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# Intrathyroidal Neurofibroma Originating from the Cervical Sympathetic Chain Mimicking a Thyroid Neoplasm: A Rare Case Report and Literature Review

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**Case Report**

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## Abstract

**Introduction:**
Neurofibromas are benign peripheral nerve sheath tumors that are most commonly associated with neurofibromatosis type 1 and typically arise in cutaneous or subcutaneous tissues. Thyroid involvement is exceedingly rare and may pose a significant diagnostic challenge because clinical, radiological, and cytological findings are often nonspecific.

**Case Presentation:**
A 35-year-old woman presented with a cervical mass. Physical examination revealed a firm lesion with limited longitudinal mobility. Her medical and family histories were unremarkable. Thyroid function tests and routine laboratory investigations were within normal limits. Neck ultrasonography demonstrated a lesion involving the left thyroid lobe, while ultrasound-guided fine-needle aspiration was non-diagnostic. Contrast-enhanced computed tomography revealed a 23 × 57 mm mass in the left anterior cervical triangle, causing compression of the left carotid artery, together with a small hypodense nodule in the left thyroid lobe. Given the persistent diagnostic uncertainty, surgical excision of the mass and total thyroidectomy were performed. Intraoperatively, the lesion was found to involve the cervical sympathetic chain and extend toward the stellate ganglion. Histopathological examination demonstrated a neurofibroma associated with diffuse goiter, and immunohistochemical staining showed strong S100 positivity, confirming the diagnosis. Subsequent systemic evaluation revealed no evidence of additional tumors or metastatic disease. Thyroid neurofibroma is an exceptionally rare entity that should be considered in the differential diagnosis of atypical cervical or thyroid-associated masses. Histopathological and immunohistochemical evaluation remain essential for definitive diagnosis, while surgical excision serves both diagnostic and therapeutic purposes.

**Conclusion:**
This case illustrates an unusual thyroid-adjacent presentation of neurofibroma involving the cervical sympathetic chain, which posed a significant preoperative diagnostic challenge because of its nonspecific clinical, radiologic, and cytological features. Neurofibroma should be considered as a rare differential diagnosis in atypical cervical or thyroid-adjacent masses when noninvasive evaluation remains inconclusive. In such settings, complete surgical excision, when anatomically feasible, may provide both definitive diagnosis and effective local management, while careful postoperative follow-up remains appropriate to monitor for recurrence.


## Introduction

Neurofibromatosis is one of the most well-recognized neurocutaneous disorders in neurology and is classically classified into two major forms: neurofibromatosis type 1 (NF1) and neurofibromatosis type 2 (NF2)(1).

Neurofibromatosis type 1 (NF1), also known as von Recklinghausen disease, is an autosomal dominant genetic disorder caused by mutations in the NF1 tumor suppressor gene located on chromosome 17(1, 2). NF1 is a multisystem disorder that can affect the nervous system, skin, bones, and various other organs(3). The disease is characterized by a broad spectrum of clinical manifestations, including café-au-lait macules, cutaneous neurofibromas, optic pathway gliomas, pheochromocytoma, Lisch nodules (iris hamartomas), cognitive impairment, seizures, and other neurological deficits(1).

The estimated incidence of NF1 ranges from approximately 1 in 2,500 to 1 in 6,000 individuals worldwide(2, 3). Although neurofibromas commonly arise from peripheral nerves and soft tissues, involvement of the thyroid gland is exceedingly rare. Only a limited number of cases describing thyroid involvement associated with NF1 have been reported in the literature, and the underlying pathophysiological mechanism remains poorly understood(4).

Careful clinical follow-up and multidisciplinary management are essential in patients with NF1. Therapeutic strategies, including surgical intervention, are determined according to symptom severity, tumor location, associated complications, and disease progression(2, 5).

In this report, we describe the case of a 35-year-old woman who presented with a cervical mass and was subsequently found to have a thyroid neurofibroma following surgical excision and histopathological evaluation.

## Case presentation

A 35-year-old woman presented with a painless neck mass. On physical examination, the lesion was firm, with lateral mobility but restriction in longitudinal movement. Her medical history was unremarkable, with no previous tumors, chronic illnesses, or regular medication use. In addition, there was no significant family history of malignancy or similar disorders. Neck ultrasonography demonstrated a mass in the left thyroid lobe. An ultrasound-guided fine-needle aspiration (FNA) was subsequently performed; however, the cytological result was non-diagnostic.

