CASE REPORT

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Abstract

Background Thyroid tumors presenting with recurrent laryngeal nerve (RLN) palsy are generally considered malignant; however, RLN palsy has been reported even in benign thyroid disease (BTD), mainly due to compression or stretching, although seemingly quite rare. Herein, we report an unusual case of nodular goiter that was extremely difficult to differentiate preoperatively from thyroid malignancy because of the concomitant ipsilateral RLN palsy caused by chronic inflammation.

Case presentation A 59-year-old Japanese female presented with hoarseness and pharyngeal discomfort. Endoscopic examination revealed fixation of the right vocal cord, presumably due to right RLN palsy. Ultrasonography and computed tomography showed an ill-defined thyroid mass lesion in the right lobe, strongly suggestive of malignancy, although repeated aspiration cytology revealed no suspicion of malignancy. Intraoperatively, because the right RLN was found to be entirely embedded within the hard mass lesion and completely unresponsive to nerve integrity monitoring, the nerve was unavoidably excised along with the right lobe. Histopathology led to the final diagnosis of nodular goiter, wherein the resected RLN was severely degenerated and disrupted due to intense chronic inflammation accompanied by perineural fibrosis.

Conclusions Our literature review suggests that RLN palsy associated with thyroid mass lesions should not be considered a definitive indicator of malignancy because it can also be observed in BTD, although it is significantly less frequent than in malignancy as corroborated by our meta-analysis. Even in BTD, if the primary cause of the coexisting RLN palsy is severe chronic inflammation, nerve preservation is potentially unfeasible.

Keywords Recurrent laryngeal nerve palsy, Benign thyroid disease, Nodular goiter, Chronic inflammation, Thyroidectomy, Nerve resection, Nerve degeneration

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Background

Conventionally, neoplastic thyroid disease presenting with vocal cord paralysis caused by recurrent laryngeal nerve (RLN) palsy are considered to be malignant tumors. However, rare cases of RLN palsy have also been reported, even in benign thyroid disease (BTD) [1-16]. The reported preoperative incidence of RLN palsy in patients with BTD who underwent surgery ranges from 0.21 to 5.52% [1, 2, 5-9, 11-14, 16]. However, the actual incidence remains unknown, as it is impossible to identify patients with RLN palsy who do not exhibit hoarseness or who have not undergone surgical intervention.

The mechanism of RLN palsy in BTD is mainly attributed to compression, stretching, displacement, or adhesion and the resulting ischemia. In these cases, recovery rates of RLN palsy after surgery performed with preservation of the paralyzed RLN have been reported to be from 20-100% [1-3, 8-12, 16], of which a wide range appears to reflect the diversity in the causes and the degree of paralysis. However, no reports exist of patients with BTD in whom the RLN could not be preserved because the nerve was encased entirely within the lesion and had to be resected along with it.

Here, we report an unusual case of a BTD (nodular goiter) presenting with ipsilateral RLN palsy that posed significant preoperative challenges in distinguishing it from thyroid malignancy. The inability to preserve the nerve forced a combined RLN resection intraoperatively, leading to a postoperative histopathological diagnosis of RLN degeneration accompanied by perineural fibrosis due to coexisting intense chronic inflammation in the surrounding tissues.

Case presentation

A 59-year-old Japanese female was referred to our department with complaints of hoarseness and pharyngeal discomfort during swallowing, which had developed approximately two weeks ago. The patient had a medical history of hypertension. Physical examination revealed an elastic hard mass measuring approximately 30 mm in size in the right lobe of the thyroid gland upon neck palpation. Transnasal flexible endoscopy revealed paramedian fixation of the right vocal cord, presumably due to right RLN palsy (Fig. 1A and B). Blood tests were all within reference limits except for an elevated serum thyroglobulin level of 714 ng/mL (reference range: ≦34 ng/ mL). Thyroid function was normal, anti-thyroid and anti-TSH receptor antibodies were negative, and there was no increase in the inflammatory response. Ultrasonography (US) showed a hypoechoic, somewhat ill-defined mass approximately $33 \times 26 \times 16$ mm in diameter on the dorsal aspect of the right lobe of the thyroid. Contrast-enhanced computed tomography (CT) revealed a low-density mass lesion with a vertical diameter > 35 mm in the right lobe of the thyroid, extending posteriorly with an ill-defined dorsal border, which appeared as if the lesion had disrupted the thyroid capsule and invaded the surrounding tissues, suggesting the possibility of malignancy. No enlarged lymph nodes were observed in the neck (Fig. 2A and B).

