Separate thyrothymic thyroid remnant; clinically crucial anatomic variation

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INTRODUCTION

Total thyroidectomy is the procedure of choice for treating several disorders of the thyroid gland. Total resection of glandular tissue, including the embryologic remnants is crucial for preventing the recurrence of goitre. Therefore, the completeness of thyroidectomy depends on total anatomical knowledge of the gland including anatomical variations, embryologic remnants, and ectopic tissue. The thyroid gland has the following 3 main embryologic remnants: pyramidal lobe (PL), Zuckerkandl’s tubercle (ZT), and thyrothymic (TT) remnant. The thyroid remnant at the TT tract is sometimes entirely separate from the main lobe. The separate thyroid remnant is often overlooked or misidentified during surgery if it is left behind after thyroid surgery. This embryologic structure involving the thyroidal tissue needs to be excised for total thyroidectomy. Small thyroidal tissue at the TT area is often misidentified as inferior parathyroid glands and lymph nodes [1,2]. Sackett and Reeve [2] have classified TT thyroidal extensions as grades I, II, III, and IV, of which grade IV small

Purpose: The anatomical variations of the thyroid gland including separate thyroidal remnant at the thyrothymic area are of significance during thyroid surgery for “total” thyroidectomy, and for recurrent goitre. In the present study, we aimed to detect the separate rests of thyroidal tissue in the thyrothymic region.

Methods: The thyrothymic region was explored for identification, dissection, and excision of separate thyroidal remnants in 134 patients who underwent primary thyroid surgery. In this series, we studied the incidence and anatomical features of the thyrothymic remnant and its relation with other embryologic remnants.

Results: Overall, 222 sides of the thyroid were explored in this study. An entirely separate thyrothymic remnant of the thyroid was identified and excised in 8 of 134 patients (6%). Mean size of removed remnants was 36.4 mm (range, 29–45 mm) in diameter. The incidences of pyramidal lobe (PL) and Zuckerkandl’s tubercle (ZT) were 71.6% and 59.7%, respectively. The thyrothymic remnant coexisted with PLs in 4 patients. Four patients had all 3 embryologic remnants: thyrothymic remnant, PLs, and ZTs.

Conclusion: An entirely separate thyroidal remnant at the thyrothymic area is not a rare variation. The considerably large size of a remnant may threaten the completeness of thyroidectomy and may result in recurrence if it is left behind after thyroid surgery. Awareness, identification, and excision of the separate remnant at the thyrothymic area and the other embryologic remnants are critical for ensuring completeness of thyroidectomy and preventing recurrences.

Key Words: Embryologic remnant, Pyramidal lobe, Thyroidectomy, Zuckerkandl’s tubercle
TT rests are frequently overlooked during thyroid surgery. Appropriate identification and excision of all remnants ensures the completeness of thyroidectomy and prevents recurrence of goitre [1]. We observed some cases of an entirely separate remnant of the thyroid gland that was easily overlooked during thyroid surgery owing to nonmeticulous dissection at the TT tract. These remnants sometimes possess a considerable amount of thyroid tissue. Significant anatomical variations of embryologic origin threaten the completeness of thyroidectomy and cause recurrent disease.

In this prospective study, we aimed to determine TT thyroidal rests during thyroid surgery, particularly the separate remnant tissue of the thyroid gland.

**METHODS**

The present study was approved by Institutional Review Board of Medical Faculty of Duzce University (IRB No. 2018-07-01). Our series was comprised of 134 consecutive patients who presented to our surgical clinic for primary thyroid surgery between January 2018 and June 2019. The patients with recurrent goitre who underwent redo-thyroid surgery were excluded. We routinely performed the exploration of the substernal area adjacent to the lower poles of thyroid lobes to identify separate embryologic remnants of the thyroid at the TT tract. In 134 patients who underwent primary thyroid surgery, 88 total thyroidectomies, and 30 left and 16 right hemithyroidectomies were performed. Therefore, 222 sides (118 left and 104 right sides) of the gland were examined, and 222 TT areas were explored. The presence of separate thyroid remnants at the TT area was determined for patients undergoing primary thyroid surgery. According to the classification by Sackett and Reeve [2], only grade IV thyroidal rests were evaluated in this study. Grade IV thyroid remnants are not attached to the thyroid gland and are an entirely separate thyroid tissue situated within the TT area. At the end of lateral lobe dissection, the TT region was carefully explored for the presence of separate thyroid remnants. All structures analogous to thyroid tissue were identified as separate thyroid remnants. All suspected remaining masses larger than 10 mm were dissected, surgically removed, and sent for histological examination. Histologically confirmed TT thyroid tissues were accepted as separate TT thyroid remnants.

Regarding the presence of PL at the pretracheal region and that of ZT, posterior embryologic appendages were also determined to establish the incidence of these embryologic remnants besides the TT rests. All the patients participating in this study signed an informed consent form.

**RESULTS**

Of the 134 primary thyroid surgeries, 88 were for total resection and 46 were hemithyroidectomies. In 134 patients, 222 sides and lateral lobes were examined, and 222 TT areas were explored for separate thyroid remnants. There were 108 female patients (80.6%). The mean age of patients in the series was 50 years (range, 24–77 years) (Table 1).

Indications for thyroid surgery were multinodular goitre and large solitary nodule in 56 patients (41.8%). In the remaining patients, the surgical indications were hyperthyroidism and indeterminate, suspicious, or malignant cytological results. Postoperative pathological examination revealed papillary cancer in 30 patients (22.4%) (Table 2).

