

World Journal of *Clinical Cases*

World J Clin Cases 2022 April 6; 10(10): 2976-3320



Contents

Thrice Monthly Volume 10 Number 10 April 6, 2022

REVIEW

- 2976 Gut microbiota in gastrointestinal diseases during pregnancy
Liu ZZ, Sun JH, Wang WJ
- 2990 Targeting metabolism: A potential strategy for hematological cancer therapy
Tang X, Chen F, Xie LC, Liu SX, Mai HR

MINIREVIEWS

- 3005 Elevated intra-abdominal pressure: A review of current knowledge
Łagosz P, Sokolski M, Biegus J, Tycinska A, Zymlinski R

ORIGINAL ARTICLE

Case Control Study

- 3014 Changes in corneal nerve morphology and function in patients with dry eyes having type 2 diabetes
Fang W, Lin ZX, Yang HQ, Zhao L, Liu DC, Pan ZQ
- 3027 Combined sevoflurane-dexmedetomidine and nerve blockade on post-surgical serum oxidative stress biomarker levels in thyroid cancer patients
Du D, Qiao Q, Guan Z, Gao YF, Wang Q

Retrospective Cohort Study

- 3035 Early warning prevention and control strategies to reduce perioperative venous thromboembolism in patients with gastrointestinal cancer
Lu Y, Chen FY, Cai L, Huang CX, Shen XF, Cai LQ, Li XT, Fu YY, Wei J
- 3047 Dose-response relationship between risk factors and incidence of COVID-19 in 325 hospitalized patients: A multicenter retrospective cohort study
Zhao SC, Yu XQ, Lai XF, Duan R, Guo DL, Zhu Q

Retrospective Study

- 3060 Preventive online and offline health management intervention in polycystic ovary syndrome
Liu R, Li M, Wang P, Yu M, Wang Z, Zhang GZ
- 3069 Evidence-based intervention on postoperative fear, compliance, and self-efficacy in elderly patients with hip fracture
Fu Y, Zhu LJ, Li DC, Yan JL, Zhang HT, Xuan YH, Meng CL, Sun YH
- 3078 Significance of dysplasia in bile duct resection margin in patients with extrahepatic cholangiocarcinoma: A retrospective analysis
Choe JW, Kim HJ, Kim JS

- 3088** Diagnostic value and safety of medical thoracoscopy for pleural effusion of different causes

Liu XT, Dong XL, Zhang Y, Fang P, Shi HY, Ming ZJ

Observational Study

- 3101** Oxaliplatin-induced neuropathy and colo-rectal cancer patient's quality of life: Practical lessons from a prospective cross-sectional, real-world study

Prutianu I, Alexa-Stratulat T, Cristea EO, Nicolau A, Moisuc DC, Covrig AA, Ivanov K, Croitoru AE, Miron MI, Dinu MI, Ivanov AV, Marinca MV, Radu I, Gafton B

- 3113** Breast-conserving surgery and sentinel lymph node biopsy for breast cancer and their correlation with the expression of polyligand proteoglycan-1

Li FM, Xu DY, Xu Q, Yuan Y

SYSTEMATIC REVIEWS

- 3121** Clinical significance of aberrant left hepatic artery during gastrectomy: A systematic review

Tao W, Peng D, Cheng YX, Zhang W

META-ANALYSIS

- 3131** Betel quid chewing and oral potential malignant disorders and the impact of smoking and drinking: A meta-analysis

Lin HJ, Wang XL, Tian MY, Li XL, Tan HZ

- 3143** Effects of physical exercise on the quality-of-life of patients with haematological malignancies and thrombocytopenia: A systematic review and meta-analysis

Yang YP, Pan SJ, Qiu SL, Tung TH

CASE REPORT

- 3156** Primary malignant peritoneal mesothelioma mimicking tuberculous peritonitis: A case report

Lin LC, Kuan WY, Shiu BH, Wang YT, Chao WR, Wang CC

- 3164** Endoscopic submucosal dissection combined with adjuvant chemotherapy for early-stage neuroendocrine carcinoma of the esophagus: A case report