An initial US-guided fine-needle aspiration cytology (FNAC) was performed on the mass in the right lobe of the thyroid, which revealed a "benign" diagnosis wherein only sheet-like follicular epithelial cell aggregates were observed without atypical cells suggestive of malignancy. Given that the abovementioned clinical findings suggested a high probability of malignancy, a second FNAC was performed; however, the cytology showed "benign," the same as the first, again with no suspicion of



Fig. 1 Endoscopic laryngeal findings. A (during inhalation) and B (during vocalization) indicate the paramedian fixation of the right vocal cord. (*: immobilized right arytenoid)



Fig. 2 CT findings. A (axial section) and B (coronal section): CT image showing a low-density mass lesion with a vertical diameter exceeding 35 mm in the right lobe of the thyroid gland (arrows), extending posteriorly with an indistinct dorsal margin, which appeared to disrupt the thyroid capsule and invade the surrounding tissues, implying a possible malignant nature. Enlarged lymph nodes were not observed in the neck

malignancy. At this stage, we considered the possibility of benign nodular goiter as a differential diagnosis; however, the possibility of thyroid malignancy could not be sufficiently ruled out as a pretreatment diagnosis in light of the abovementioned findings. Therefore, we decided to perform a right hemithyroidectomy and central compartment neck dissection under general anesthesia as a curative surgical treatment, which also served as a definitive histological diagnosis.

During the surgery, the mass lesion in the right lobe was found to be firmly adherent to the surface of the esophagus in the posterior aspect, owing to the surrounding fibrosis. The right RLN was identified laterally to the trachea, as usual, without any compression or stretching of the nerve. However, because its distal end was completely embedded within the right lobe hard mass, it was impossible to dissect the nerve from the lesion for its preservation. We performed intraoperative histopathological consultations using frozen sections to confirm whether the mass lesion was malignant. However, consistent with the preoperative cytological findings, biopsy specimens obtained from the center of the mass lesion showed thyroid follicular tissue with intense inflammation and severe fibrosis without any suspicion of malignancy, leading to a provisional diagnosis of nodular goiter associated with a high degree of chronic inflammation. Nevertheless, because of the abovementioned findings of the right RLN, together with its complete loss of response to nerve integrity monitoring, we had no option left to preserve the right RLN and the nerve was unavoidably resected along with the right lobe lesion. (Fig. 3A). Because the possibility of malignancy could not be completely ruled out intraoperatively, a prophylactic central compartment neck dissection was performed as planned, just in case the diagnosis might be reversed. Because no intact distal end of the transected RLN remained, nerve reconstruction had to be abandoned. The excised mass measured approximately $35 \times 35 \times 30$ mm (Fig. 3B).

Histopathology showed a typical follicular epithelium that formed follicular structures with fibrous septa and nodular proliferation, leading to the final diagnosis of nodular goiter (Figs. 3C, and 4A, D). The resected RLN did not retain its original normal morphology; instead, severely degenerated and disrupted neural structures due to intense inflammation of the surrounding area were observed (Fig. 4B, E), which was further confirmed by immunostaining for S100 (Fig. 4C, F).

The postoperative course was uneventful, and the patient was discharged five days after surgery. Twelve months postoperatively, no disability was observed except for hoarseness due to right RLN palsy that had been present since the initial visit, with the right vocal cord remaining fixed in the paramedian position. Given that spontaneous compensation (excessive adduction) of the opposite side (left side) vocal cord movement was insufficient, voice therapy by a speech therapist commenced at six months postoperatively. If future improvement in vocal function is insufficient, we will consider surgical approaches such as vocal fold injection augmentation or medialization thyroplasty.

