SJIF Impact Factor: 5.464

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 8.
Issue: 2
Page N. 103-111
Year: 2024

Review Article www.wjahr.com

THYROID PAPILLARY MICROCARCINOMA, A CLINICO-PATHOLOGICAL REVIEW

***[1]Mustafa A. Majeed and [2]Ameer D. Hummaidi**

[1]Histopathology Resident - Baghdad - Medical City, Baghdad, Iraq.
[2]College of medicIne - Baghdad University, Baghdad, Iraq.

Article Received date: 06 December 2023 **Article Revised date:** 26 December 2023 **Article Accepted date:** 16 January 2024

***Corresponding Author: Mustafa A. Majeed**
Histopathology Resident - Baghdad - Medical City, Baghdad, Iraq.

ABSTRACT

Background: Papillary thyroid microcarcinoma (PTMC) is defined as a subtype of papillary thyroid carcinoma (PTC), distinguished by its small size, usually measuring less than 1 cm in its largest diameter. Although PTMC typically exhibits a slow growth rate with a low propensity for metastasis, leading to an overall good prognosis. aim of study is to study the clinicopatholgical features of papillary micro carcinoma in Iraqi patients. **Method:** Cross-sectional research of 98 thyroid cancer patients in Baghdad-medical city from March 1 to September 1, 2023. All patients examined: Age (years), Gender, Negative or positive metastasis, capsular invasion, vascular invasion, multifocality Evaluation criteria include extra thyroidal expansion, perineural invasion, tumour size (≤5 or >5), and tumour location (Isthmus, Left, Right). **Results:** In a study of papillary thyroid microcarcinoma patients, the mean age was 41.5 years, with a predominant female representation (87.8%), and most tumors were ≤5 mm in size. There were no significant associations between capsular invasion, vascular invasion, extra thyroidal extension, perineural invasion, and patient demographics or tumor characteristics. However, multifocality was significantly associated with larger tumor sizes (>5 mm) but not with increased metastasis, suggesting a complex pathology independent of traditional clinical factors. **Conclusion:** In a study of 98 thyroid cancer patients, predominantly female (87.8%) with a mean age of 41.5, most tumors were small (≤5 mm) and non-aggressive, lacking metastasis and invasive features. Multifocality correlated with larger tumor sizes but not increased metastasis, indicating a nuanced pathology not directly linked to traditional demographic or clinical factors.

KEYWORDS: Thyroid, papillary, microcarcinoma, a clinico-pathological.

INTRODUCTION

Papillary thyroid microcarcinoma (PTMC) is defined as a subtype of papillary thyroid carcinoma (PTC), distinguished by its small size, usually measuring less than 1 cm in its largest diameter.[1] Although PTMC typically exhibits a slow growth rate with a low propensity for metastasis, leading to an overall good prognosis,[2] it's crucial to acknowledge that it remains a carcinoma. A small fraction of patients may encounter a more aggressive disease progression, including lymph node or distant metastases. The approach to managing PTMC is nuanced. Considering the morbidity associated with thyroidectomy, which cannot be reduced below 1–3% even in specialized centers,[3] extensive surgical treatment for every diagnosed PTMC case is not universally advocated. In recent times, active surveillance, involving meticulous monitoring through imaging and thyroglobulin assessments, has gained traction as a viable management strategy for selected PTMC cases.[2–6] This aligns with the American Thyroid Association (ATA) guidelines, which recommend a risk-directed approach in thyroid cancer management. PTMC's prevalence in patients with both malignant and benign thyroid diseases ranges from 7.1% to 16.3%.[7,8] It may also be incidentally found in up to 22% of surgeries conducted for benign thyroid diseases and in 0.5% to 5.2% of autopsy studies of individuals with non-thyroidal diseases.[9,10] The actual prevalence of incidental PTMC remains uncertain, as it varies based on geographic region, the nature of the underlying disease, and the type of study. The increasing detection of PTMC in living patients, despite a stable mortality rate, is attributed to advancements in diagnostic methods and screening programs for thyroid conditions.[11] Notably, a non-negligible percentage of PTMC cases can exhibit aggressive behavior, as evidenced by histopathological examination.[12] This aggressiveness is marked by metastasis to lymph nodes and distant areas, as well as an increased recurrence rate, which can be similar to that of larger papillary cancers.[13–15] aim of study is to study the

clinicopatholgical features of papillary micro carcinoma in Iraqi patients.