Tang N, Feng Z

- 3170** Lymph-node-first presentation of Kawasaki disease in a 12-year-old girl with cervical lymphadenitis caused by *Mycoplasma pneumoniae*: A case report

Kim N, Choi YJ, Na JY, Oh JW

- 3178** Tuberculosis-associated hemophagocytic lymphohistiocytosis misdiagnosed as systemic lupus erythematosus: A case report

Chen WT, Liu ZC, Li MS, Zhou Y, Liang SJ, Yang Y

- 3188** Migration of a Hem-o-Lok clip to the renal pelvis after laparoscopic partial nephrectomy: A case report

Sun J, Zhao LW, Wang XL, Huang JG, Fan Y

- 3194** Ectopic intrauterine device in the bladder causing cystolithiasis: A case report
Yu HT, Chen Y, Xie YP, Gan TB, Gou X
- 3200** Giant tumor resection under ultrasound-guided nerve block in a patient with severe asthma: A case report
Liu Q, Zhong Q, Zhou NN, Ye L
- 3206** Myomatous erythrocytosis syndrome: A case report
Shu XY, Chen N, Chen BY, Yang HX, Bi H
- 3213** Middle thyroid vein tumor thrombus in metastatic papillary thyroid microcarcinoma: A case report and review of literature
Gui Y, Wang JY, Wei XD
- 3222** Severe pneumonia and acute myocardial infarction complicated with pericarditis after percutaneous coronary intervention: A case report
Liu WC, Li SB, Zhang CF, Cui XH
- 3232** IgA nephropathy treatment with traditional Chinese medicine: A case report
Zhang YY, Chen YL, Yi L, Gao K
- 3241** Appendico-vesicocolonic fistula: A case report and review of literature
Yan H, Wu YC, Wang X, Liu YC, Zuo S, Wang PY
- 3251** *Scedosporium apiospermum* infection of the lumbar vertebrae: A case report
Shi XW, Li ST, Lou JP, Xu B, Wang J, Wang X, Liu H, Li SK, Zhen P, Zhang T
- 3261** Woman diagnosed with obsessive-compulsive disorder became delusional after childbirth: A case report
Lin SS, Gao JF
- 3268** Emphysematous pyelonephritis: Six case reports and review of literature
Ma LP, Zhou N, Fu Y, Liu Y, Wang C, Zhao B
- 3278** Atypical infantile-onset Pompe disease with good prognosis from mainland China: A case report
Zhang Y, Zhang C, Shu JB, Zhang F
- 3284** *Mycobacterium tuberculosis* bacteremia in a human immunodeficiency virus-negative patient with liver cirrhosis: A case report
Lin ZZ, Chen D, Liu S, Yu JH, Liu SR, Zhu ML
- 3291** Cervical aortic arch with aneurysm formation and an anomalous right subclavian artery and left vertebral artery: A case report
Wu YK, Mao Q, Zhou MT, Liu N, Yu X, Peng JC, Tao YY, Gong XQ, Yang L, Zhang XM
- 3297** Dedifferentiated chondrosarcoma of the middle finger arising from a solitary enchondroma: A case report
Yonezawa H, Yamamoto N, Hayashi K, Takeuchi A, Miwa S, Igarashi K, Morinaga S, Asano Y, Saito S, Tome Y, Ikeda H, Nojima T, Tsuchiya H

- 3306** Endoscopic-catheter-directed infusion of diluted (-)-noradrenaline for atypical hemobilia caused by liver abscess: A case report
Zou H, Wen Y, Pang Y, Zhang H, Zhang L, Tang LJ, Wu H
- 3313** *Pneumocystis jiroveci* pneumonia after total hip arthroplasty in a dermatomyositis patient: A case report
Hong M, Zhang ZY, Sun XW, Wang WG, Zhang QD, Guo WS

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The WJCC is now indexed in Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports/Science Edition, Scopus, PubMed, and PubMed Central. The 2021 Edition of Journal Citation Reports® cites the 2020 impact factor (IF) for WJCC as 1.337; IF without journal self cites: 1.301; 5-year IF: 1.742; Journal Citation Indicator: 0.33; Ranking: 119 among 169 journals in medicine, general and internal; and Quartile category: Q3. The WJCC's CiteScore for 2020 is 0.8 and Scopus CiteScore rank 2020: General Medicine is 493/793.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Xu Guo*; Production Department Director: *Xiang Li*; Editorial Office Director: *Jin-Lai Wang*.