Comprehensive laboratory investigations, including thyroid function tests, were within normal limits. Contrast-enhanced computed tomography (CT) of the neck, chest, abdomen, and pelvis revealed no abnormalities in the thorax, abdomen, or pelvis. In the neck, imaging showed a nodular mass in the left anterior triangle measuring 23 × 57 mm, together with an 11-mm hypodense nodule in the left thyroid lobe. The remaining cervical structures were unremarkable, except for compression of the left carotid artery by the mass (figure 1).

Surgical excision of the neck mass and total thyroidectomy were performed (Figure 2). Intraoperatively, the mass was found to involve the sympathetic chain and extend to the stellate ganglion. The resected specimen was submitted for histopathological evaluation. Microscopic examination demonstrated diffuse goiter involving both thyroid lobes, with an associated neurofibroma in the left lobe (Figure 3). Immunohistochemical analysis showed strong S100 positivity within the tumor cells, supporting the diagnosis of thyroid neurofibroma. Subsequent comprehensive systemic evaluation revealed no evidence of additional primary tumors or metastatic disease.

Following surgical resection, levothyroxine therapy was initiated with periodic TSH monitoring to maintain euthyroidism. Postoperative surveillance—including clinical and ultrasonographic neck evaluations at 1, 3, 6, and 12 months, and annually thereafter—demonstrated no evidence of locoregional recurrence.

## Discussion

Neurofibromas are benign peripheral nerve sheath tumors that most commonly arise in the skin and subcutaneous tissues and are frequently encountered in the context of neurofibromatosis type 1(6). In contrast, involvement of deep-seated or visceral locations remains distinctly uncommon (7). In parallel, the vast majority of thyroid neoplasms originate from follicular epithelial cells or parafollicular C cells, underscoring the predominantly epithelial nature of tumors arising within the thyroid gland (8). Within this framework, the occurrence of a neurofibroma in close association with the thyroid represents an unusual and diagnostically challenging entity. Despite its rarity, this presentation is anatomically plausible given the complex neuroanatomical environment of the thyroid gland, which maintains close relationships with multiple neural structures, including perithyroidal nerve plexuses and the cervical sympathetic chain (9). Accordingly, neurofibroma development in this location may originate from intrathyroidal nerve fibers or arise through extension from adjacent components of the cervical sympathetic chain. This anatomical hypothesis is supported by the intraoperative findings in the present case, which demonstrated direct involvement of the cervical sympathetic chain with extension toward the stellate ganglion. The diagnostic challenge in this case was primarily driven by a nonspecific clinical presentation, limited to a slowly enlarging neck mass without neurological deficits or thyroid-related symptoms. Preoperative imaging with ultrasonography and contrast-enhanced computed tomography demonstrated a cervical mass exerting compressive effects on adjacent structures but failed to reveal features suggestive of a neural origin, a recognized limitation in the evaluation of peripheral nerve sheath tumors (10). Similarly, ultrasound-guided fine-needle aspiration yielded inconclusive findings, reflecting the well-described constraints of cytological assessment in benign peripheral nerve tumors, where low cellularity and overlapping cytomorphologic features frequently preclude definitive diagnosis (11). Given these limitations, a broad differential diagnosis was considered. Thyroid carcinoma represented a principal concern in accordance with established diagnostic approaches to thyroid-adjacent masses (12). Paraganglioma was also included, owing to its typical presentation as a deep cervical mass in close proximity to major neurovascular structures (13). Schwannoma constituted another relevant consideration, as cervical schwannomas may present as slowly enlarging, asymptomatic neck masses with nonspecific imaging characteristics (14). Lymphoma was likewise contemplated, given its well-recognized presentation as a firm cervical mass and a common cause of unexplained cervical lymphadenopathy (15). Nevertheless, none of these entities could be definitively established on the basis of preoperative clinical assessment, imaging, or cytology. Histopathological examination of the excised specimen ultimately provided decisive diagnostic clarification. The lesion exhibited features characteristic of neurofibroma, including a non-encapsulated proliferation of spindle cells with wavy nuclei embedded within a collagenous to myxoid stroma, accompanied by immunohistochemical positivity for S-100 protein (16). The absence of encapsulation and the presence of a heterogeneous spindle cell population favored neurofibroma over schwannoma, which typically demonstrates a well-encapsulated architecture with more uniform histological features (16). In retrospect, these overlapping histopathological characteristics help explain the inability to reliably distinguish between these entities using preoperative diagnostic modalities alone. In this context, surgical management represented a rational and balanced strategy. Beyond its therapeutic intent, surgical excision fulfilled a critical diagnostic role by enabling definitive tissue characterization in a setting of persistent diagnostic uncertainty. The anatomical location of the lesion necessitated meticulous surgical planning because of its close relationship to vital neurovascular structures and the cervical sympathetic chain. Complete excision was therefore pursued with careful preservation of surrounding structures, aiming to achieve diagnostic and therapeutic adequacy while minimizing surgical morbidity. Neurofibromas are benign tumors generally associated with a favorable prognosis following complete surgical excision (16). In the absence of clinical or pathological features suggestive of syndromic disease, postoperative surveillance remains an appropriate strategy to monitor for local recurrence. From a clinical perspective, this case highlights the need to consider neurofibroma as a potential, albeit rare, diagnostic entity in atypical cervical or thyroid-adjacent masses when noninvasive diagnostic evaluation proves inconclusive, thereby contributing to the limited literature on this uncommon presentation.

