Case Report

Multiple primary malignancies of the thyroid gland and the brain: a case report

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Abstract: A majority of studies have reported cases on patients with primary thyroid cancer who developed subsequent malignancies, following their initial thyroid cancer diagnosis. Notably glioma has been reported as a secondary cancer following thyroid cancer diagnosis. A case of a 50-year-old woman with a history of thyroid nodules and symptom of throat discomfort is reported in the present study. A fine needle aspiration of the thyroid nodules confirmed the presence of papillary thyroid carcinoma. The patient received a total thyroidectomy followed by iodine 131 (¹³¹I) treatment. The patient was admitted to the hospital following 5 years of the initial treatment, due to headache and nausea. Magnetic resonance imaging (MRI) of the head region revealed an irregular lesion at the left temporal lobe. Following frontal tumor resection, the biopsy revealed brain astrocytoma. Postoperatively, the patient underwent intensity modulated radiation therapy (IMRT) at a total dose of 60 Gy in combination with oral temozolomide chemotherapy. The frequency of radiation treatment was 2 Gy/day ×30 fractions. The data are not conclusive of a correlation between the incidence of glioma and ¹³¹I treatment. But, the incidence of long-term survival of the patients with thyroid cancer and second primary cancer warrants considerable attention by medical professionals. In addition, during radioactive iodine therapy, the indication and the total dose of the radioactive iodine require careful monitoring.

Keywords: Thyroid, glioma, cancer

Introduction

Multiple primary carcinomas, refers to the development of two or more independent primary malignant tumors, simultaneously or successively, in a single or multiple organs of the same individual. Thyroid cancer is one of the most common solid tumors. It has been estimated that the incidence of thyroid cancer in China in 2012 was approximately 11.9 million new cases [1]. Glioma is a common cancer of the nervous system, accounting for 80% of primary central nervous system malignancies in the United States [2]. Thyroid cancer can develop concurrently with primary glioma, although very few cases have been documented. To our knowledge, one case of an American young woman with the aforementioned malignancies has been reported to date. In the present study, a thyroid cancer case with glioma is reported.

Case report

The patient was a 50 years old woman, who presented with symptoms of throat discomfort and was diagnosed with thyroid nodules. The patient had no history of smoking or alcohol abuse. During physical examination, two masses with diameters of approximately 1.5 cm and 1 cm in size were observed in the left and right lobes of the thyroid, respectively. The masses were homogeneous, hard and exhibited smooth surfaces. In addition, they could move up and down during swallowing. The computed tomography (CT) scan of the neck region indicated that the left thyroid lobe exhibited a low density mass with dimensions of approximately 1.4 cm×1.3 cm, whereas the right lobe exhibited an uneven low density mass with dimensions of approximately 1.1 cm×0.8 cm (Figure 1). The papillary thyroid carcinoma was diagnosed by thyroid fine-needle aspiration biopsy. The
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The patient underwent a total thyroidectomy in 2011. The postoperative pathological examinations indicated papillary thyroid carcinoma, invading the local capsule (Figure 2). Following surgery, the patient was subjected to radioiodine ablation therapy at a total dose of 100 mCi in one month duration. No local recurrence or distal metastasis was present during follow-up examinations.

The patient was admitted to hospital due to continuous headaches for a total period of 3 months, following 5 years of the radioiodine ablation therapy. No nausea, vomiting, or blurred vision was reported at first. The headache symptoms were progressively exacerbated and were associated with nausea and projectile vomiting. The physical examination indicated muscle strength of grade 5 of upper and lower extremities, normal muscle tone, pain and normal sensation. Magnetic resonance imaging (MRI) of the head region revealed an irregular lesion at the left temporal lobe with dimensions of 4.1 cm×3.5 cm×3.0 cm. The lesions were subjected to garland like enhancement (Figure 3). The supratentorial cranial craniotomy for tumor resection was conducted in December of 2015. The pathological examinations revealed brain astrocytoma that developed from grade II to grade III (WHO classification 2007) (Figure 4). Following a period of one month after surgical resection, the patient received IMRT at a total dose of 60 Gy. The frequency of radiation therapy was 2 Gy/day ×30 fractions at 4 MV. Concomitant oral temozolomide chemotherapy (100 mg, 150 mg alternate on days 1-42) was administered to the patient. The subject exhibited no major toxicities. The patient showed no signs of tumor, following 4 months of the initial diagnosis.