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

EDITORS-IN-CHIEF

Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

April 6, 2022

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INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Middle thyroid vein tumor thrombus in metastatic papillary thyroid microcarcinoma: A case report and review of literature

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Specialty type: Medicine, research and experimental

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): 0
Grade C (Good): C, C
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Goloni-Bertollo EM, Jain M

Received: November 3, 2021

Peer-review started: November 3, 2021

First decision: December 27, 2021

Revised: January 7, 2022

Accepted: February 23, 2022

Article in press: February 23, 2022

Published online: April 6, 2022



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Abstract

BACKGROUND

Although papillary thyroid microcarcinoma (PTMC) is not considered a threatening tumor, in some cases, it can be aggressive. Metastatic thrombosis of papillary thyroid carcinoma, follicular thyroid carcinoma, Hürthle cell carcinoma, poorly differentiated thyroid carcinoma and anaplastic thyroid carcinoma have been reported in the literature, but there have been no reports about PTMC.

CASE SUMMARY

A 45-year-old woman presented with a thyroid mass and thrombosis in a middle thyroid vein during a physical examination. She had no symptoms, and the physical examination showed no positive signs. Subsequent ultrasonography-guided fine-needle aspiration biopsy results indicated an atypical lesion of ambiguous significance, with some actively growing cells (TBSRTC III) and the BRAF^{V600E} mutation not present. This patient underwent left thyroidectomy, isthmus lobectomy, prophylactic central lymph node dissection and thromboembolism. Postoperative pathology showed papillary microcarcinoma of the left thyroid, and the thrombus in the middle thyroid vein was a tumor thrombus.

CONCLUSION

Middle thyroid vein tumor thrombus is an extremely rare condition in PTMC, but it does exist. Lobectomy and thromboembolism may be an option for patients with thrombi in the middle vein of the thyroid, and we strongly suggest close

follow-up of these patients.

Key Words: Thyroid neoplasms; Papillary carcinoma; Thyroid vein; Venous thrombosis; Surgery; Case report

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Core Tip: We report the case of a 45-year-old woman presented with a thyroid mass and thrombosis in a middle thyroid vein during a physical examination. This patient underwent left thyroidectomy, isthmus lobectomy, prophylactic central lymph node dissection and thromboembolectomy. Postoperative pathology showed papillary microcarcinoma of the left thyroid, and the thrombus in the middle thyroid vein was a tumor thrombus. Middle thyroid vein tumor thrombus is an extremely rare condition in papillary thyroid microcarcinoma, but it does exist. Lobectomy and thromboembolectomy may be an option for patients with thrombi in the middle vein of the thyroid, and we strongly suggest close follow-up of these patients.

Citation: Gui Y, Wang JY, Wei XD. Middle thyroid vein tumor thrombus in metastatic papillary thyroid microcarcinoma: A case report and review of literature. *World J Clin Cases* 2022; 10(10): 3213-3221

URL: <https://www.wjgnet.com/2307-8960/full/v10/i10/3213.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v10.i10.3213>

INTRODUCTION

Papillary thyroid microcarcinoma (PTMC) is a variant of papillary thyroid carcinoma (PTC) that is defined by the World Health Organization as less than or equal to 1 cm in diameter[1]. Although PTMC is not considered a threatening tumor, in some cases, it can be aggressive. Metastatic thrombosis of PTC, follicular thyroid carcinoma (FTC), Hürthle cell carcinoma (HCC), poorly differentiated thyroid carcinoma (PDTC) and anaplastic thyroid carcinoma (ATC) have been reported in the literature, but there have been no reports about PTMC. We report the case of a 45-year-old woman with a middle thyroid vein thrombus. She underwent successful resection, and postoperative pathology showed papillary microcarcinoma of the left thyroid and a tumor thrombus in the middle thyroid vein. We reviewed the literature to identify reports of tumor thrombus and distant metastasis of PTMC.