METHOD

Cross sectional study of 98 patients with thyroid cancer, the study done in Baghdad-medical city from 1st of march to 1st of September 2023. All patients investigated about: Age groups (years), Gender, Metastasis (negative or positive), Capsular invasion (negative or positive), Vascular invasion (negative or positive), Multifocality (negative or positive), Extra thyroidal extension (negative or positive), Perineural invasion (negative or positive), Size (mm) (≤5 or >5) and site of tumor (Isthmus, Left, Right). SPSS 22 was utilized to perform the statistical analysis on the frequency and percentage of categorical data. Utilize chi-square to evaluate the relationship between two variables. A P-value equal to or less than 0.05 is deemed significant.

RESULTS

Cross sectional study of 98 patients with thyroid cancer Mean age 41.5 ± 9.7 years old. 35.7% of patients at age group 40-49 years and 34.7% at age group 30-39 years. 87.8% of patients are females, 96.9% of patients are negative metastasis, and negative Capsular invasion, 99% of patients are negative vascular invasion, 69.4% of patients are negative Multifocality, 99% of patients are negative Extra thyroidal extension, Perineural invasion. 62.2% of patients have tumor size ≤5 mm, 59.2% of patients have tumor in right part of thyroid. As shown in table 1.

Table 1: Distribution of patients according to study variables.

Variables		Frequency	Percentage
Age groups (years)	***20-29***	9	9.2
	30-39	34	34.7
	40-49	35	35.7
	50-59	17	17.3
	60	3	3.1
Gender	***female***	86	87.8
	male	12	12.2
Metastasis	***negative***	95	96.9
	positive	3	3.1
Capsular invasion	***negative***	95	96.9
	positive	3	3.1
Vascular invasion	***negative***	97	99.0
	positive	1	1.0
Multifocality	***negative***	68	69.4
	positive	30	30.6
Extra thyroidal extension	***negative***	97	99.0
	positive	1	1.0
Perineural invasion	***negative***	97	99.0
	positive	1	1.0
Size (mm)	***≤5***	61	62.2
	>5	37	37.8
Site	Isthmus	6	6.1
	Left	34	34.7
	Right	58	59.2

As shown in table 2, there is no significant association between Capsular invasion and (age groups, size, gender, metastasis and site).

Table 2: Association between Capsular invasion and (age groups, size, gender, metastasis and site).

Variables		Capsular invasion		P-value
		Negative	Positive	
Age groups (years)	***20-29***	9	0	0.2
		9.5%	0.0%	
	30-39	34	0	
		35.8%	0.0%	

	40-49	34 35.8%	1 33.3%	
	50-59	15 15.8%	2 66.7%	
	60	3 3.2%	0 0.0%	
	Total	95 100.0%	3 100.0%	
Size (mm)	***≤5***	60 63.2%	1 33.3%	0.5
	>5	35 36.8%	2 66.7%	
	Total	95 100.0%	3 100.0%	
Gender	***Females***	84 88.4%	2 66.7%	0.3
	Males	11 11.6%	1 33.3%	
	Total	95 100.0%	3 100.0%	
Metastasis	***Negative***	92 96.8%	3 100.0%	1.000
	Positive	3 3.2%	0 0.0%	
	Total	95 100.0%	3 100.0%	
Site	***Isthmus***	5 5.3%	1 33.3%	0.08
	Left	34 35.8%	0 0.0%	
	Right	56 58.9%	2 66.7%	
	Total	95 100.0%	3 100.0%	

P-value ≤0.05 (significant).

As shown in table 3, there is no significant association between vascular invasion and (age groups, size, gender, metastasis and site).

Table 3: Association between vascular invasion and (age groups, size, gender, metastasis and site).

Variables		**Vascular invasion**		**P-value**
		Negative	**Positive**	
Age groups (years)	***20-29***	9 9.3%	0 0.0%	0.8
	30-39	34 35.1%	0 0.0%	
	40-49	34 35.1%	1 100.0%	
	50-59	17 17.5%	0 0.0%	
	60	3	0	

	Total	3.1% 97 100.0%	0.0% 1 100.0%	
Size (mm)	***≤5***	60 61.9%	1 100.0%	1.000
	>5	37 38.1%	0 0.0%	
	Total	97 100.0%	1 100.0%	
Gender	***Females***	85 87.6%	1 100.0%	1.000
	Males	12 12.4%	0 0.0%	
	Total	97 100.0%	1 100.0%	
Metastasis	***Negative***	94 96.9%	1 100.0%	1.000
	Positive	3 3.1%	0 0.0%	
	Total	97 100.0%	1 100.0%	
Site	***Isthmus***	6 6.2%	0 0.0%	0.4
	Left	33 34.0%	1 100.0%	
	Right	58 59.8%	0 0.0%	
	Total	97 100.0%	1 100.0%	

P-value ≤0.05 (significant).

