



Case Series

Thyroid collision tumors; A case series with literature review

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ABSTRACT

Background: Collision tumors are two histologically distinct types of malignancies within the same mass and organ. The aim of this study is to present a case series of thyroid collisions.

Methods: This was a multicenter retrospective case series study. The participants were consecutive in order. Socio-demographic and clinical data were obtained from hospital records.

Results: The study included eight cases comprising six (75%) females and two (25%) males. The patients had different presentations, including neck swelling, dyspnea, and dizziness. The pathology was successfully determined through fine-needle aspiration. Four patients (50%) underwent lobectomy, whereas the other half (four patients) underwent total thyroidectomy.

Conclusion: Collision tumors of papillary thyroid cancer (PTC) and follicular thyroid carcinoma (FTA) or medullary thyroid carcinoma (MTC) and FTA are exceedingly rare phenomena that most commonly affect females. Complete or partial thyroidectomy is the ideal management of choice for these cases and is associated with good survival.

1. Introduction

Collision tumors are two histologically distinct types of malignancies with dissimilar cellular lineages and genetic origins within the same mass and organ and without a clear transitional zone [1]. Collision tumors are extremely rare, with occasional case reports in the colon, lungs, ovaries, liver, stomach, and kidneys [2]. However, despite thyroid neoplasia being the most reported endocrine malignancy (2.1%), patients with thyroid collision tumors have rarely been observed in the literature, with most thyroid collision tumors consisting of papillary and medullary carcinoma [3,4].

The aim of this study is to present a series of cases of thyroid collision tumors with a brief review of the literature.

2. Methods

2.1. Registration

The study was registered in accordance with the Helsinki declaration – “Every research study involving human subjects must be registered in a publicly accessible database before recruitment of the first subject”. The study was registered in the Chinese Clinical Trial Registry (Registration No.: ChiCTR2100045625), Chinese Clinical Trial Register (ChiCTR) - The world health organization international clinical trials registered organization registered platform.

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2.2. Study design

This is a multicenter retrospective case series study. The participants were enrolled in consecutive order. This paper has been written in line with PROCESS 2020 guidelines [5].

2.3. Setting

The cases were managed in both governmental and private settings. The research was conducted over eight months (from January 1, 2020 to August 8, 2020). The data were collected from the patients, patient's family, and hospital records. The pathology was successfully determined through fine-needle aspiration. The patients were followed up for a mean duration of 4 months, ranging from 2 months to 8 months.

3. Results

This study included eight cases, comprising six (75%) females and two (25%) males. They had different presentations, including neck swelling, dyspnea, and dizziness. Four patients (50%) underwent lobectomy, whereas the other half (four patients) underwent total thyroidectomy. Table 1 lists the details for each case.

4. Discussion

Collision tumors are described as the coexistence of two histologically distinct neoplasms in the same anatomic location without admixture. While the incidence of collision tumors is extremely rare in any part of the body, the occurrence of thyroid collision tumors is even rarer [6]. Previous research has shown that the most common malignancy of the thyroid is papillary thyroid cancer (PTC) (80%), followed by follicular thyroid carcinoma (FTC) (10%), medullary thyroid carcinoma (MTC) (4%), Hurtle cell carcinoma (3%), and anaplastic carcinoma (2%) [7]. According to a review by Ryan et al. until 2015, only 33 cases of thyroid collision tumors have been reported in the literature [8]. Although the simultaneous occurrence of PTC and other metastatic carcinomas in the thyroid has been reported [9,10], reports of PTC and FTA or MTC and FTA collision tumors are currently lacking, and only four similar counterparts of PTC and FTC have been reported in the English literature [2,4,11,12]. Therefore, most of the thyroid collision tumors consist of papillary and medullary carcinomas [13].