CASE PRESENTATION

Chief complaints

A 45-year-old woman presented with a thyroid mass (Figure 1) and thrombosis (Figure 2) in a middle thyroid vein during a physical examination.

History of present illness

The patient came to hospital because of thyroid mass found in physical examination 3 mo before. She had no symptoms. The patient requested surgery because of the stress.

History of past illness

The patient was healthy in the past.

Personal and family history

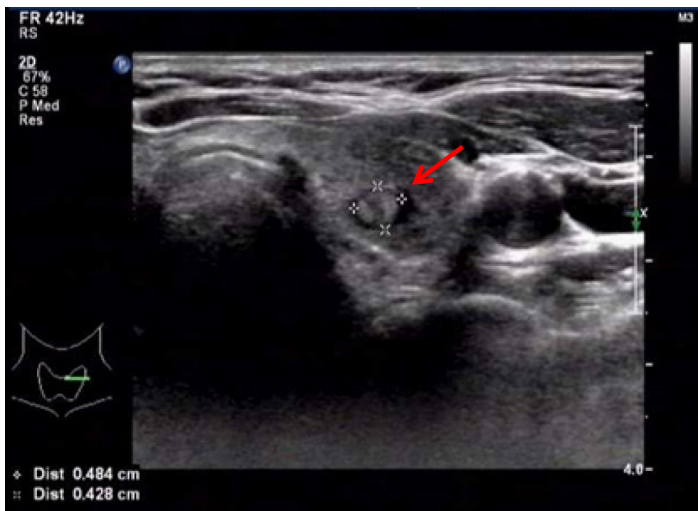
The patient had no family history of thyroid carcinoma and no history of radiation exposure in childhood.

Physical examination

The physical examination showed no positive signs.

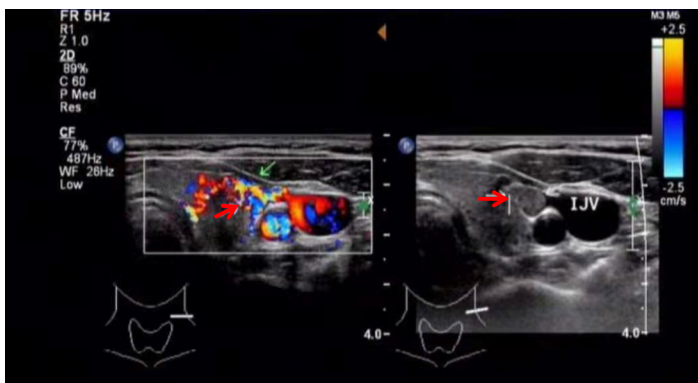
Laboratory examinations

Laboratory tests showed that triiodothyronine, free triiodothyronine, thyroxine, thyroglobulin, and thyroid-stimulating hormone levels were within the normal limits.



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Figure 1 A solid nodule in the left lobe of the thyroid by ultrasound examination.



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Figure 2 Ultrasound examination revealed a medially echoic mass in the middle thyroid vein.

Imaging examinations

A solid nodule in the left lobe of the thyroid by ultrasound examination. Ultrasound examination revealed a medially echoic mass in the middle thyroid vein.

