*Original Article*

# Accuracy of Adjunct OPD Ultrasonography for Cervical Lymph Node Staging in Oral Cavity Cancer

Nithi Srisukhumchai MD[1], Warinthorn Phuttharak MD[2],
Bowornsilp Chowchuen MD, MBA[1], Palakorn Surakunprapha MD[1], Kamonwan Jenwitheesuk MD[1]

[1] Division of Plastic Surgery, Department of Surgery, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand
[2] Department of Radiology, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

***Background:*** Oral cavity cancer has a good survival outcome if detected early and properly managed; however, thorough investigation is required for cervical lymph node staging, which can delay surgery. The authors examined the accuracy OPD ultrasounds in a number of cases, to try a simpler investigative method.

***Objective:*** Our aim was to investigate the accuracy of OPD ultrasounds for use in cervical lymph node staging in oral cavity cancer.

***Materials and Methods:*** Between January 2015 and February 2016, oral cavity cancer patients at Srinagarind Hospital underwent both manual physical examination and OPD ultrasound for pre-operative cervical lymph node staging.

***Results:*** Fifty patients had oral cavity cancer (23 [46%] males and 27 [54%] females). The respective sensitivity, specificity, and accuracy of cervical lymph node staging via manual physical examination vs. staging by OPD ultrasound was 77.3%, 60.7%, and 68% vs. 100%, 82.1%, and 90%.

***Conclusion:*** In cases of oral cavity cancer, adjunct OPD ultrasonography demonstrated high sensitivity, specificity, and accuracy for pre-operative cervical lymph node staging.

***Keywords:*** Ultrasound, Oral cavity cancer, Cervical lymph node

**J Med Assoc Thai 2018; 101 (Suppl. 5): S139-S142**
**Full text. e-Journal:** http://www.jmatonline.com

Oral cavity cancer has been identified as a significant public health threat. The epidemiology of oral cavity cancer has been the subject of numerous studies, both in Thailand and around the world. The incidence of oral cavity cancers is particularly high in Northeast Thailand[1]. The chewing of betel nut has been reported to lead to an increased risk for the development of oral cavity malignancy. In addition, a history of smoking and alcohol consumption are also risk factors for developing the cancer[2]. The plastic surgeons at Srinagarind Hospital treat a large number of patients who have oral cavity cancer. Management of the N0 neck in patients with early invasive squamous cell carcinoma of the oral cavity often involves neck dissection for cervical lymph nodes metastasis, as the risk of occult metastasis in these cases is 20 to 30%[3]. Neck dissection, however, leads to increased rates of morbidity due to injury to the lymphatic and venous vessels[4,5]. Imaging studies, including CT, MRI, and ultrasonography, have been used to better identify grossly involved, non-palpable nodes. All of these methods, however, predict lymph node involvement through size and shape and, thus, have a significant expected rate of false-positive and false-negative results. In order to treat this group of patients, a better diagnostic technique for identifying subclinical cervical metastasis is necessary.

Some studies have found ultrasonography provides high sensitivity, specificity, and accuracy[6-9] as well as being safe, economical, less time-consuming

**Correspondence to:**
Jenwitheesuk K, Division of Plastic Surgery, Department of Surgery, Faculty of Medicine, Khon Kaen University, Khon Kaen 40002, Thailand.
**Phone:** +66-43-363252
**E-mail:** kamoje@kku.ac.th

**How to cite this article:** Srisukhumchai N, Phuttharak W, Chowchuen B, Surakunprapha P, Jenwitheesuk K. Accuracy of Adjunct OPD Ultrasonography for Cervical Lymph Node Staging in Oral Cavity Cancer. J Med Assoc Thai 2018;101;Suppl. 5: S139-S142.

than other methods of cervical lymph node staging[10]. The authors hypothesized that ultrasonography would exhibit higher accuracy and be more cost-effective for cervical lymph node staging than CT scans, as well as reducing the amount time patients spend in hospital.

## Objective

To investigate the accuracy of pre-operative ultrasound in cervical lymph node staging in cases of oral cavity cancer at Srinagarind Hospital.