Discussion

We reviewed the previous studies that reported patients who underwent surgery for BTD presenting with RLN palsy (Table 1 [1-16]). Furthermore, to capture the epidemiological and clinical characteristics of



Fig. 3 Surgical findings. A: Intraoperative view after resection of the right lobe mass of the thyroid gland, followed by central compartment neck dissection. The right recurrent laryngeal nerve (RLN) was unavoidably resected along with the right lobe. (Arrows, right common carotid artery; arrowheads, excised section of the thyroid gland). B: Macroscopic view of the excised tissue, including the right lobe mass lesion of the thyroid gland. C: Horizontal cross-sectional view of the specimen used for histopathological examination. The rectangular section contains the resected RLN, which corresponds to that indicated in Fig. 3 A

the patients (n = 117) in those reports, the numbers of the key categories (age, sex, affected side, histopathology, contributing factor, intraoperative RLN preservation, and postoperative RLN palsy recovery) were all extracted, except for those with missing records, and summarized in Table 2 [1–16]. The majority were 45 years or older, with equal proportions of those aged 45–64 and 65 or older [3, 4, 6, 9, 10, 15, 16]. The sex difference was predominantly female, with a female-to-male ratio of 2:1 [3, 4, 6, 9, 10, 13, 15, 16], which is comparable to that of common thyroid tumors. No apparent right-left difference was observed on the



Fig. 4 Histopathological findings. A, B, D, E: Hematoxylin and eosin staining. C and F: Immunohistochemical staining for S100. The rectangular section in A corresponds to B and C, whereas that in D corresponds to E and F. A and D: In the right lobe mass lesion, the typical follicular epithelium formed follicular structures with fibrous septa and nodular proliferation, consistent with nodular goiter. B and C: A structure consistent with the resected RLN that appeared severely degenerated by intense inflammation (arrows) was observed just beneath the dissected surface of the thyroid lesion. E and F: Close to B and C, the nerve structure appears markedly disrupted (arrows) and surrounded by dense fibrosis with inflammatory cell infiltration and hemorrhagic necrosis

Ref no.	Year	1st author	Country	N	Sex		RLNP side		Intraoperative RLN preservation		Postoperative vocal cord motion recovery	
					м	F	R L		Yes	No	rate	
[1]	###	Greisen, O	Denmark	5	NA		NA		5	0	20% (1/5)	
[2]	###	Rowe-Jones, JM	USA	22	NA		13	9	22	0	89.5% (17/19) ^a	
[3]	###	Fenton, JE	USA	3	2	1	1	2	3	0	100% (3/3)	
[4]	###	Collazo-Clavell, ML	USA	1	0	1	1	0	1	0	100% (1/1)	
[5]	###	Steurer, M	Austria	3	NA		NA		NA		NA	
[6]	###	Chiang, FY	Taiwan	1	1	0	NA		1	0	100% (1/1)	
[7]	###	Randolph, GW	USA	1	NA		NA		1	0	NA	
[8]	###	Schlosser, K	Germany	4	NA		NA		4	0	25% (1/4)	
[9]	###	Wang, CC	Taiwan	8	2	6	5	3	6	2 ^b	25% (2/8)	
[10]	###	Moorthy, R	UK	5	0	5	2	3	5	0	40% (2/5)	
[11]	###	O'Duffy, F	Ireland	6	NA		0	6	6	0	100% (6/6)	
[12]	###	Xin, J	China	28	NA		NA		28	0	100% (28/28)	
[13]	###	Kay-Rivest, E	Canada	6	0	6	1	5	NA		NA	
[14]	###	Birben, B	Turkey	5	NA		NA		NA		NA	
[15]	###	Oscé, H	Belgium	1	0	1	0	1	1	0	100% (1/1)	
[16]	###	Li, WH	China	18	9	9	8	10	16	2	88.9% (16/18)	

Table 1 The literature regarding preoperative recurrent laryngeal nerve (RLN) palsy in patients undergoing surgery for benign thyroid disease [1–16]

Ref no., Reference number, M Male, F Female, R Right, L Left, NA Not assigned or not available, RLNP Recurrent laryngeal nerve palsy