Ultrasonography-guided fine-needle aspiration biopsy

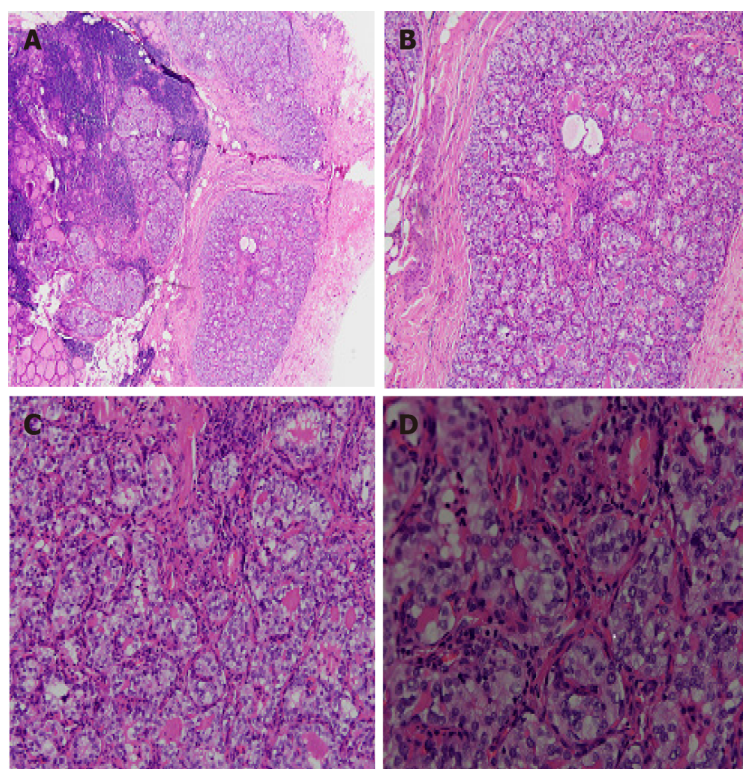
Subsequent ultrasonography-guided fine-needle aspiration biopsy results indicated an atypical lesion of ambiguous significance, with some actively growing cells (TBSRTC III) and the BRAF^{V600E} mutation not present.

FINAL DIAGNOSIS

PTMC (pT1aN0M?). Middle thyroid vein tumor thrombus.

TREATMENT

The patient and her family were fully informed of the advantages and disadvantages of total thyroidectomy and lobectomy prior to surgery. The patient declined to undergo a total thyroidectomy. Intraoperative exploration showed that the mass was located in the middle and upper left lobe of the thyroid gland, adjacent to the capsule, but the capsule was not invaded. There was a round mass in the middle thyroid vein with a diameter of 0.8 cm. The middle thyroid vein was ligated distal to the mass and cut off. Rapid freezing pathological examination showed that both the left thyroid mass and the left middle



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Figure 3 Hematoxylin and eosin staining of left lobe thyroid mass, it shows papillary thyroid microcarcinoma. A: 4x; B: 10x; C: 20x; D: 40x.

thyroid vein mass were carcinomas. These results were communicated to the patient's family, and total thyroidectomy was again declined. Therefore, the patient underwent left thyroidectomy, isthmus lobectomy and prophylactic central lymph node dissection. Postoperative pathology showed papillary microcarcinoma of the left thyroid (single lesion, maximum diameter of 0.9 cm) (Figure 3), and the thrombus in the middle thyroid vein was a tumor (diameter of 0.6 cm) (Figure 4).

OUTCOME AND FOLLOW-UP

No metastases were observed in the central lymph nodes. Initial TSH suppression was treated with 75 µg levothyroxine. Three months later, ¹⁸F-FDG positron emission tomography-computed tomography scanning did not detect local recurrence or distant metastasis (Figure 5). No complications occurred. Fearing recurrence and metastasis, the patient underwent genetic testing at a third-party testing facility. No genetic variation was detected in BRAF^{V600}, BRAF^{K601}, TERT, KRAS, NRAS, EIFIAX or RET. No gene fusion mutations were detected in PAX8/PPAR γ , RET/PTC1, or RET/PTC3. Six months after surgery, the patient had no obvious discomfort, and no tumor recurrence or distant metastasis was observed. The patient took 50 µg levothyroxine once daily, and the serum TSH was 0.49 mIU/L.

