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# Asymptomatic traumatic neuroma after neck dissection in a patient with thyroid cancer

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Traumatic neuroma is not a neoplasm in nature, happens rarely, and varies in different patients. It is a reactive hyperplasia of neuronal and fibrous tissue of the nerve sheath, which develops at the end of a proximal nerve stump after surgery or trauma-related injury [1]. Patients may complain of painful hypersensitivity or paraesthesia, but asymptomatic cases are common. Traumatic neuroma can be detected during neck sonography for evaluation of suspected metastasis or recurrence of thyroid cancer [2, 3]. The incidence of traumatic neuroma after neck dissection is reported as 1.1–2.7% [2–4]. The discovery of 2 adjacent traumatic neuromas simultaneously without symptoms is even rarer, which further increases the difficulty of differential diagnosis. Herein, we report such a case in the current study.

A 32-year-old Chinese male was diagnosed with papillary thyroid carcinoma in the right thyroid lobe and underwent right-sided hemithyroidectomy with radical neck dissection. The patient did not return to our hospital for regular follow-up re-examination. Two painless simultaneous lesions were discovered by ultrasound almost 2 years after surgery. The adjacent lesions were located longitudinally near the surgical scar (Fig. 1A). Greyscale sonogram showed 2 marginated, homogeneously hypoechoic fusiform lesions (size about 17.0 × 12.0 × 5.0 mm and 12.0 × 8.0 × 4.0 mm) with internal parallel heterogeneous hyper-echogenicity (Fig. 1B). An ultrasound transverse view of the bigger lesion displayed the same findings (Fig. 1C). Colour Doppler flow imaging showed no blood flow supply in the lesions (Fig. 1D). A biopsy was scheduled.

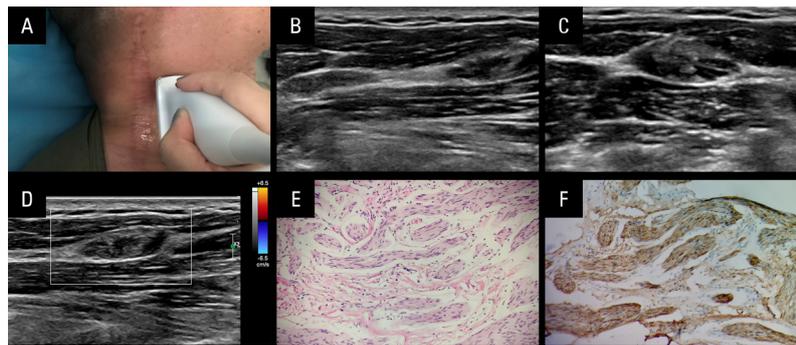
The patient experienced severe pain at the biopsy site despite local anaesthesia when the core needle biopsy was performed. Histopathological findings showed that the mass consisted of proliferative nerve fibre bundles with normal Schwann cells, perineural cells, axons, and endo-neural fibroblasts surrounded by fibro-adipose tissues. Representative haematoxylin and eosin staining and S100 staining results were demonstrated (Fig. 1E, F). Therefore, traumatic neuroma was diagnosed, and no invasive intervention was implemented because the patient had no symptoms. During another 2 years of follow-up, until now, no significant change was found in the lesions by ultrasound examination.

Traumatic neuroma is a non-neoplastic proliferation of nerve tissue that often develops at the proximal end of an injured nerve as a reparative process [1]. To reconstruct nerve continuity, Schwann cells from the distal nerve will generate a channel for ingrowth of adjacent axons, or sometimes grow in multiple directions. Because nerve tissues grow more slowly than surrounding soft tissues, they will mix with fibroblast and mastocyte. Although the exact cascading events remains elusive, the mechanism of traumatic neuroma development is proposed to be divided into 5 phases [1]: nerve injury; proliferation of nerve-repairing cells and wound-repairing cells; wound and scar contraction; defensive reaction of nerve fibres causing constriction; and development of a balance between nerve regeneration (proliferation) and damage (contraction).

Tenderness or hypersensitivity corresponding to the lesion of traumatic neuroma is a relatively com-



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**Figure 1.** **A.** Sonogram of the neck, positioning the location of the lesions; **B.** Longitudinal view of the 2 adjacent lesions; **C.** Transverse view of the larger lesion; **D.** Colour Doppler flow of one lesion; **E.** Haematoxylin and eosin staining ( $\times 200$ ) of the biopsy tissue; **F.** Immunohistochemistry S100 staining ( $\times 200$ ) of the biopsy tissue

mon symptom because the sensory nerve is frequently involved. However, Yabuuchi et al. [4] reported symptomatic cases in only 40% of their cohort of 10 cases (like the current case). For the first symptomatic scenario, differential diagnosis should not be difficult. Nevertheless, for the second asymptomatic scenario, imaging should play an important role in differentiating from recurrent lymphadenopathy and in decision-making for treatment. Ultrasound is adopted as a very useful imaging modality to distinguish traumatic neuroma from recurrent lymphadenopathy [2–4]. Ultrasound of traumatic neuroma often presents a central hyper-echoic area, a smaller short-axis diameter, a smaller short-to-long-axis ratio, or an isoechoic mass with internal parallel heterogeneous hyper-echogenicity. Direct continuity with the cervical plexus may be a characteristic ultrasonic feature of traumatic neuroma after neck lymph node dissection. These imaging findings were displayed in our reported case. Moreover, CT has additional potential to effectively differentiate traumatic neuromas from recurrent thyroid cancers by demonstrating significantly different enhancement patterns. This finding could complement ultrasound and may prevent unnecessary painful biopsy or surgery for ultrasound-detected lesions after thyroidectomy and neck dissection.

Treatment of traumatic neuroma is still controversial. On the one hand, regarding symptomatic traumatic neuroma, conservative and operative therapies both have advantages and disadvantages [5]. Conservative pharmacotherapy includes the following: opioid analgesics, antispasmodic drugs,  $\alpha$  receptor blockers and lidocaine; ultrasound-guided percutaneous ethanol injection; etc. Operative therapy (neuroma resection) can also be applied. On the other hand, regarding asymptomatic traumatic neuroma, observational follow-up should be considered [2]. At the same time, chronic irritation of the nerve by factors such as lithiasis or foreign material, which may

be causative or promoting factors for traumatic neuromas, should be removed. In our asymptomatic case, no therapeutic intervention was applied, and there was no significant change at 2 years of follow-up ultrasound examination.

In conclusion, it is important to increase the awareness among clinicians of this rare entity. Differentiating traumatic neuroma from recurrent lymphadenopathy after neck dissection should be included in the overall management of thyroid cancer patients.

#### Conflicts of interest

None declared.

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The present study did not receive any funding.

#### Ethical approval

All procedures performed in this study involving a human participant were in accordance with the ethical standards of the institution and with the principles of the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

#### Informed consent

Informed consent was obtained from the patient for the anonymous use of the patient's clinical, imaging, and histological data.

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