^a Three cases of NA were excluded

^b Transected and repaired

affected side [2-4, 9-11, 13, 15, 16]. Histopathology shows that adenomatous goiter (multinodular goiter or nodular goiter/hyperplasia) comprised the vast majority of the lesions [2-13, 15, 16]. Factors contributing to paralysis were missing in more than half (53.8%) of the cases [1-5, 7-16]. Although multiple causes were stated in several cases [10, 11], compression (31.6%) was the most common, followed by adhesion (9.4%) and stretching (8.5%) [3, 6, 8–12, 16]. Notably, no cases were reported solely due to inflammation, whereas only one was attributed to a combination of inflammation, compression, and stretching [11]. Despite the presence of nerve palsy, the RLN was preserved in most cases (84.6%) [1-4, 6-12, 15, 16], whereas the nerve was sacrificed in only four cases [9, 16]. Postoperatively, more than two-thirds (67.5%) of patients showed recovery of vocal cord motion [1-4, 6, 8-12, 15, 16], whereas no improvement was observed in 20 cases (17.1%) [1, 2, 8-10, 16], including four cases in which the RLN had been transected [9, 16].

The patient in this report presented with a relatively recent onset and rapid progression of RLN palsy-induced symptoms and showed a noticeably ill-defined thyroid mass lesion on US and CT images, all of which were highly suggestive of malignancy. Hence, we could not entirely exclude the possibility of thyroid malignancy before and during surgery, even though repeated preoperative FNAC and intraoperative histopathological biopsy showed no suspicion of malignancy, resulting in a very atypical case of nodular goiter. Although postoperative histopathology disclosed marked inflammatory changes in and around the resected RLN, these were only localized, chronic findings associated with perineural fibrosis but not diffuse inflammation involving the entire thyroid gland. Additionally, the preoperative blood test findings did not reflect any inflammation related to the thyroid lesion. Neither supported the presumption that RLN palsy was due to inflammation rather than thyroid malignancy. As mentioned above, there have been very few reports of BTD accompanied by RLN palsy wherein nerve preservation was impossible [9, 16], and none have ever reported a case of BTD with RLN palsy caused solely by direct spread of inflammation without compression or stretching of the nerve together with histopathology of the excised RLN. The present case was highly unusual for a nodular goiter in that the paralyzed RLN was encased entirely within the hard mass at the time of surgery, leaving no chance for preservation. Hence, it is essential to keep in mind that if the cause of RLN palsy is suspected to be degeneration and fibrosis due to intense chronic inflammation in and around the nerve, its preservation

Table 2 Characteristics of the patients who underwent surgery for benign thyroid disease presenting with preoperative recurrent laryngeal nerve (RLN) palsy (n = 117) [1–16]

Category		Ν	(%) ^d
Age, y	< 44	3	8.1
	45—64	17	45.9
	≧65	17	45.9
	NA	80	/
Sex	Male	14	32.6
	Female	29	67.4
	NA	74	/
RLNP side	Right	31	44.3
	Left	39	55.7
	N/A	47	/
Histopathology	AG/MNG/NG/NH	92	78.6
	Follicular adenoma	6	5.1
	Hashimoto's thyroiditis	6	5.1
	Cyst	2	1.7
	Graves disease	1	0.9
	N/A	10	8.5
Contributing factor ^a	Compression	N 3 17 17 80 14 29 74 31 39 47 92 6 2 1 10 37 11 10 37 11 63 99 4 14 79 20 18	31.6
	Adhesion	11	9.4
	Stretching	10	8.5
Sex RLNP side Histopathology Contributing factor ^a Intraoperative RLN preservation Postoperative vocal cord recover	Displacement	3	2.6
	Inflammation	1	0.9
	NA	63	53.8
Intraoperative RLN preservation	Yes	3 17 17 80 14 29 74 31 39 47 92 6 6 2 1 10 37 11 10 37 11 10 37 11 10 37 11 63 99 4 14 79 20 18	84.6
	No ^b	4	3.4
	NA	14	12.0
Postoperative vocal cord recovery	Yes	3 17 17 80 14 29 74 31 39 47 92 6 2 1 10 37 11 10 3 1 63 99 4 14 79 20 18	67.5
	No ^c	20	17.1
	NA	18	15.4