## Conclusion

This case illustrates an unusual thyroid-adjacent presentation of neurofibroma involving the cervical sympathetic chain, which posed a significant preoperative diagnostic challenge because of its nonspecific clinical, radiologic, and cytological features. Neurofibroma should be considered as a rare differential diagnosis in atypical cervical or thyroid-adjacent masses when noninvasive evaluation remains inconclusive. In such settings, complete surgical excision, when anatomically feasible, may provide both definitive diagnosis and effective local management, while careful postoperative follow-up remains appropriate to monitor for recurrence.

## Literature Review

The published literature on thyroid neurofibroma remains extremely limited and consists almost entirely of isolated case reports. Reported lesions have involved the thyroid capsule, intrathyroidal tissue, or the perithyroidal region, and they are frequently clinically and radiologically indistinguishable from ordinary thyroid nodules or other cervical masses. Across these reports, thyroid function tests were generally normal, and fine-needle aspiration cytology was often non-diagnostic or inconclusive, leaving histopathology with immunohistochemistry as the definitive diagnostic standard(17–22).

The earliest well-documented case was reported by Ciardi et al. (1997), who described a 64-year-old woman with a solitary neurofibroma arising from the thyroid capsule, adherent to the lower thyroid margin and extending into the anterior mediastinum. This report highlighted the unusual relationship of the lesion to the thyroid gland and underscored the diagnostic difficulty created by its mediastinal extension. Later, Anagnostouli et al. (2002) reported a 55-year-old man with NF1 whose course was complicated by thyroid gland neurofibroma, thereby reinforcing the association between NF1 and rare thyroid involvement .(17,18)

Subsequently, Severo et al. (2008) reported a patient with NF1 and a nonfunctional thyroid nodule accompanied by obstructive symptoms; surgical resection confirmed thyroid neurofibroma on histopathology. In Doulias et al. (2013), a 14-year-old girl with NF1 was found to have plexiform thyroid neurofibroma, again emphasizing that thyroid neurofibromas may present as apparently routine thyroid nodules while remaining diagnostically elusive before surgery .(18,21)

More recently, Bulut et al. (2024) described a 60-year-old woman with primary thyroid neurofibroma in the absence of NF1, and Feller et al. (2024/2025) reported the youngest pediatric case to date: a 6-year-old boy with NF1 whose tumor was adherent to the larynx and trachea, with the recurrent laryngeal nerve entering the lesion; together these reports emphasize that thyroid neurofibromas **occur both with and without NF1** and may present with local adherence that complicates surgical management (19,20).

Taken together, these cases show a consistent pattern: a rare thyroid or cervical mass, frequent preoperative diagnostic ambiguity, normal thyroid biochemistry in most patients, and final confirmation only after resection and immunohistochemical workup. Our case is closely consistent with the existing literature; however, it remains distinctive due to the specific anatomical behavior of the lesion, its surgical complexity, and the precise intrathyroidal/perithyroidal relationship documented on histopathological examination.

