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Hypothyroidism in infant of breast feeding mother after Radioiodine therapy (for CA thyroid): a case report

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ABSTRACT

Background: Patients with differentiated CA thyroid are treated with surgery followed by radioactive iodine-131 therapy. Pregnancy and lactation are absolute contraindications to radio-iodine therapy. Lactation after radio-iodine therapy results in thyroid dysfunction of infant which may lead to hypothyroidism.

Case presentation: We describe a case of 24-year old male who developed permanent hypothyroidism at the age of 2 years after breast feeding from mother treated with radio-iodine for CA thyroid in spite of proper advice.

Conclusion: Lactation should be stopped in patients treated with radioactive I-131 therapy through maternal education and counselling. It is necessary to avoid radio-iodine induced hazards to infants and close follow up is needed if lactation is not ceased after radio-iodine therapy.

Keywords: Neonatal hypothyroidism, lactation, radio-iodine therapy, CA thyroid, counseling, case report.

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Introduction

Differentiated thyroid cancer (DTC) is the most common type of thyroid cancer. Surgery followed by radioactive iodine (RAI) therapy is the effective and widely recommended treatment in DTC. Although radioiodine therapy is safe; however, there are several radiation safety measures to optimize safety in breast feeding mothers [1].

Pregnancy and lactation are absolute contraindication to radio-iodine therapy. Lactation should be stopped at least 6 weeks before administration of radio-iodine to ensure that mammary excretory activity has ceased because mammary epithelial tissue receives significant radiation dose in this case. Lactation should not be resumed after RAI ablation in order to protect infant's thyroid gland from I-131 in breast milk [1,2].

Case Presentation

A 24-year old male, known case of hypothyroidism, was referred to nuclear medicine department for adjustment of thyroid hormone replacement therapy. His history revealed that his mother was a known case of CA thyroid. She underwent total thyroidectomy followed by RAI ablation [100 milli curie (mCi)]. She continued breast feeding during her treatment despite the instructions given by the

doctor as per loco regional customs. He was 4 months old at that time with normal developmental milestones.

After about 2 years, mother consulted a pediatrician for her child. The child had delayed developmental milestones with increase in weight. Investigations of baby showed hypothyroidism for which he was put on thyroxine. He remained well for about next 14 years. At 16 years of age, he had complained of poor memory and stuttering. He stopped thyroxine for 3 months on his own at the age of 16 years and attempted suicide twice. Again, he was referred to nuclear medicine department for adjustment of thyroxin dose. Patient got married and has one kid. He is doing well now.

Discussion

Surgery followed by oral administration of radioactive iodine (I-131) is an effective standard therapy in differentiated CA thyroid patients [3]. Radio-iodine therapy is contraindicated in pregnancy and lactation. I-131 can cross the placenta and blocks fetal thyroid gland leading to goiter or hypothyroidism [4]. The human placenta expresses enzymes iodothyronine Type 2 deiodinase (D2) which activates tetra-iodothyronine (thyroxine) (T4) to

tri-iodothyronine (T3) and Type 3 (D3) which deactivates T4 and T3. The activity of the type D3 is 200 times the activity of D2. Most of the thyroid hormone from the maternal or fetal circulation is inactivated by D3 enzyme, thus making human placenta relatively impermeable to thyroid hormone. The iodide released can then be used for fetal thyroid hormone synthesis. Iodine is actively transported via placental sodium iodide transporter to the fetus [5].

The breast feeding infant is exposed to radioactive iodine due to ingestion of activity via breast milk as well as radiation exposure from external irradiation due to close contact with the mother. The estimated close contact dose to infant is 5.5 to 8.9 micro sievert /mega Becquerel (MBq) of radioactive iodine administered to adult [6].

Radioactive I-131 is excreted in breast milk via sodium iodide symporters. Iodine content in milk is roughly proportional to the quantity of milk produced. Total fraction excreted in breast milk is variable ranging from 21% to 28% in patients receiving therapeutic dose of radioactive iodine. Leide-Svegborn et al. [7] estimated mean absorbed dose of 670 mGy to the thyroid of the infant per 0.5 MBq of radioactive iodine to mother. The effective dose to newborn infant per unit activity administered to the mother is 106 mSv infant/MBq mother for radioactive I-131. In order to avoid high radiation dose to infant, breast feeding must be stopped for that child. However, breast feeding can be safely resumed for future pregnancies [2].

Patients should be advised to discontinue breastfeeding for approximately 6-8 weeks before I-131 therapy in order to minimize radiation dose to breast tissue [8]. The radiation absorbed dose to the lactating breast is 200 rad (2 Gy) for a therapeutic administered activity of 150 mCi (5,550 MBq) of I-131 [9]. Discontinuation of breast feeding immediately before I-131 administration would result in a significant absorbed dose to breast tissue. It is recommended to use diagnostic I-123 scans prior to radioactive I-131 ablation to prevent excessive breast uptake in post-partum patients [10].

The patient in this case report was postpartum and had breastfed her child at the time of referral for radioiodine ablation. Patient was advised to discontinue lactation and radio-iodine therapy was delayed for 6 weeks to minimize radiation dose to breast tissue. However, patient didn't stop lactating her baby and violated against medical advice due to which her son developed neonatal hypothyroidism.

Previous studies show excess of iodine exposure results in transient congenital hypothyroidism [11]. However, none of the previous reported cases are on permanent hypothyroidism in infant induced after breast feeding a mother who has been given therapeutic dose of radioactive-iodine.

Therefore, proper counseling of CA thyroid patient regarding cessation of lactation before radio-iodine

therapy is of utmost importance. ¹³¹I should be postponed in those patients who wish to resume nursing.

Conclusion

Neonatal exposure to radioactive-iodine may cause thyroid dysfunction leading to transient/permanent hypothyroidism. Close follow up of infant for the development of hypothyroidism is needed if there is accidental exposure to radio-active iodine. Maternal education and counselling are necessary to avoid lactation induced permanent hypothyroidism in infants after therapeutic doses of radioactive-iodine to mothers.

List of Abbreviations

μSv	Micro sievert
CA	Carcinoma
MBq	Mega Becquerel
mCi	Milli curie
RAI	Radioactive iodine
T3	Tri-iodothyronine
T4	Tetra-iodothyronine (thyroxine)

Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article

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Consent for publication

Informed consent was obtained from the patient/mother to publish this case.

Ethical approval

Ethical approval is not required at our institution for publishing a case report in a medical journal.

Authors' contribution

All authors contributed to the drafting, revising and final editing of the manuscript.

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