NA Not assigned or not available, *RLNP* Recurrent laryngeal nerve palsy, *AG* adenomatous goiter, *MNG* Multinodular goiter, *NG* Nodular goiter, *NH* Nodular hyperplasia

^a Since several cases were shown to have more than one factor, the sum of the number of each factor (n = 125) exceeds the total number of cases (n = 117), and the sum of the percentages exceeds 100

^b Two of them were transected and repaired

^c Four case with RLN resection were included

^d In Age, Sex, and RLNP side, cases of NA were excluded

may be impossible even in BTD, although this is exceptionally rare.

In this case, because the nodule lesion was evident at the first presentation, differentiating between malignant and benign by FNAC was prioritized over identifying inflammation. However, if RLN paralysis is presented without thyroid nodules, other modalities for detecting local inflammatory lesions in the thyroid may play an important role. Because elastography enables visualization of tissue stiffness (elasticity) using ultrasound, it can help differentiate malignant tumors, which typically tend to become hard, from benign lesions (benign tumors and inflammatory lesions), which usually remain soft [17, 18]. However, even in inflammatory diseases, soft lesions in the early or acute phase can become hard as fibrosis develops in the chronic phase, thereby making it difficult to distinguish them from malignant lesions. Therefore, the contribution of elastography in the differential diagnosis in the present case would be quite limited. Contrast-enhanced ultrasound (CEUS) is an imaging tool for evaluating the blood flow pattern of various lesions [19–21]. In thyroid diseases, malignant tumors typically show hypoenhancement or heterogeneous contrast patterns due to decreased or irregular vascularity, whereas acute thyroiditis usually presents with diffuse and homogeneous hyperenhancement due to increased blood flow. In contrast, chronic thyroiditis commonly shows patchy enhancement with fibrosis-related hypoenhancement, which is not noticeably different from the malignant patterns. Therefore, even with CEUS, when chronic inflammation has developed in a part of the tumor, as in the present case, it is presumably challenging to distinguish it from malignancy.

Suppose RLN palsy appears to be associated with thyroid inflammation rather than a thyroid nodule. In that case, the differential diagnosis should include chronic inflammatory conditions other than Hashimoto's thyroiditis, such as Riedel's thyroiditis or multifocal fibrosing thyroiditis (MFT), although both are extremely rare diseases. Riedel's thyroiditis, also known as "invasive fibrous thyroiditis," is an uncommon form of chronic thyroiditis in which "stony hard" dense fibrous tissue replaces the thyroid gland and extends into adjacent tissues, often mimicking thyroid malignancies [22, 23]. Although exceptionally unusual, there have been a few reports of Riedel's thyroiditis that developed RLN palsy [23-25]. MFT, also recognized as "multifocal sclerosing thyroiditis," is another peculiar form of thyroiditis in which multiple foci of fibrosis are surrounded by a cellular peripheral zone with reactive follicular atypia and variable chronic inflammation [26, 27]. Intriguingly, overlapping morphologic features between MFT and papillary thyroid microcarcinoma suggest that some cases of MFT are possible premalignant lesions [26, 27]. Because both diseases are very atypical inflammatory conditions that are difficult to differentiate from thyroid malignancy on pretreatment clinical, imaging, and cytologic findings, a definitive diagnosis inevitably requires histologic diagnosis based on surgical specimens.

To ascertain whether the incidence of preoperative RLN palsy varies depending on histopathology (benign versus malignant) in patients with thyroid nodules undergoing initial surgery, a literature search of

