

# Role of Computed Tomography Imaging in Evaluation Cervical Lymph Nodes in Patients with Nasopharyngeal Carcinoma

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**Keywords:** Computed Tomography; Cervical Lymph Nodes; Nasopharyngeal Carcinoma

**Abbreviations:** NPC: Nasopharyngeal Carcinoma; CT: Computed Tomography; T Stage: Tumor Stage; N Stage: Nodal Stage; NKUC: Non-Keratinizing Undifferentiated Carcinoma; NKDC: Non-Keratinizing Differentiated Carcinoma; KSCC: Keratinizing Squamous Cell Carcinoma

## Abstract

**Background:** Nasopharyngeal carcinoma, the most common neoplasm to arise in the nasopharynx, is a locally aggressive tumor with a high incidence of cervical nodal metastases. This study aimed to investigate the role of computed tomography in the evaluation of cervical lymph nodes in patients with nasopharyngeal carcinoma. **Methods:** CT scans of 141 newly diagnosed nasopharyngeal carcinoma patients were reviewed. All patients were diagnosed by histopathology.

**Results:** The 141 patients included in this analysis comprised men account for 75.9%, with a median age at diagnosis of 49 years (range, 20-80 years). On CT scan, there were 119 patients found with lymph nodes, accounting for 84.4%. Above carotid lymph nodes account for a high percentage (92.4%). The cervical lymph nodes on the both sides account for a high proportion (58.8%). The size of cervical lymph nodes from 2cm to less than 4cm accounts for a high proportion (54.6%), the size of lymph nodes under 1cm is only 0.8% and over 6cm is 4.2%. Retropharyngeal space lymph nodes is present in 39% of the total number of 141 patients with nasopharyngeal cancer, supraclavicular lymph nodes accounting for 1.4%. The period of neck lymph nodes N2 accounts for the highest proportion of 48.9%, the period of N3 is 4.3% and without neck lymph nodes is 15.6%.

**Conclusion:** Computed tomography is essential for evaluation the cervical lymph nodes.

## Introduction

Nasopharyngeal carcinoma (NPC), the most common neoplasm to arise in the nasopharynx, is a locally aggressive tumor with a high incidence of cervical nodal metastases. The tumor has a propensity towards extensive invasion into adjacent tissues, particularly laterally into the parapharyngeal space and superiorly into the skull base. However, spread to the palate, nasal cavity, and oropharynx have also commonly reported. Distant metastases can arise within bone, lung, the mediastinum and, more rarely, the liver [1-3]. Although NPC is rare in North America and Europe with an incidence of 0.5-2 per 100,000, intermediate incidence rates are seen in Southeast Asia, the Mediterranean Basin, and

the Arctic ranging from 0.5 to 31.5 per 100,000 person-years in males and 0.1 to 11.8 person-years in females [4-6]. In southern China, NPC is endemic with overall NPC incidence rates reaching 20-30 per 100,000 person-years and 15-20 per 100,000 person-years amongst males and females, respectively, in the province of Guangdong [7,8].

NPC has a male to-female ratio of 2-3:1 [9,10], and is most common among patients 40-60 years old with bimodal age peaks in the second and sixth decades of life [11,12]. Early detection, early diagnosis, accurate staging and evaluation after treatment had been the key to improve the efficacy of treatment and

prolong survival period [13]. CT has been the most reliable and well-established imaging technique for staging and assessing the extent of nasopharyngeal carcinoma. The biggest advantage of CT imaging is that the surrounding bony destruction by NPC can be clearly visualized on CT image [13]. Zheng, et al. [14] found that radiologists should pay attention to bony structures invaded by nasopharyngeal carcinoma on CT images. In addition, CT scan is very quick and gets abundant information. It is also relatively cheaper and still an effective imaging method for diagnosis and follow-up of nasopharyngeal carcinoma [15,16]. This study aims to investigate the role of computed tomography (CT) in the evaluation of tumor stage (T stage) and nodal stage (N stage) in patients with nasopharyngeal carcinoma.

