

Iodine biokinetics in the salivary glands in thyroid cancer treatment

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Introduction

For decades, radioiodine has been used as an effective and simple treatment after a thyroidectomy to treat 2 types of thyroid cancer: papillary thyroid cancer and follicular thyroid cancer [1]. However, there is a shortage data in the scientific literature about the metabolic behavior of iodine after its administration for thyroid carcinoma treatment.

Dose estimates for athyreotic individuals upon administration of ablation quantities of iodine cannot be based on existing kinetic models. The iodine organification index, the distribution, the clearance, and consequently, the biokinetic model and dose are expected to be significantly influenced by a reduce mass of the residual thyroid tissue and the elimination dynamics of this tissue upon administration of large iodine activity levels [2].

Due to the high magnitude of activity administered in radioiodine treatment (3.7 to 7.4 GBq), the following side effects are usually observed: nausea, gastrointestinal disorders, thyroiditis, medullar suppression and salivary glands dysfunctions, such as inflammation, decrease or loss of taste and hyposalivation (xerostomia).

Since the scarce information about the iodine behavior in the salivary glands of these patients, it is also difficult to reach a consensus on the appropriate restrictions on the issue of radioiodine contamination by saliva. This aspect of radiation protection is particularly important for two cases: for children patients' hospital release and for patients treated outside of the hospital.

The recent ICRP recommendations for the revision of the human digestive tract model, with the addition of the salivary glands as source and target organ, highlight the importance of these glands in the dose commitment process [3] In addition to the significant volume of saliva secreted daily and its intense vascularization, the absence of the thyroid gland in these patients promotes a preference of iodide retention in the salivary glands. It is important to consider also that a significant amount of the radionuclide secreted via salivary glands is reabsorbed by the intestinal tract, increasing the contribution to the dose. The present work aims to

study the iodine biokinetics as a function of time in the salivary glands of patients previous underwent subtotal thyroidectomy, after oral administration of NaI for the purpose of diagnosis and treatment of differentiated thyroid carcinoma.

Methodology

Patients from the HUCFF (UFRJ) and of IEDE are selected from criteria concerned to minimize metabolic and morphological differences and other possible sources of interference, such as habits and history of diseases. The saliva samples are collected from a proposed protocol and are measured using a NaI(Tl) detector gamma spectrometry system. The sample collection is divided into three groups: since just after Na¹²³I administration for diagnostic tests purpose before treatment; since just after Na¹³¹I administration for treatment and while the patients are hospitalized in the therapeutic room; and since just after Na¹²³I administration for post-treatment diagnosis purpose. Programs that use the technique of cross-correlation to cycles with random spacing will be used to estimate the frequency of cyclical behavior in the analysis of the curves of iodine in saliva secretion.

Results and conclusion

Twenty-three patients have been followed so far, with an average of 17 samples per patient. The analysis of the first results suggests that the estimation of the secretion of iodine in samples of saliva is feasible with the proposed protocol. Furthermore the estimation of iodine activity secreted in saliva as a function of time, it is expected that the study will allow the correlation of results with the degree of efficiency of lemon juice use (or other citrus fruits), with different presentations of NaI (liquid or capsule) and with other potential disturbance factors on dynamics of iodine secretion in saliva of the followed patients.

References

- [1] International Atomic Energy Agency. Nuclear medicine in thyroid cancer management: a practical approach. Vienna: IAEA; TECDOC-1608; 2009.
- [2] Nascimento ACH, Lipsztein JL, Corbo R, Rebelo, AMO, ¹³¹I biokinetics and cytogenetic dose estimates in ablation treatment of thyroid carcinoma. Health Physics 99: 457-463; 2010.
- [3] International Commission on Radiological Protection. Human Alimentary Tract Model. New York: Elsevier; ICRP Publication 100; 2007.