We explored 222 TT areas in 134 patients. Entirely separate thyroid remnants were identified and excised in 8 patients (6%). All embryologic remnants were unilateral—7 remnants were found on the left side and one on the right. The incidence of separate remnant was 6% at the left side (Table 3). The mean size of excised remnants was 36.4 mm (range, 29–45 mm) with the largest remnant being 45 mm in diameter (Fig. 1). In the present series, 96 patients (71.6%) had PL at the pretracheal region and 80 patients (59.7%) had ZTs. Overall, 106 ZTs (47.7%) were excised with 222 lobes of the thyroid gland. The incidence of ZT was 57% on the right and 40% on the left side (Table 3). In addition, 4 patients with a separate TT thyroid remnant also had PLs (Fig. 1). Four patients with separate thyroid remnant

| Variable | Total thyroidectomy | Left hemithyroidectomy | Right hemithyroidectomy | Total |
|----------|---------------------|------------------------|-------------------------|-------|
| Sex      |                     |                        |                         |       |
| Women    | 88 (65.7)           | 30 (22.4)              | 16 (11.9)               | 134 (100) |
| Men      | 72 (81.8)           | 22 (73.3)              | 14 (87.5)               | 108 (80.6) |
| Mean age (yr) | 16 (18.2) | 8 (26.7) | 2 (12.5) | 26 (19.4) |
| Explored lobe sides |     |            |                         |       |
| Left     | 88                  | 30                     | -                       | 118 (53.2) |
| Right    | 88                  | -                      | 16                      | 104 (46.8) |
| Total    | 176                 | 30                     | 16                      | 222 (100) |

Values are presented as number (%) or number.
had both PLs and bilateral ZTs (Fig. 2).

**DISCUSSION**

Some embryologic remnants of the thyroid gland such as PL, ZT, and TT remnants may complicate thyroid surgery. Sackett and Reeve [2] have classified TT thyroidal extensions as grades I to IV. Notably, the grades I, II, and III extensions are attached to lower poles of thyroid lobes, but grade IV remnant has no connection with the main lobe of the thyroid. Typically, the identification, dissection, and removal of the attached extensions are not challenging when *en bloc* excision of lateral lobes is performed. On the contrary, entirely separate thyroid remnant at the TT tract can be disregarded during thyroidectomy. Separate rests may be overlooked if the surgeon is unaware of the potential presence of such remnants and if the TT area is not dissected properly. In the present series of thyroid surgeries, we routinely explored the TT area to detect separate embryologic remnants of the thyroid.

In this study, the incidence rate of 6% revealed the significance of such embryologic rests and validated that the presence of separate thyroidal remnant is not a rarity. Sackett

**Table 2. Indications for thyroid surgery**

| Preoperative diagnosis               | No. of patients (%) | Papillary cancer |
|--------------------------------------|---------------------|------------------|
| Benign goitre                        | 56 (41.8)           |                  |
| Multinodular                         | 49                  | 7                |
| Larger solitary nodule               | 7                   | 1                |
| Hyperthyroidism                      | 30 (22.4)           |                  |
| Toxic multinodular goiter            | 14                  |                  |
| Graves’ disease                      | 10                  | 2                |
| Toxic adenoma                        | 6                   |                  |
| Results of fine needle aspiration cytology | 48 (35.8) |                  |
| AUS/FLUS*                            | 14                  | 1                |
| Follicular or Hurthle cell neoplasia | 8                   | 1                |
| Suspicious for malignancy            | 14                  | 6                |
| Malignant                            | 12                  | 12               |
| Total                                | 134 (100)           | 30               |

*aAUS/FLUS: atypia of, or follicular lesion of undetermined significance.*

**Table 3. Embryologic remnants in patients with thyroid surgery and in explored sides**

| Embryologic thyroid remnant          | Patients (n = 134) | Explored lobes-sides (n = 222) |
|--------------------------------------|-------------------|-------------------------------|
|                                     |                   | Right (n = 104) | Left (n = 118) |
| Separate thyrothymic thyroid remnant| 8 (6)             | 1 (0.9)          | 7 (6)           |
| Zuckerkanndl’s tubercle              |                   |                  |                 |
| Right                                | 33 (24.6)         | 33 (24.6)        | -               |
| Left                                 | 21 (15.7)         | -                | 21 (15.7)       |
| Bilateral                            | 26 (19.4)         | 26 (19.4)        | 26 (19.4)       |
| Total                                | 80 (59.7)         | 59 (57)          | 47 (40)         |
| Pyramidal lobe                       | 96 (71.6)         | -                | -               |

Values are presented as number (%).
In conclusion, even though the literature has scant information regarding TT extension, the incidence of 6% in our series indicates that the presence of a separate TT thyroid remnant is not a rare variation. Large separate remnants often occur like a retrosternal third lobe of the thyroid gland. Such remnants may be easily overlooked if the TT area is inadequately explored during thyroid surgery. An overlooked
remnant could lead to goitre recurrence or persistence. Awareness, identification, and excision of the embryologic remnants and the separate remnant at the TT area are critical to ensure completeness of thyroidectomy and prevent recurrences. We recommend routine exploration of the TT region during thyroid surgery owing to the relatively common presence of retrosternal unattached remnants.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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