DISCUSSION

Thyroid carcinoma that causes tumor thrombus is rare. Forty-seven cases have been reported in the English literature since May 1, 2021. The details of these cases are shown in Table 1. The patients included 12 males and 35 females; their ages ranged from 26 years to 84 years, and the median age was 62 years. The location of the thrombus included the brachiocephalic vein, internal jugular vein, superior vena cava, subclavian vein, innominate vein, middle cerebral artery, pulmonary vein, external jugular veins, axillary vein, right atrium, ascending aorta, pulmonary artery, valvular endocardium and right ventricle. In almost all cases, the thrombus was located in the large vessels. Our patient had a thrombus in the middle thyroid vein, which may represent early-stage disease. Early-stage diagnosis and treatment are of great significance to patient prognosis.

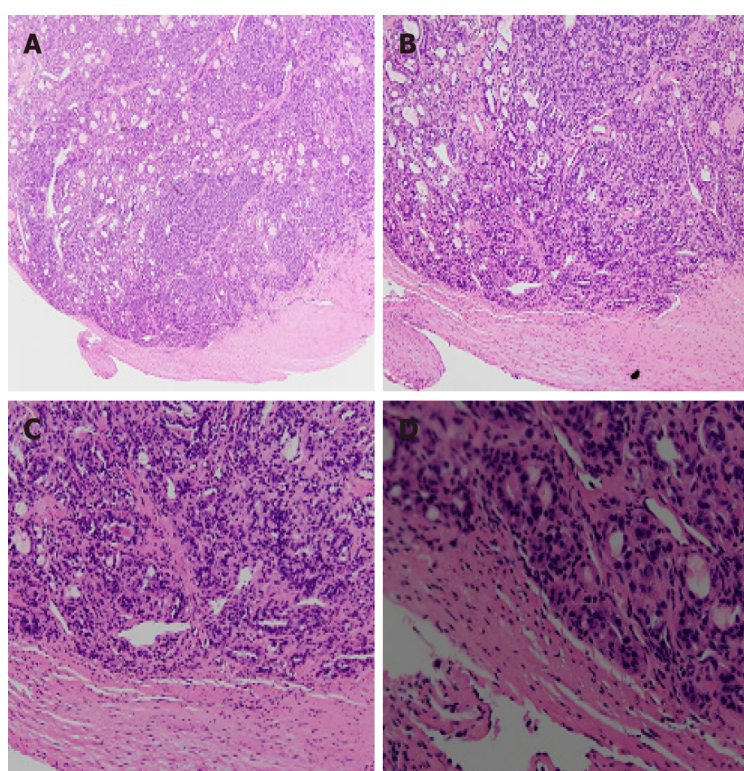
Pathological types included PTC, FTC, HCC, ATC and PDTC. Ten of these cases were PTC (one of the follicular variants of PTC, FVPTC), 24 were FTC, 3 were HCC, 1 was PDTC, 5 were ATC, 1 was ATC with HCC and 3 were not described in the literature. Most of these case reports did not describe the size