Regarding the formation and pathogenesis of collision tumors, several theories have been proposed: "stem cell theory" proposes that these tumors arise from a single pluripotent precursor cell, the "neoplastic coercion theory" states that the formation and growth of one tumor alters the surrounding microenvironment and promotes the formation and propagation of a second tumor, and finally the "random collision theory" postulates that the meeting of two different tumors is

Table 1
Shows the details of each patient.

Cases	Sex, age (year), occupation	Presentation	Hematological tests	Ultrasound findings	Operation	Fine needle aspiration	Histological examination	Follow up and outcomes
First case	Male, 44, policeman	Right anterior neck swelling	Normal TSH level, elevated TPO antibody level (18.33 IU/mL), normal thyroglobulin level, normal calcium level, elevated TGAb (25.8 IU/mL)	RT thyroid lobe nodule measuring 35*27*25 mm suspicious for neoplasm	RT hemithyroidectomy	Follicular neoplasm	PTC and FTA	No reoccurrence in 18 months
Second case	Female, 40, unemployed	Weakness and dyspnea	Elevated TSH level (10.36 mIU/L), normal TPO antibody level, normal thyroglobulin level	A few small and solid nodules in both of the thyroid lobes, with the largest measuring 11*8*7 mm in the mid-third (TR3) of the left (LT) thyroid	Total thyroidectomy	PTC	PTC and FTA	No reoccurrence in 9 months
Third case	Female, 37, housewife	Palpitation, neck and shoulder pain, and dyspnea	Normal TSH level, elevated TPO antibody level (35.63 IU/mL)	LT thyroid lobe solid nodule measuring 15*8 mm	LT hemithyroidectomy	Adenomatous follicular lesion	PTC and FTA	No reoccurrence in 23 months
Fourth case	Female, 46, housewife	Dyspnea, dizziness, decreased appetite, and tremor	Low TSH levels (0.08 mIU/L), normal calcium level	LT thyroid gland solid nodule measuring 32*26*26 mm	LT hemithyroidectomy	–	PTC and FTA	No reoccurrence in 27 months
Fifth case	Female, 40, nurse	Dyspnea and palpitation	Low TSH level (0.009 mIU/L), normal calcium level	RT thyroid lobe solid nodule measuring 5*4*4 mm (TR4) and a LT thyroid lobe small cystic nodule measuring 3 mm (TR1)	Total thyroidectomy	–	PTC and FTA	No reoccurrence in 15 months
Sixth case	Male, 52, policeman	Left side neck swelling	Normal hematological and thyroid function tests	LT thyroid lobe solid nodule measuring 45*43*27 mm (TR4)	LT hemithyroidectomy	PTC	MTC and FTA	No reoccurrence in 12 months
Seventh case	Female, 55, housewife	Neck swelling	Normal thyroid function tests and serum electrolytes	RT thyroid lobe mass (35 × 20 × 15 mm)	Total thyroidectomy	Follicular neoplasm	PTC and FTA	Lost to follow up
Eighth case	Female, 31, housewife	Neck swelling	Normal hematological and thyroid function tests	–	Total thyroidectomy	Follicular neoplasm	PTC and FTA	Lost to follow up

Rt: right, LT: left, PTC: papillary thyroid carcinoma, FTA: follicular thyroid adenoma, MTC: medullary thyroid carcinoma, TSH: thyroid stimulating hormone, TR: TIRAD score. TPO: thyroid peroxidase.

purely by chance [2]. Nevertheless, no single theory alone might be able to completely explain the genesis of such tumors.