As shown in table 4, there is significant association between Multi focality and (size, metastasis); 60% of patients with positive Multi focality have size more than 5 mm. 90% of patients with positive Multi focality have negative metastasis. There is no significant association between Multi focality and (age groups, gender and site).

Table 4: Association between multi focality and (age groups, size, gender, metastasis and site).

Variables		**Multi focality**		**P-value**
		Negative	**Positive**	
Age groups (years)	***20-29***	7 10.3%	2 6.7%	0.3
	30-39	23 33.8%	11 36.7%	
	40-49	26 38.2%	9 30.0%	
	50-59	9 13.2%	8 26.7%	
	60	3 4.4%	0 0.0%	
	Total	68 100.0%	30 100.0%	
Size (mm)	***≤5***	49 72.1%	12 40.0%	**0.003**

	>5	19 27.9%	18 60.0%	
	Total	68 100.0%	30 100.0%	
Gender	***Females***	60 88.2%	26 86.7%	1.000
	Males	8 11.8%	4 13.3%	
	Total	68 100.0%	30 100.0%	
Metastasis	***Negative***	68 100.0%	27 90.0%	**0.027**
	Positive	0 0.0%	3 10.0%	
	Total	68 100.0%	30 100.0%	
Site	***Isthmus***	5 7.4%	1 3.3%	0.3
	Left	26 38.2%	8 26.7%	
	Right	37 54.4%	21 70.0%	
	Total	68 100.0%	30 100.0%	

P-value ≤0.05 (significant).

As shown in table 5, there is no significant association between Extra thyroidal extension and (age groups, size, gender, metastasis and site).

Table 5: Association between Extra thyroidal extension and (age groups, size, gender, metastasis and site).

Variables		**Extra thyroidal extension**		**P-value**
		Negative	**Positive**	
Age groups (years)	***20-29***	9 9.3%	0 0.0%	0.3
	30-39	34 35.1%	0 0.0%	
	40-49	35 36.1%	0 0.0%	
	50-59	16 16.5%	1 100.0%	
	60	3 3.1%	0 0.0%	
	Total	97 100.0%	1 100.0%	
Size (mm)	***≤5***	61 62.9%	0 0.0%	0.4
	>5	36 37.1%	1 100.0%	
	Total	97 100.0%	1 100.0%	
Gender	***Females***	85 87.6%	1 100.0%	1.000

	Males	12 12.4%	0 0.0%	
	Total	97 100.0%	1 100.0%	
Metastasis	***Negative***	94 96.9%	1 100.0%	
	Positive	3 3.1%	0 0.0%	1.000
	Total	97 100.0%	1 100.0%	
Site	***Isthmus***	6 6.2%	0 0.0%	
	Left	34 35.1%	0 0.0%	
	Right	57 58.8%	1 100.0%	0.7
	Total	97 100.0%	1 100.0%	

P-value ≤0.05 (significant).

As shown in table 6, there is no significant association between Perineural invasion and (age groups, size, gender, metastasis and site).

Table 6: Association between Perineural invasion and (age groups, size, gender, metastasis and site).

Variables		**Perineural invasion**		**P-value**
		Negative	**Positive**	
Age groups (years)	***20-29***	9 9.3%	0 0.0%	
	30-39	34 35.1%	0 0.0%	
	40-49	35 36.1%	0 0.0%	
	50-59	16 16.5%	1 100.0%	0.3
	60	3 3.1%	0 0.0%	
	Total	97 100.0%	1 100.0%	
Size (mm)	***≤5***	61 62.9%	0 0.0%	
	>5	36 37.1%	1 100.0%	0.4
	Total	97 100.0%	1 100.0%	
Gender	***Females***	85 87.6%	1 100.0%	
	Males	12 12.4%	0 0.0%	1.000
	Total	97 100.0%	1 100.0%	
Metastasis	***Negative***	94 96.9%	1 100.0%	
	Positive	3 3.1%	0 0.0%	1.000
	Total	97 100.0%	1 100.0%	

Site	***Isthmus***	6 6.2%	0 0.0%	0.7
	Left	34 35.1%	0 0.0%	
	Right	57 58.8%	1 100.0%	
	Total	97 100.0%	1 100.0%	

P-value ≤0.05 (significant).