## Materials and Methods

From July 2015 to December 2019, a total of 141 consecutive patients with NPC visited HCMC Oncology Hospital, Vietnam. All patients with histologically proven NPC newly diagnosed were enrolled in this study. They completed a pre-treatment evaluation that included physical examination, nasopharyngeal fiberoptic endoscopy, CT scan of the nasopharynx and neck, chest radiography, abdominal sonography. The CT scans were obtained with a GE Optima CT660, in axial plane and coronal, sagittal reconstruction after the injection of contrast medium (Ultravist 370, Schering, Berlin, Germany) using 3 mm section thickness; 50 mL of Ultravist was administered by intravenous. All the images were reviewed and assessed by two of the authors independently. Cases with variable interpretation or disagreement in staging between the observers were reevaluated side by side, and the differences were

confirmed to reach a final consensus. Medical records and imaging studies were analyzed, and all patients were restaged according to the 8th edition of the Union for International Cancer Control/American Joint Committee on Cancer staging system [17] relies on evaluation of the primary tumor (T category), the draining nodal groups (N category). Histopathologic evaluation was according to the 2003 World Health Organization classification: non-keratinizing undifferentiated carcinoma (NKUC), non-keratinizing differentiated carcinoma (NKDC), keratinizing squamous cell carcinoma (KSCC). SPSS version 20.0 (IBM, Armonk, NY) was used for all statistical analyses.

## Results

The 141 patients included in this analysis comprised men account for 75,9%, with a median age at diagnosis of 49 years (range, 20-88 years). There were 119 patients found with cervical lymph nodes on CT scan (both sides in 70 patients), accounting for 84.4%. Retropharyngeal space lymph nodes is present in 55 (39%) of the total number of 141 patients with nasopharyngeal cancer, supraclavicular lymph nodes accounting for 1.4%. Of these cervical lymph nodes, above carotid lymph nodes account for a high percentage (92,4%) (Table 1). The size of cervical lymph nodes from 2cm to less than 4cm accounts for a high proportion (54.6%), the size of lymph nodes under 1cm is only 0.8% and over 6cm is 4.2% (Table 2). The period of neck lymph nodes N2 accounts for the highest proportion of 48.9%, the period of N3 is 4.3% and without neck lymph nodes is 15.6% (Table 3). Some CT images of the patients are showed in Figures 1-4.

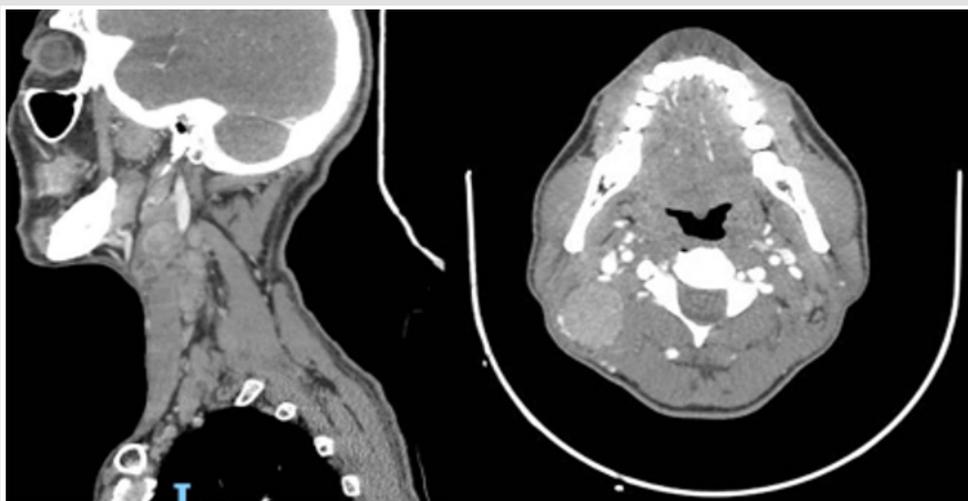


Figure 1: Above carotid lymph nodes.