Ref no.	1st author	N				RLNP in total		RLNP by histology			Fisher exact test ^a		
[1]	Greisen	Total 233	Histology	N 39	(%) ####	N 16	Incidence	Histology M	N #	Incidence	P value < 0.0001	OR (95%Cl)	
												#####	(4.979—44.058)
			В	194	####			В	5	2.58%			
[2]	Rowe-Jones	2408	М	87	(4%)	29	1.20%	Μ	7	8.05%	< 0.0001	9.144	(3.888—21.555)
			В	###	####			В	#	0.95%			
[5]	Steurer	459	М	123	####	9	1.96%	М	6	4.88%	0.013	5.692	(1.532—21.088)
			В	336	####			В	3	0.89%			
[6]	Chiang	622	Μ	156	####	16	2.57%	М	#	9.61%	< 0.0001	#####	(8.250—295.187)
			В	466	####			В	1	0.21%			
[7]	Randolph	365	М	135	####	16	4.38%	М	#	11.1%	< 0.0001	#####	(4.754—171.224)
			В	230	####			В	1	0.43%			
[8]	Schlosser	695	М	51	(7%)	7	1.01%	Μ	3	5.88%	0.011	#####	(2.434—41.227)
			В	644	####			В	4	0.62%			
[9]	Wang	187	Μ	42	####	12	6.42%	Μ	4	9.52%	0.472	1.803	(0.548—5.973)
			В	145	####			В	8	5.52%			
[11]	O'Duffy	830	Μ	206	####	14	1.69%	Μ	3	1.46%	0.697	1.522	(0.414—5.610)
			В	624	####			В	6	0.96%			
								latrogenic	5	/			
[12]	Xin	1619	Μ	907	####	39	2.41%	Μ	#	1.21%	0.0005	0.300	(0.150—0.599)
			В	712	####			В	#	3.93%			
[13]	Kay-Rivest	1923	Μ	###	####	25	1.30%	Μ	#	1.64%	0.214	1.859	(0.761—4.541)
			В	677	####			В	6	0.89%			
			Unknown	84	(4%)								
[14]	Birben	2070	Μ	743	####	17	0.82%	Μ	#	1.62%	0.004	4.340	(1.588—11.856)
			В	###	####			В	5	0.38%			
[16]	Li	####	Μ	###	####	99	0.79%	Μ	#	1.13%	< 0.0001	3.403	(2.051—5.648)
			В	###	####			В	#	0.34%			

Table 3 The literature reporting the incidence of preoperative recurrent laryngeal nerve (RLN) palsy in patients undergoing surgery for thyroid disease [1, 2, 5–9, 11–14, 16]

Ref no. Reference number, RLNP Recurrent laryngeal nerve palsy, M Malignant, B Benign, OR Odds ratio, Cl Confidence interval

English-language studies published between 1980 and December 2024 was conducted using the appropriate descriptors in PubMed, Scopus, and Web of Science databases (Supplementary Fig. 1). The incidences of preoperative RLN palsy in patients undergoing surgery for thyroid mass lesions, reported separately for overall, malignant, and benign lesions in the 12 studies, is summarized in Table 3 [1, 2, 5-9, 11-14, 16]. The cohort comprises 25,910 patients, 294 (1.23%) of whom presented with RLN palsy. Notably, the proportion of surgeries for benign lesions varied widely, ranging from 35 to 96% (conversely, that for malignant lesions ranged from 4 to 60%), which appears to reflect inter-institutional disparities in the indication criteria for surgery for benign (rather than malignant) lesions. Regarding preoperative RLN palsy, its overall incidence rates widely range from 0.79% to 6.87%, which is partly attributable to differences in the extent to which preoperative laryngoscopic evaluation is mandatory. Namely, even patients with RLN palsy can be asymptomatic if they do not develop hoarseness thanks to compensatory movement of the contralateral vocal cord, thereby being overlooked without laryngoscopic assessment. For these reasons, a direct comparison among different reports is not considered appropriate. The preoperative RLN palsy incidence in BTD varies from 0.21% to 5.52%, which can also be attributed to the above-mentioned inter-institutional differences in the indication criteria for performing preoperative laryngoscopy and for surgery for BTD. Similarly, the preoperative RLN palsy incidence in malignancy also broadly ranges from 1.13% to 28.2%, with a recent downward trend, probably reflecting the differences in surgical indications among institutions, as well as the steady increase in incidental early detection of micropapillary carcinoma in recent years [16, 28–30].