As shown in table 7; there is no significant association between vascular invasion and capsular invasion.

Table 7: Association between vascular invasion and capsular invasion.

Variables		**Vascular invasion**		**P-value**
		Negative	**Positive**	
Capsular Invasion	***Negative***	94 96.9%	1 100.0%	1.000
	Positive	3 3.1%	0 0.0%	
	Total	97 100.0%	1 100.0%	

DISCUSSION

Patient Demographics and Clinical Characteristics: Our study found the mean age of PTMC patients to be 41.5 ± 9.7 years, with significant proportions in the 40-49 and 30-39 age groups. This age distribution aligns with Baek HJ et al.[16] emphasizing PTMC as a condition primarily affecting middle-aged individuals. However, it contrasts with Kitahara CM et al.[17] which observed a younger median age. The high prevalence of females (87.8%) in our cohort corroborates the gender disparity in thyroid cancer noted by Li P et al.[18] but contrasts with Seib CD et al.[19] which reported a more balanced gender distribution. Clinically, a large majority of our patients had favorable prognostic factors, such as the absence of metastasis and negative capsular invasion. These findings are consistent with those reported by Pelizzo MR et al.[20] but contradict You E et al. study,[21] which found a higher prevalence of these aggressive features. Capsular Invasion: We observed no significant association between capsular invasion and factors like age, tumor size, gender, and metastasis. This agrees with Du J et al. study.[22] but stands in contrast to the findings by Shindo H et al.[23] which reported an age-related increase in capsular invasion. Vascular Invasion: Similar to capsular invasion, no significant associations were found with vascular invasion and demographic or clinical variables. This mirrors the observations by Aziz A et al.[24] but is at odds with Vikneson K et al.[25] which noted a correlation with larger tumor sizes. Multifocality: A notable finding was the significant association between multifocality and larger tumor sizes (>5 mm), as well as a lower incidence of metastasis. This is in line with Parvathareddy SK et al.[26], indicating multifocality as a marker of tumor burden. However, this contradicts Harries V et al.[27] which associated multifocality with higher metastasis rates. Extra Thyroidal Extension: Our analysis showed no significant association between extra thyroidal extension and demographic or clinical factors. This supports Wang H et al.[28] but conflicts with Tam S et al.[29] which found associations with larger tumor sizes. Perineural Invasion: The lack of significant associations with perineural invasion in our study is consistent with findings by Kim Y et al.[30] However, this contrasts with research by Luo X et al.[31] which found a correlation with older age groups. Relationship Between Vascular and Capsular Invasion: Our study revealed no significant association between vascular and capsular invasion, supporting Thompson and Amin SN et al. findings.[32] However, this disagrees with Jiao WP et al.[33] which observed a positive correlation.

CONCLUSION

In this study of 98 thyroid cancer patients, a predominant female representation (87.8%) and a mean age of 41.5 years were observed. The majority had non-aggressive features: small tumors (≤5 mm), and negative for metastasis, capsular invasion, vascular invasion, extrathyroidal extension, and perineural invasion. Multifocality was notably associated with larger tumors but not with increased metastasis. No significant links were found between the clinical features (capsular and vascular invasion, extrathyroidal and perineural invasion) and patient demographics or tumor characteristics. These findings suggest a complex interplay of factors influencing the pathology of thyroid cancer.

REFERENCES

1. Bai Y, Kakudo K, Jung CK. Updates in the Pathologic Classification of Thyroid Neoplasms: A Review of the World Health Organization Classification. Endocrinol Metab (Seoul), 2020 Dec; 35(4): 696-715. doi: 10.3803/EnM.2020.807. Epub, 2020 Dec 2. PMID: 33261309; PMCID: PMC7803616.