**Table 1:** Distribution of cervical lymph nodes on CT scan.

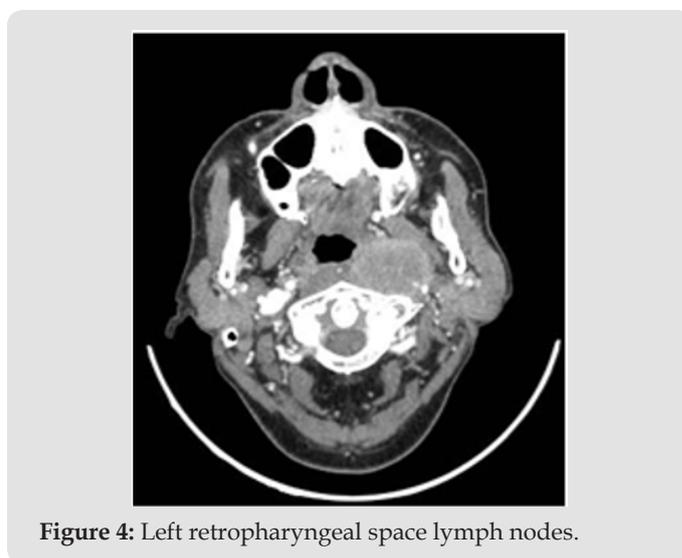
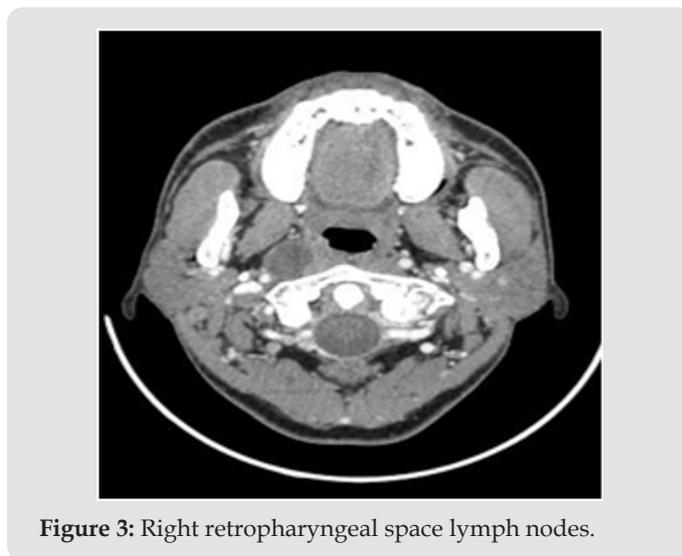
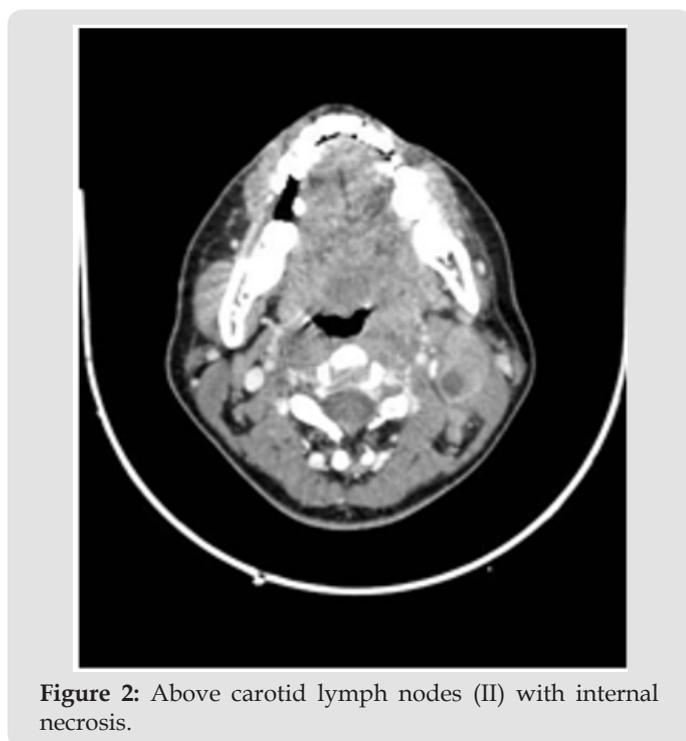
Cervical lymph nodes	Frequency (n=119)	Percentage (%)
Submental and submandibular lymph nodes	8	6.7
Above carotid lymph nodes	110	92.4
Middle carotid lymph nodes	73	61.3
Below carotid lymph nodes	50	42.0
Posterior triangle lymph nodes	62	52.1
Anterior triangle lymph nodes	0	0.0

**Table 2:** Classification of cervical lymph nodes size on CT scan.

Size	Frequency (n=119)	Percentage (%)
<1cm	1	0,8
1-<2cm	27	22,7
2-<4cm	65	54,6
4-<6cm	21	17,6
≥6cm	5	4,2