Table 1 Reported cases of vein tumor thrombus in thyroid carcinoma

Ref.	Sex	Age	Lesion size (cm)	Pathology	Blood vessel of thrombus
Banerjee and Chopra[2], 1972	F	60	-	FTC	Middle cerebral artery
Thompson <i>et al</i> [3], 1978	F	67	-	FTC	JV, BV, SVC, RA
Perez and Brown[4], 1984	F	48	-	FTC	SVC
Sirota[5], 1989	F	61	-	PTC	Axillary vein
Thomas <i>et al</i> [6], 1991	M	60	-	PDTC	Bilateral IJV
Onaran <i>et al</i> [7], 1998	M	48	-	HCC	IJV
Onaran <i>et al</i> [7], 1998	F	48	-	-	IJV
Onaran <i>et al</i> [7], 1998	F	69	-	HCC	IJV
Bussani and Silvestri[8], 1999	F	67	-	FTC	Pulmonary artery, valvularendocardium
Wiseman <i>et al</i> [9], 2000	M	84	-	-	IJV, BV
Koike <i>et al</i> [10], 2002	F	26	7.8	PTC	BV
Yoshimura <i>et al</i> [11], 2003	F	65	-	ATC	IJV, SV
Panzironi <i>et al</i> [12], 2003	F	68	-	ATC	Bilateral IJV
Gross <i>et al</i> [13], 2004	M	49	3.2 × 2.5 × 3	ATC, HCC	IJV
Sugimoto <i>et al</i> [14], 2006	M	61	-	ATC	BV, SVC, RA
Taib and Hisham[15], 2007	F	45	-	FTC	IJV
Taib and Hisham[15], 2007	F	62	-	FTC	RA
Taib and Hisham[15], 2007	F	66	-	FTC	IJV, SVC, RA
Tripathi <i>et al</i> [16], 2008	F	48	-	FTC	BV, SVC, IJV
Yamagami <i>et al</i> [17], 2008	M	74	2	PTC	JV, IV, SVC, atrium
Hyer <i>et al</i> [18], 2008	F	81	-	FTC	IJV, SVC
Agrawal <i>et al</i> [19], 2009	M	48	-	FVPTC	IJV, SVC, SV
Wada <i>et al</i> [20], 2009	M	64	-	FTC	IJV, BV, SVC
Sanioglu <i>et al</i> [21], 2009	M	64	2 × 1.5	PTC	Ascending aorta
Wada <i>et al</i> [20], 2009	F	74	-	PTC	BV, SVC
Mugunthan <i>et al</i> [20], 2010	F	51	-	PTC	IJV, SVC, RA
Bukhari <i>et al</i> [23], 2011	M	67	-	FTC	SVC
Nakashima <i>et al</i> [24], 2012	F	54	-	FTC	IJV, SV, BV
Babu <i>et al</i> [25], 2012	F	68	-	PTC	IJV
Onoda <i>et al</i> [26], 2012	F	70	7	FTC	IJV, SVC
Stickel <i>et al</i> [27], 2013	F	77	-	ATC	RV
do Nascimento <i>et al</i> [28], 2014	F	54	-	FTC	IJV
Al-Jarrah <i>et al</i> [29], 2014	F	62	3 × 5	PTC	IJV
Dikici <i>et al</i> [30], 2015	F	52	5.5 × 5.5	PTC	IJV, IV
Luo <i>et al</i> [31], 2015	F	57	-	HCC	RA
Franco <i>et al</i> [32], 2015	F	59	-	FTC	IV
Manik <i>et al</i> [33], 2016	F	65	-	FTC	SVC, RA
Kawano <i>et al</i> [34], 2016	F	75	4.5 × 3	ATC	IJV, IV, SUV, sigmoid sinus
Chiofalo <i>et al</i> [35], 2018	M	58	5	FTC	IJV

Chiofalo <i>et al</i> [35], 2018	F	64	3 × 17	FTC	IJV
Chiofalo <i>et al</i> [35], 2018	F	75	3.5 × 2.3	FTC	IJV, IV
Jain <i>et al</i> [36], 2019	F	44	-	-	IJV
Khoo and Chen[37], 2019	F	57	17	FTC	SVC, RA
Lad <i>et al</i> [38], 2020	F	52	-	FTC	IJV, SVC, RA
Cassar and Stirrup[39], 2020	F	75	-	FTC	Inferior pulmonary vein, left atrium
Čolović <i>et al</i> [40], 2020	M	67	-	FTC	IJV, BV
Kavanal <i>et al</i> [41], 2021	F	64	-	FTC	BV

F: Female; M: Male; PTC: Papillary thyroid carcinoma; FTC: Follicular thyroid carcinoma; HCC: Hürthle cell carcinoma; PDTC: Poorly differentiated thyroid carcinoma; ATC: Anaplastic thyroid carcinoma; FVPTC: Follicular variant of papillary thyroid carcinoma; IJV: Internal jugular vein; SVC: Superior vena cava; SV: Subclavian vein; RA: Right atrium; RV: Right ventricle; IV: Innominate vein; BV: Brachiocephalic vein; JV: Jugular vein.