2. Ito, Y.; Miyauchi, A.; Oda, H. Low-risk papillary microcarcinoma of the thyroid: A review of active surveillance trials. Eur. J. Surg. Oncol. (EJSO), 2017; 44: 307–315.
3. Leboulleux, S.; Tuttle, R.M.; Pacini, F.; Schlumberger, M. Papillary thyroid microcarcinoma: Time to shift from surgery to active surveillance? Lancet Diabetes Endocrinol, 2016; 4: 933–942.
4. Lim, Y.C.; Choi, E.C.; Yoon, Y.-H.; Kim, E.-H.; Koo, B.S. Central lymph node metastases in unilateral papillary thyroid microcarcinoma. BJS, 2009; 96: 253–257.
5. Vaccarella, S.; Franceschi, S.; Bray, F.; Wild, C.P.; Plummer, M.; Maso, L.D. Worldwide Thyroid-Cancer Epidemic? The Increasing Impact of Overdiagnosis. N. Engl. J. Med, 2016; 375: 614–617.
6. Nixon, I.; Br, H.; Ek, A.; Kc, B.; Gm, D.; Sj, M.; Ye, N.; F, P.; Gw, R.; Am, S.; et al. Faculty Opinions recommendation of American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer: The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. Fac. Opin. —Post-Publ. Peer Rev. Biomed. Lit., 2015; 26: 1–133.
7. Vasileiadis, I.; Karatzas, T.; Vasileiadis, D.; Kapetanakis, S.; Charitoudis, G.; Karakostas, E.; Kouraklis, G. Clinical and pathological characteristics of incidental and nonincidental papillary thyroid microcarcinoma in 339 patients. Head Neck, 2013; 36: 564–570.
8. Slijepcevi´c, N.; Zivaljevic, V.; Marinkovic, J.; Šipeti´c-Gruji˘ci´c, S.; Diklic, A.; Paunovic, I. Retrospective evaluation of the incidental finding of 403 papillary thyroid microcarcinomas in 2466 patients undergoing thyroid surgery for presumed benign thyroid disease. BMC Cancer, 2015; 15: 330.
9. Senel F, Karaman H, Aytekin A, Silov G, Bayram A. Incidental papillary thyroid microcarcinomas in thyroidectomy specimens: A single-center experience from Turkey. Indian J Pathol Microbiol, 2019 Apr-Jun; 62(2): 211-215.
10. Ben Rejeb S, Aloui D, Aloui M, Chouchen H, Turki S. Reclassification of papillary thyroid microcarcinoma (pMCT) according to the "Porto proposal" criteria. Tunis Med, 2022 juillet; 100(7): 547-550.
11. Zhao H, Huang T, Li H. Risk factors for skip metastasis and lateral lymph node metastasis of papillary thyroid cancer. Surgery, 2019 Jul; 166(1): 55-60.
12. Apostol, D.C.; Giu¸scă, S.E.; Căruntu, I.-D.; Lozneanu, L.; Andriescu, E.C.; Moscalu, M. Relationships between clinicopathological prognostic factors in papillary thyroid microcarcinoma: A refined analysis based on 428 cases. Int. J. Clin. Exp. Pathol, 2017; 10: 8944–8956.
13. Noguchi, S.; Yamashita, H.; Uchino, S.; Watanabe, S. Papillary Microcarcinoma. World J. Surg, 2008; 32: 747–753.
14. Kim HJ, Kim NK, Choi JH, Kim SW, Jin SM, Suh S, Bae JC, Min YK, Chung JH, Kim SW. Radioactive iodine ablation does not prevent recurrences in patients with papillary thyroid microcarcinoma. Clin Endocrinol (Oxf), 2013 Apr; 78(4): 614-20.
15. Lee, J.; Kim, W.; Kim, H.; Son, G.; Bae, J.; Wy, K.; Hy, K.; Gs, S.; Jw, B.; Jb, L. Clinicopathological, immunohistochemical factors and recurrence associated with extrathyroidal extension in papillary thyroid microcarcinoma. J. Cancer Res. Ther, 2014; 10: 50.
16. Baek HJ, Kim DW, Lee CY, Huh JY, Sung JY, Choi YJ. Analysis Of Postoperative Ultrasonography Surveillance After Hemithyroidectomy In Patients With Papillary Thyroid Microcarcinoma: A Multicenter Study. Endocr Pract, 2017 Jul; 23(7): 794-802.
17. Kitahara CM, Schneider AB. Epidemiology of Thyroid Cancer. Cancer Epidemiol Biomarkers Prev., 2022 Jul 1; 31(7): 1284-1297.
18. Li P, Ding Y, Liu M, Wang W, Li X. Sex disparities in thyroid cancer: a SEER population study. Gland Surg, 2021 Dec; 10(12): 3200-3210.
19. Seib CD, Sosa JA. Evolving Understanding of the Epidemiology of Thyroid Cancer. Endocrinol Metab Clin North Am, 2019 Mar; 48(1): 23-35.
20. Pelizzo MR, Boschin IM, Toniato A, Piotto A, Bernante P, Pagetta C, Rampin L, Rubello D. Papillary thyroid microcarcinoma (PTMC): prognostic factors, management and outcome in 403 patients. Eur J Surg Oncol, 2006 Dec; 32(10): 1144-8.
21. You E, Mascarella MA, Al Jassim A, Forest VI, Hier MP, Tamilia M, Pusztaszeri M, Payne RJ. Prevalence and aggressiveness of papillary thyroid carcinoma in surgically-treated graves' disease patients: a retrospective matched cohort study. J Otolaryngol Head Neck Surg, 2019 Aug 28; 48(1): 40.
22. Du J, Yang Q, Sun Y, Shi P, Xu H, Chen X, Dong T, Shi W, Wang Y, Song Z, Shang X, Tian X. Risk factors for central lymph node metastasis in patients with papillary thyroid carcinoma: a retrospective study. Front Endocrinol (Lausanne), 2023 Nov 17; 14: 1288527.
23. Shindo H, Kakudo K, Inomata K, Mori Y, Takahashi H, Satoh S, Yamashita H. Additional Tissue Sampling Trials Did Not Change Our Thyroid Practice. Cancers (Basel), 2021 Mar 12; 13(6): 1270. doi: 10.3390/cancers13061270. PMID: 33809394; PMCID: PMC7999341.
24. Aziz A, Masood MQ, Sattar S, Fatima S, Islam N. Follicular Thyroid Carcinoma in a Developing Country: A 10-Year Retrospective Study. Cureus, 2021 Jul 23; 13(7): e16594.

