



# The efficacy and short- and long-term side effects of radioactive iodine treatment in pediatric Graves' disease: a systematic review



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## INTRODUCTION

30% of pediatric Graves' disease patients achieve remission with anti-thyroid drugs. The majority of patients require definitive treatment. Data on the efficacy and side-effects of radioactive iodine (RAI) in pediatric Graves' disease is scarce.

## AIM

We performed a systematic review to identify studies reporting the efficacy, or short- and long-term side effects of RAI treatment in pediatric Graves' disease.

## METHOD

PubMed and Embase were searched in July 2020 for studies on pediatric patients with Graves' disease.

The following search terms were used: Graves' disease, RAI, efficacy and side effects.

Original studies reporting on RAI treatment in a minimum of 10 patients were included.

The Critical Appraisal Skills Program checklist was used to evaluate the quality of each included study.

## RESULTS

Search yielded 208 unique articles. 10 additional articles were identified via reference reading. A total of 23 articles were included in this systematic review. 1,283 children and adolescents treated with RAI for Graves' disease were evaluated in the included studies.

The treatment goal of RAI treatment changed over time, from trying to achieve euthyroidism in the past, to aiming at complete thyroid destruction and subsequent hypothyroidism in the last three decades.

Seventeen studies used a calculated activity of RAI, and 2 studies a fixed activity of RAI. In 4 studies, it was not clear how the activity of RAI was determined.

In 13 of the 23 included studies, data on short-term side effects of RAI treatment are reported, and data on long-term side effects are reported in 15 studies.

### Efficacy of RAI treatment in pediatric Graves' disease

The efficacy of RAI treatment aiming at hypothyroidism was only studied in 5 studies (n=278).

All 23 studies reported patients requiring additional RAI treatment because of persistent or recurrent hyperthyroidism.

The reported efficacy of a first RAI treatment when aiming at hypothyroidism ranged from **42.8% to 97.5%**, depending on the activity administered.

The efficacy seems to increase with higher RAI activities.

Administering **a minimum activity of 11 MBq but possibly a little >15 MBq** of iodine-131 per gram of thyroid tissue seems necessary to achieve thyroid destruction in the vast majority of pediatric Graves' disease patients.

### Side effects of RAI treatment in pediatric Graves' disease

When aiming at hypothyroidism, both **short- and long-term side effects of treatment are very rare.**

Reported short-term side effects included vomiting (n=4), radiation thyroiditis (n=1), local inflammation (n=1), palpitations (n=1), and myxedema (n=6). Long-term side effects were mainly seen in patients in whom treatment aimed at achieving euthyroidism: benign thyroid nodules (n=6), multinodular benign goiter (n=1), hyperparathyroidism (n=1), and papillary thyroid carcinoma (n=1).

No additional cases of thyroid cancer, no cases of leukemia, and no impaired reproductive capacity or increased frequency of congenital abnormalities in their offspring were reported.

## CONCLUSIONS

RAI is a safe definitive treatment option for pediatric Graves' disease when aiming at complete thyroid destruction.

When aiming at hypothyroidism, the efficacy of treatment seems to increase with a higher RAI activity.

Prospective studies are needed to determine the optimal RAI dosing regimen in pediatric Graves' disease.

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