The preoperative RLN palsy incidence was seemingly lower in benign than malignant cases in all but one study [12]; nevertheless, only one report provided a statistical



Axis is shown using log scale

Fig. 5 Forest plot of the log odds ratio by meta-analysis. The pooled odds ratio for the preoperative RLN palsy of malignancy compared with benign was 4.38 (95% confidence interval, 1.99–9.62, P = 0.0002), with relatively high heterogeneity across studies ($l^2 = 0.85$)

analysis [16]. Therefore, we examined the statistical differences in each study using the Fisher exact test, which revealed inconsistent results: eight studies showed a significantly higher incidence in malignant cases [1, 2, 5–8, 14, 16], but three did not [9, 11, 13], and the remaining one study showed a significantly higher incidence in rather benign cases [12] (Table 3). Therefore, to quantitatively integrate these 12 studies, we performed a metaanalysis with the DerSimonian and Laird random effects model using SPSS Statistics (version 28.0.1.0, IBM). As shown in the forest plot (Fig. 5), the incidence of preoperative RLN palsy was significantly higher in malignancy, with a pooled odds ratio (OR) of 4.38 (95% confidence interval, 1.99–9.62, P = 0.0002) and relatively high heterogeneity across studies ($I^2 = 0.85$), consistent with the previous systematic reviews [31]. However, regarding the authors' opinion as to whether RLN palsy is an indicator of malignancy, only two of the studies showing the significantly higher RLN palsy incidence in malignancy, and one of the studies showing no significant difference, were affirmative [6, 7, 13], whereas the other five studies were negative [2, 9, 11, 14, 16], and the remaining four studies were neither [1, 5, 8, 12]; that is, the results of the abovementioned individual statistical examination were not necessarily the decisive reason for the authors'view. Accordingly, even for thyroid lesions presenting with RLN palsy, a comprehensive evaluation of each patient is

essential to differentiate between benign and malignant tumors. However, considering the potential complexity of the present case, correct preoperative differential diagnosis of a thyroid mass lesion with RLN palsy could be unexpectedly challenging.

Conclusions

In the present case of nodular goiter presenting with ipsilateral RLN palsy, the nerve was unavoidably resected because it was completely embedded within the hard mass, and postoperative histopathology showed severely degenerated RLN along with perineural fibrosis induced by intense chronic inflammation of the surrounding tissues. The literature review suggests that RLN palsy associated with thyroid mass lesions should not be considered a definitive indicator of malignancy, as it can also be observed in BTD, albeit significantly less frequently than in malignancy. We must be aware that even in BTD, if severe chronic inflammation is suspected as the primary cause of coexisting RLN palsy, such palsy can already be irreversible, and preservation of the nerve may no longer be feasible.

Abbreviations

- BTD Benign thyroid disease
- CEUS Contrast-enhanced ultrasound
- CT Computed tomography
- FNAC Fine needle aspiration cytology MFT Multifocal fibrosing thyroiditis
- RLN Recurrent laryngeal nerve

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12902-025-01929-w.

Supplementary Material 1. Supplementary Fig. 1: Flow diagram of the study screening process. Twelve studies in which the incidences of preoperative RLN palsy in patients undergoing surgery for thyroid nodules could be evaluated, separately for malignant and benign lesions, were screened. Their demographic data are summarized in Table 3 [1, 2, 5–9, 11–14, 16].

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Authors' contributions

RT treated the patient, collected and analyzed the materials and data, and drafted the manuscript. KM, ST, TK, DNN, KK, and YW helped manage the patient and supported the data interpretation. MO and YN provided helpful advice and administrative support. YH made the pathological diagnosis and provided critical suggestions. YI treated and managed the patient, organized the materials and data, and wrote and revised the manuscript. All the authors have read and approved the final version of the manuscript.

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Data availability

Data is provided within the manuscript.

Declarations

Ethics approval and consent to participate

The hospital's Institutional Review Board waived the need for ethical approval for the case report. Clinical Trial Number is not applicable.

Consent for publication

Written informed consent was obtained from the patient for publication of any potentially identifiable images or data included in this case report. A copy of the written consent form is available for review by the editor-in-chief of the journal.

Competing interests

The authors declare no competing interests.

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