In the report by Ryan et al. the most frequent presentation associated with thyroid collision tumors was anterior cervical mass with the occurrence of metastases in the majority of cases. The mean age of the patients was 53.4 years (range, 27–84 years), and there was a female gender predominance [8]. Both papillary and follicular collision tumors show peak occurrences at a later stage of life, especially during the fourth to seventh decades of life [14]. The first case of PTC and FTC collision tumor was reported by Plauche et al., in 2013, who was a 62-year-old female with a collision tumor in the left thyroid lobe, and presented with shortness of breath and mild palpitation for a year [11]. Thomas et al. presented a 33-year-old male with a collision tumor in the right lobe with anterior neck swelling for 6 months [2]. Feng et al. and Pishdad et al. reported cases of collision tumors in the right lobe without any stated symptoms, in a 40-year-old female and a 79-year-old male, respectively [4,12]. In the current study, a series of six cases of PTC and FTA, with a single case of MTC and FTA collision tumors have been reported, with a mean age of 41.4 years, ranging from 31 to 46 years with much higher incidences among females (5/7), and with most cases presenting with anterior neck lesion and dyspnea.

Due to the contribution of two distinct types of tumors and limited clinical information, the diagnosis and treatment of collision tumors of the thyroid presents a challenge to the managing physician. According to Ryan et al. FNA is not accurate in the detection of collision tumors, but can be reliable in detecting malignant pathologies [8]. This was also the case in the current study. Hence, histopathological examination is the only absolute and reliable option for determining two distinct tumors. During the sectioning and grossing of the samples by the pathologists, it is important to concentrate on the surrounding area of the target lesion to identify other unrelated lesions. Thyroid function tests in these patients are usually normal, and US examination demonstrated nodular thyroid [2,11]. In the current study, the cases were mostly associated with normal laboratory findings, and US investigations showed nodular thyroid.

Both PTC and FTC are well differentiated and have a good prognosis [12]. Kim et al. pointed out that collision tumors are more aggressive than singleton tumors [15]. However, in the review by Ryan et al. collision tumors and singleton tumors have nearly equal aggressiveness; however, they advised that the most aggressive tumor out of the two should guide the management, and suggested the development of a multidisciplinary team to decide on the best treatment option based on a patient-centered approach, recommending surgical management with adjunct therapy [8]. While early cases of papillary and follicular carcinoma collision tumors have been first managed through hemithyroidectomy and subsequently through total thyroidectomy [2,11], more recent cases were directly managed through total thyroidectomy with good clinical outcomes [4,12]. In the current study, total thyroidectomy was deemed necessary in three of the cases and the other four patients underwent hemithyroidectomy. Nearly all cases (6/7) were associated with good outcomes and follow-up, but one of the cases was lost to follow-up.

The current study has its own limitations. First, the sample size is small. Second, it is retrospective study. Third is the absence of significant laboratory test results. Nearly 20% of MTC cases are inherited tumor syndromes, including multiple endocrine neoplasia type 2 [16]. For these patients, prospective family screening with testing for mutant RET genes is crucial. Moreover, finding small PTCs is important, especially in cases with a positive family history of other cancers such as breast cancer, which is linked to PTC in Cowden syndrome [17]. Unfortunately, such prospective family screening was not conducted in this study.

5. Conclusion

Collision tumors of PTC and FTA or MTC and FTA are exceedingly

rare phenomena that most commonly affect females. Complete or partial thyroidectomy is the ideal management of choice for these cases and is associated with good survival.

Ethical approval

The manuscript approved by ethical committee of Kscien Organization.

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Author contribution

Abdulwahid M. Salh: surgeon performing the operation, major contribution of the idea, literature review, final approval of the manuscript. Berwn A. Abdulla, Shvan H. Mohammed, Shaho F. Ahmed, Hiwa O. Baba, Rivvan Hermiz Ishaac, Ari M. Abdullah, Aras J. Qaradakhly, Mohsin M. Ahmed, Sami S. Omar: literature review, final approval of the manuscript. Fahmi H. Kakamad, Hawbash M. Rahim: literature review, writing the manuscript, final approval of the manuscript.

Registration of research studies

1. Chinese Clinical Trial Registry
2. ChiCTR2100045625

Guarantor

Fahmi Hussein Kakamad is Guarantor of this submission.

Consent

Consent has been taken from the patients and the family of the patients.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

There is no conflict to be declared.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2022.103444>.

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