**Comparative table of reported thyroid neurofibroma cases:**

| Authors | Year | Age/Sex | NF1 association | Clinical presentation | Imaging | FNAC/FNA | Treatment | Pathology/key finding |
|---|---|---|---|---|---|---|---|---|
| Ciardi et al(17). | 1997 | 64/F | No clear NF1 | Cervical/thyroid mass with mediastinal extension | Mass adherent to thyroid with anterior mediastinal extension | Not reported | Total thyroidectomy | Solitary neurofibroma arising from the thyroid capsule |
| Anagnostouli et al(22). | 2002 | 55/M | Yes | Thyroid gland neurofibroma in NF1 | Thyroid gland involvement | Not reported | Surgical management | Thyroid gland neurofibroma; NF1 complication highlighted |
| Severo et al(21). | 2008 | Not fully detailed in the available snippet | Yes | Nonfunctional thyroid nodule with obstructive symptoms | Thyroid nodule | Not diagnostic / not emphasized | Surgical resection | Histopathology compatible with thyroid neurofibroma |
| Doulias et al(18). | 2013 | 14/F | Yes | Female patient with thyroid nodule | Thyroid plexiform lesion | Not diagnostic | Thyroidectomy / resection | Plexiform thyroid neurofibroma |
| Bulut et al(20). | 2024 | 60/F | No | Enlarging thyroid lobe | Left thyroid lobe mass | Not emphasized in abstract snippet | Thyroidectomy | Primary thyroid neurofibroma; S100 positive |
| Feller et al(19). | 2024 | 6/M | Yes | Pediatric thyroid tumor in NF1 | Heterogeneous intrathyroidal mass | FNAB not performed | Hemithyroidectomy | Intrathyroidal plexiform neurofibroma; youngest reported pediatric case |
| Present case | 2024 | 35/F | No definite NF1 features | Hard cervical mass with vascular compression | Left anterior triangle mass with left thyroid nodule | Inconclusive | Mass excision with total thyroidectomy | Thyroid neurofibroma with S100 positivity; diffuse goiter also present |

## Abbreviations

CT: Computed tomography; FNA: Fine-needle aspiration; FNAB: Fine-needle aspiration biopsy; FNAC: Fine-needle aspiration cytology; NF1: Neurofibromatosis type 1; NF2: Neurofibromatosis type 2; TSH: Thyroid-stimulating hormone.

## Declarations

**Clinical trial number:**

not applicable.

**Ethics approval and consent to participate:**

Not applicable.

**Consent for publication:**

We got written informed consent from the patient to publish this article.

**Availability of data and materials:**

The laboratory tests and imaging results are available from the corresponding author on reasonable request.

**Competing interests:**

The authors declare that they have no competing interests.

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**Authors' contributions**:

M.B., A.A., M.A., S.G., F.A., and M.A.N. took part in writing the manuscript. All authors read and approved the final manuscript.

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**Authors' information:**

Not applicable.

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## Figures




**Figure 1**

CT of the neck, chest, abdomen, and pelvis revealed no abnormalities in the thorax, abdomen, or pelvis. In the neck, imaging showed a nodular mass in the left anterior triangle measuring 23 × 57 mm, together with an 11-mm hypodense nodule in the left thyroid lobe. The remaining cervical structures were unremarkable, except for compression of the left carotid artery by the mass.