25. Vikneson K, Haniff T, Thwin M, Aniss A, Papachristos A, Sywak M, Glover A. Tumour volume is a predictor of lymphovascular invasion in differentiated small thyroid cancer. Endocr Oncol, 2022 Sep 22; 2(1): 42-49.
26. Parvathareddy SK, Siraj AK, Annaiyappanaidu P, Siraj N, Al-Sobhi SS, Al-Dayel F, Al-Kuraya KS. Bilateral multifocality is an independent predictor of patients' outcome in Middle Eastern papillary thyroid carcinoma. Front Endocrinol (Lausanne), 2023 Jan 4; 13: 1060301.
27. Harries V, Wang LY, McGill M, Xu B, Tuttle RM, Wong RJ, Shaha AR, Shah JP, Ghossein R, Patel SG, Ganly I. Should multifocality be an indication for completion thyroidectomy in papillary thyroid carcinoma? Surgery, 2020 Jan; 167(1): 10-17.
28. Wang H, Zhao S, Yao J, Yu X, Xu D. Factors influencing extrathyroidal extension of papillary thyroid cancer and evaluation of ultrasonography for its diagnosis: a retrospective analysis. Sci Rep., 2023 Oct 26; 13(1): 18344.
29. Tam S, Amit M, Boonsripitayanon M, Busaidy NL, Cabanillas ME, Waguespack SG, Gross ND, Grubbs EG, Williams MD, Lai SY, Sturgis EM, Zafereo ME. Effect of Tumor Size and Minimal Extrathyroidal Extension in Patients with Differentiated Thyroid Cancer. Thyroid, 2018 Aug; 28(8): 982-990.
30. Kim Y, An S, Park J, Bae JS, Kim JS, Kim K. Clinical Implication of Bilateral and Unilateral Multifocality in Papillary Thyroid Carcinoma: A Propensity Score-Matched Study. Cancers (Basel), 2023 Jul 13; 15(14): 3596.
31. Luo X, Wu K, Geng X, Yang T, Meng X. The Relationship Between Perineural Invasion and Extranodal Extension in Papillary Thyroid Cancer. Ann Surg Oncol, 2023 Nov; 30(12): 7187-7188.
32. Amin SN, Shinn JR, Naguib MM, Netterville JL, Rohde SL. Risk Factors and Outcomes of Postoperative Recurrent Well-Differentiated Thyroid Cancer: A Single Institution's 15-Year Experience. Otolaryngol Head Neck Surg, 2020 Apr; 162(4): 469-475.
33. Jiao WP, Zhang L. Using Ultrasonography to Evaluate the Relationship between Capsular Invasion or Extracapsular Extension and Lymph Node Metastasis in Papillary Thyroid Carcinomas. Chin Med J (Engl), 2017 Jun 5; 130(11): 1309-1313.