adequate calcium intake (at least 2 dairy products per day).

Start 3 days **preoperative** (day -3):

Alfacalcidol (Etalpa) 1 dd (0.05mcg/kg/day) (max 2 mcg/day) \*

### Postoperative (with adequate calcium values):

Day 0 t/m 4: Alfacalcidol (Etalpa) 1 dd (0.05mcg/kg/day) (max 2 mcg/day)

Day 5: **STOP** Alfacalcidol (Etalpa) (if adequate calcium values).

In case of supply issues with Etalpa: Use Rocaltrol as an alternative according to the following dosing regimen: 3 days preoperatively Rocaltrol (=Calcitriol) 2 dd 1 capsule 0.5 mcg (= 1.0 mcg/day), until day 1 postoperatively. From postoperative day 2 to day 4, Rocaltrol 1 dd 1 capsule 0.5 mcg (with satisfactory calcium levels). Stop Rocaltrol on day 5 (with satisfactory calcium levels).

**Note:**

- In case of prophylactic total thyroidectomy, start levothyroxine postoperatively.
- In case of total thyroidectomy for thyroid carcinoma, with an indication for additional I-131 therapy (within <4 weeks), do not start levothyroxine until after I-131 therapy.

**Management of postoperative hypocalcemia:**

In case of postoperative hypocalcemia, appropriate treatment will be initiated in consultation with the local pediatric endocrinologist. The severity of hypocalcemia and the patient's age (and corresponding weight) will be taken into consideration. In the event of postoperative hypocalcemia, discontinuation of alfacalcidol will only occur in consultation with the pediatric endocrinologist.

**References**

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