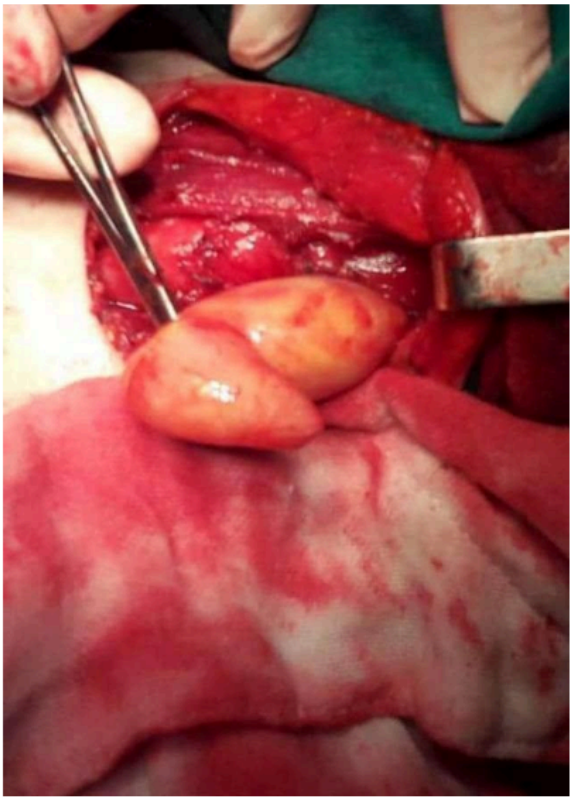


**Figure 2**

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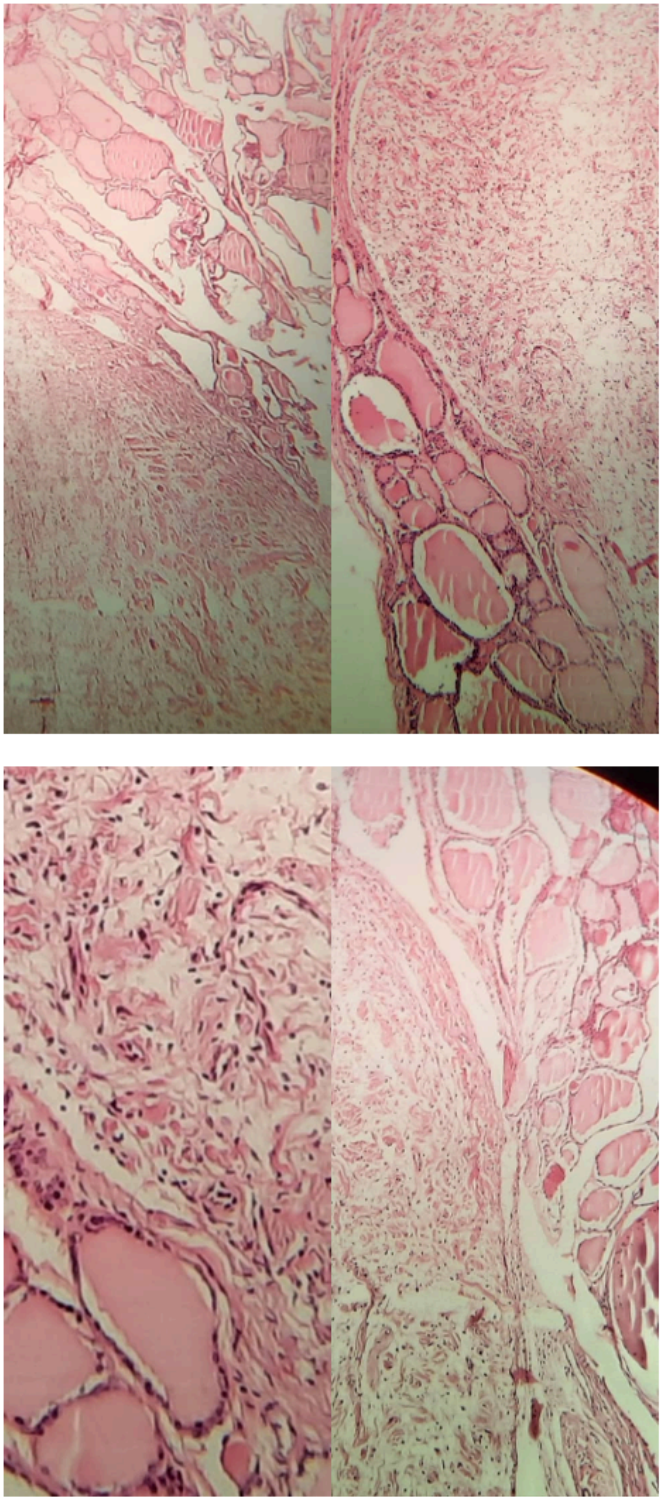


**Figure 3**

Microscopic examination demonstrated diffuse goiter involving both thyroid lobes, with an associated neurofibroma in the left lobe.