**Table 3:** Proportional distribution of cervical lymph node stage (N) on CT scan.

Stage N	Frequency (n=141)	Percentage (%)
N0	22	15,6
N1	44	31,2
N2	69	48,9
N3	6	4,3



**Discussion**

According to our Table 1 results, metastatic neck lymph nodes account for 84.4%. According to Vietnamese authors results such as Phung Hung and Ngo Huu Thuan, this ratio is 88.71% [18] and 96.1% [19], respectively. According to author Chan Y.W. this is 85% [20]. According to Lee et al., A study of 4768 patients, metastatic neck lymph nodes accounted for 75.8% [21]. According to authors Razeq A. and King A., the metastatic neck lymph nodes met 75-90% [22]. Our research results are quite consistent with this author. According to our results in Table 2, the carotid lymph nodes accounted for the highest proportion, in which the upper segment was found in 92.5% of the total number of lymph node findings in CT scan. According to the research results of the author Ngo Huu Thuan, the lymph node group accounts for a high proportion, in which the middle carotid lymph nodes accounts for 62.7%

[19]. According to author Mao Y.P, the ganglion group is the most common [23]. According to Ho F.C.H et al., The carotid lymph nodes accounted for 44.9-74.2% [24]. According to Hodler J. et al., The inside carotid lymph node group encountered in 86-90% [25].

Our research results show that bilateral neck lymph nodes account for the highest proportion (accounting for 58.8% of cases of lymph node metastases detected on CT scan). According to AJCC's N table, when metastatic neck lymph nodes are found on both sides, they are included in N2 or higher stage [26]. The study results of the author Ngo Huu Thuan showed that the ratio of bilateral neck lymph nodes accounted for 82.4% [19]. According to author Mao Y.P, neck lymph nodes on both sides account for 55.2% [23]. According to the results of Table 3, neck lymph nodes with a size of 2-4cm account for 54.6% of the total number of lymph node findings. According to the results of author Mao Y.P, neck lymph node size from 2-4cm accounts for 46.9% [23]. According to the research results of the author Ngo Huu Thuan, the 1-3cm neck lymph nodes account for the highest proportion with 58.8% [19]. According to AJCC grading, retropharyngeal space lymph nodes present on one or both sides are classified into N1 and above [26]. The presence of a retropharyngeal space lymph node is the first marker of regional metastatic ability of palate cancer [24,27].

However, only advanced imaging techniques such as CT scan and magnetic resonance imaging can examine and assess the posterior region of the pharynx. Ultrasound has proved to be of no value in examining the retropharyngeal space lymph nodes. Our results show that the incidence of retropharyngeal space lymph nodes is 39% of total patients with pharyngeal cancer. According to the results of the author Ngo Huu Thuan, the rate of retropharyngeal space lymph nodes is 19.6% [19]. Ho F.C.H et al. Showed that 69% of the retropharyngeal space lymph nodes [24]. The supraclavicular lymph node is one of the markers for the N3 stage of regional lymph node metastasis of nasopharyngeal cancer [26]. The results of our study showed that the supraclavicular lymph nodes accounted for 1.4%. According to the results of Ngo Huu Thuan and Ho F.C.H, the incidence of supraclavicular lymph nodes is 9.8% and 3% [19,24]. According to our research results in Table 3, CT scan revealed metastatic neck lymph nodes accounted for 84.4%. In particular, the N0-N1 lymph node stage is 46.8%, the N2 period accounts for the highest proportion with 48.9%, the N3 period is 4.3%.

According to author Ngo Huu Thuan, a study on CT scan, 96.1% of the patients had neck lymph node on CT scan, in which period N0-N1 was 13.7%, stage N2 was 66, 7% and N3 are 19.6% [19]. According to Phung Hung, the period of N0-N1 accounted for 35.48%, the period of N2 was 48.39% and the period of N3 was 16.13% [18]. According to the author Kim J.H and Lee J.K on CT scan, metastatic neck lymph nodes in N0-N1 stage accounted for 58%, N2 stage was 35% and N3 stage was 7% [28]. The results on the comparison table of metastatic neck lymph nodes on CT scan, our study agreed with the authors on the period N2 accounted for the highest proportion. Our N3 stage is lower than the rest of the

authors, possibly due to the large size of the lymph nodes or the late stage of cancer of the nasopharynx so the treatment is not merely radiotherapy so we cannot give it to form.

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