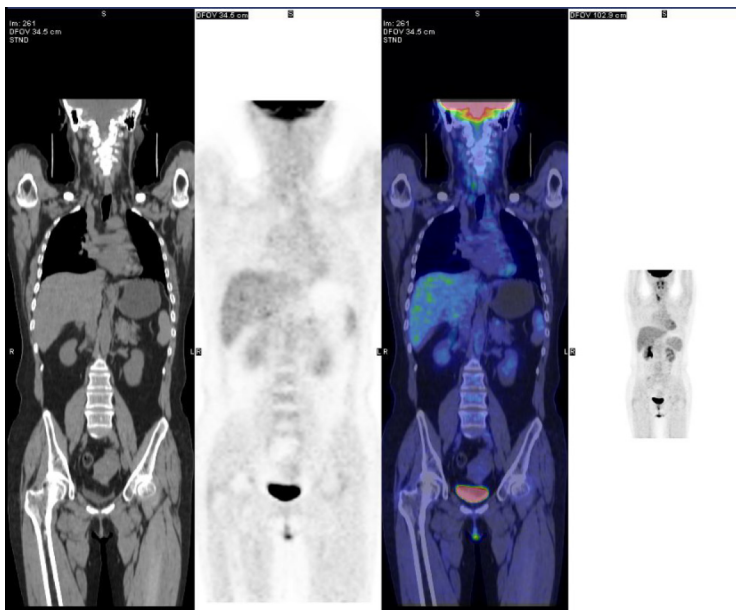


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Figure 4 Hematoxylin and eosin staining of the thrombus, it shows carcinoma tissues. A: 4×; B: 10×; C: 20×; D: 40×.

of the thyroid lesion. From the 12 cases with size data available, the maximum diameter of the lesions ranged from 2 cm to 17 cm (the average was 6.6 ± 5.2 cm). Our patient had PTMC (the maximum diameter was 0.8 cm), which had not been previously reported. Middle thyroid vein tumor thrombus in metastatic PTMC is extremely rare. It is necessary to consider how to perform TNM staging for such cases. Kawano *et al*[34] suggested setting management criteria. Unfortunately, there are still no related standards or guidelines for such criteria. Here, we emphasize the importance of aggressive treatment and close follow-up for these patients. Tumor cells are exposed to the circulatory system in this clinical presentation, and embolus shedding may also cause serious complications, such as pulmonary embolism. While there is a lack of objective clinical data to support this hypothesis, we will continue to monitor future occurrences.

In terms of treatment for tumor thrombi in metastatic PTMC, there is also no standard. Treatments include surgery, RAI therapy, external beam radiation therapy and chemotherapy. Most patients choose surgery combined with radioiodine therapy. Kavanal *et al*[41] reported that ^{131}I therapy as a single modality may be considered for a subset of patients who have been rigorously screened. If the pathologic type is PDTC with no surgical opportunity and refractory to radioactive iodine, targeted therapy such as tyrosine kinase inhibitors may be another choice for this subset of patients[42].



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Figure 5 Systemic positron emission tomography metabolism imaging showed no obvious signs of malignancy.

Overall, we have demonstrated a middle thyroid vein tumor thrombus in PTMC. Our patient will continue to attend follow-up appointments. In the absence of other risk factors, lobectomy and thromboembolectomy may be an option for patients with thrombi in the middle vein of the thyroid. We strongly suggest a close follow-up of these patients.

CONCLUSION

Middle thyroid vein tumor thrombus is an extremely rare condition in PTMC, but it does exist. Lobectomy and thromboembolectomy may be an option for patients with thrombi in the middle vein of the thyroid, and we strongly suggest close follow-up of these patients.

ACKNOWLEDGEMENTS

We thank the thyroid and neck tumor specialist, ultrasound specialist and pathologist of the Tianjin Medical University Cancer Institute and Hospital for their valuable help.

FOOTNOTES

Author contributions: Gui Y is responsible for reviewing literature and writing article; Wang JY is responsible for surgery and collecting clinical data; Wei XD is responsible for providing overall thinking.

Informed consent statement: Consent from the patient was obtained before publication.

Conflict-of-interest statement: There are no conflicts of interest or funding to disclose concerning this case report.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

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Country/Territory of origin: China

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