Discussion

The incidence of thyroid cancer has increased recently, notably with regard to the papillary thyroid carcinoma. Following standard treatment, the majority of the thyroid cancer patients exhibit optimal survival rates and quality of life. However, certain cohort and population-based studies have shown that the incidence of thyroid cancer with a second primary cancer has increased significantly compared with the normal population. This increase has been notably observed in young females [3, 4]. A previous study indicated that the 5 most common sites of initial cancer localization included the breast, prostate, colon, skin and lung tissues in the patients with secondary thyroid cancer [5]. The combination of clinical thyroid cancer with glioma is relatively rare. Murali Krishna Gurram et al. reported a young woman who was diagnosed with two synchronous tumours namely, glioblastoma multiforme (GBM) and papillary thyroid carcinoma [6]. The major symptoms of the patient were dizziness, headache and vomiting. MRI of the brain demonstrated a non-enhancing and non-hemorrhagic component of the lesion along the lateral margin of the hemorrhage that was indicative of a tumor. In addition, CT scan of the head and neck region demonstrated that the left lobe of the thyroid exhibited a nodule with a diameter of approximately 1.1 cm. The brain biopsy confirmed GBM, which was associated with an extremely low survival rate. The thyroid fine needle aspiration biopsy confirmed the diagnosis of the thyroid papillary cancer. In contrast to the diagnosis, the present study does not report on the treatment and prognosis of the patient. However, the present case is a middle-aged female who had been diagnosed with metachronous multiple primary carcinomas. The secondary tumor was an astrocytoma, originating from a relatively low grade glioma than GBM. The patient currently has a high quality of life following the combined radiation therapy and chemotherapy.

Several studies demonstrated that the exposure to radioactive iodine could affect the development of thyroid cancer and subsequent primary cancers, with the exception of the contributing factors namely, age, environment and
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Figure 2. Pathological examination of the thyroid. A. Thyroid fine needle aspiration pathological examination indicated that the tumor cells were in papillary arrangement. Staining: hematoxylin and eosin (H&E); Magnification ×100. B. Histopathological sections from resection of thyroid cancer: tumor cells were in papillary arrangement. The central of the nipple indicated fibrovascular and psammoma body formation. Staining: H&E; Magnification ×100. C. Immunohistochemistry (IHC) of thyroglobulin (Thyroglobulin, Tg) stain. Tg expression in the cytoplasm of the tumor cells was positive. Magnification ×100. D. IHC for the thyroid transcription factor-1 (thyroid transcription factor-1, TTF-1) staining. TTF-1 expression in the nucleus of the tumor resection tissue was positive. Magnification ×100.

Figure 3. Enhanced MRI of the head region. Irregular lesion at the left temporal lobe with dimensions of 4.1 cm×3.5 cm×3.0 cm. Enhanced scan lesions were subjected to garland like enhancement.

genetic predisposition. A retrospective analysis conducted by Sawka et al. indicated that radioactive iodine treatment increased the probability of occurrence of a second primary cancer compared with non radioactive iodine treatment [7]. Teng and co-workers demonstrated that $^{131}$I treatment of thyroid cancer patients was associated with an increased risk of lymphoma, whereas it was not associated with the incidence of other solid tumors [8]. However, Ko et al. reported an increased risk of urinary system cancer and head and neck cancer in patients that received $^{131}$I treatment [9].

It is well established that the exposure to high doses of ionizing radiation, and the inherited mutations of highly penetrant genes are associated with rare syndromes. The aforementioned parameters are considered the two main pathogenetic factors of glioma [10]. Furthermore, certain studies have reported recently that thyroid hormones (TH) may directly or indirectly
influence the development of glioma cells [11-13]. Cristiana Perrotta proposed that 3, 3′,5-triiodothyronine (T3) indirectly affects glioma growth via the modulation of microglia [12]. Nauman demonstrated that TH affects the pathogenesis of GBM via the activation of various signalling pathways, such as the EGFR/PTEN/Akt/mTOR and the TP53/MDM2/p14ARF pathways [13]. Clinical evidence further supports to some extent that the cancer remission and lifespan of patients with high grade glioma can be extended by reducing their corresponding TH levels in the blood [14]. Although further investigations are required to fully clarify the exact causes of cancer remission, the aforementioned clinical and epidemiological evidence may provide insight in the development of novel treatment strategies to patients with glioma, such as chemical-induced hypothyroidism.

In addition, in the present study, the patient had undergone radioactive iodine therapy following thyroidectomy. The correlation between the incidence of glioma and 131I treatment in this case was not possible. Although cases with thyroid cancer combined with second primary cancer are extremely rare, it is required that clinicians are aware of the long-term survival of these patients. During radioactive iodine thera-
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The indication and the total dose of the radioactive iodine require careful monitoring. Future studies can address the development of new therapeutic methods for thyroid cancer patients.

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Disclosure of conflict of interest

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References


[13] Nauman P. Thyroid hormones in the central nervous system (CNS) and their effect on neoplasm formation, particularly on the development and course of glioblastoma multiforme-research hypothesis. Endokrynol Pol 2015; 66: 444-459.