## Materials and Methods

This was prospective study. Oral cavity cancer patients were investigated using OPD ultrasound in cervical lymph node staging by expert radiologists in the plastic surgery unit at Srinagarind Hospital between 2015 and 2016. The results in the same period were compared with routine manual physical examination. We used a GE LOGIQ e portable ultrasound Rev.6 with a linear probe 9L-RS at a frequency of 3.5 to 10.0 MHz and classified cervical lymph node staging as per the American Joint Committee on Cancer. Assessors were not apprised as to the assessment made by others.

### *Population and samples*

#### *Inclusion criteria*

We included oral cavity cancer patients, 18 and over who presented at Srinagarind Hospital, Department of Plastic Surgery, between 2015 and 2016.

#### *Exclusion criteria*

We excluded oral cavity cancer patients who had not undergone cervical lymph node resection.

### *Data analysis*

The diagnostic value of the data (with 95% confidence interval) were assessed for sensitivity, specificity, positive predictive value [PPV], negative predictive value [NPV], accuracy, vis-a-vis age, sex, sites of lesions, and cervical lymph nodes. STATA version 10.0 was used for the analyses. The accuracy of both tests was compared with the pathology results.

## Results

Of the 50 patients diagnosed with squamous cell carcinoma of the oral cavity by incisional biopsy, 46% (n = 23) were male and 54% (n = 27) were female. Affected persons were between 38 and 87 with a mean age of 61. The site of the cancer varied among the patients (tongue = 22; buccal mucosa = 8; floor of mouth = 6; hard palate = 2; lower gum = 5; upper gum = 2; and, lip = 5).

Before surgery, patients who participated in the study were examined using both palpation and ultrasound of the cervical lymph nodes. According to the pathology results after cervical lymph node dissection, only 22 patients had cervical lymph node metastases. Statistical analyses revealed that cervical lymph node staging through manual physical examination had a 77.3% sensitivity, 60.7% specificity, and 68% accuracy. OPD ultrasound, by comparison, provided 100% sensitivity, 82.1% specificity, and 90% accuracy vis-a-vis cervical lymph node staging.

## Discussion

An assessment of lymph node metastases is essential when choosing the course of therapy for an improved prognosis of patients with oral cavity cancer, especially among patients who undergo neck dissection. Notwithstanding, the results of such an assessment need to be interpreted with care. Ahmed et

**Table 1.** Demographic data

| | n (%) |
|---|---|
| Sex | |
| Male | 23 (46) |
| Female | 27 (54) |
| Tongue cancer | 22 (44) |
| Buccal mucosa cancer | 8 (16) |
| Floor of mouth cancer | 6 (12) |
| Upper gum cancer | 5 (10) |
| Lower gum cancer | 2 (4) |
| Hard palate cancer | 2 (4) |
| Lips cancer | 5 (10) |

**Table 2.** Results of pre-operative cervical lymph node staging

| | Sensitivity | Specificity | Accuracy | PPV | NPV |
|---|---|---|---|---|---|
| Ultrasonography | 100% | 82.1% | 90% | 81.5% | 100% |
| Detecting by hand | 77.3% | 60.7% | 68% | 60.7% | 77.3% |

al[11] found that patients with oral cavity cancer had a high risk for developing early Level I metastasis to the lymph nodes, followed by level II and level III. Recent studies have shown that there is a tendency to over diagnose lymph nodes as metastases in patients with clinically palpable cervical lymph nodes, which leads to overtreatment. There are now a number of modalities by which metastatic nodes can be accurately detected thereby making treatment more timely and focused (i.e., ultrasound, CT scans, and MRI).

Ultrasound is less time-consuming, safer, and more cost-effective than many other methods. It is also effective for differentiating between metastatic and non-metastatic lymph nodes. Among the various parameters, the size and shape of lymph nodes can be measured objectively, whereas the measurement of other paramets is more subjective (i.e., edge definition, margins, patterns, intensity of internal echoes, and echogenic hilus).

In the present study, the authors used various parameters, but the most accurate parameter for diagnosing metastatic lymph nodes was mixed vascularity.This could be because tumor nests have replaced the nodes. The pre-existing nodal vessels may have proliferated and transformed into feeding vessels through angiogenesis as a result of destruction of the hilar blood supply. The latter occurs through the central aberrant nodal vessels and advanced tumoral infiltration of a node. Induction of the vascular supply is, moreover, from the peripheral pre-existing vessel or vessels in perinodal connective tissue.

Previous studies have reported a range of results with regard to sensitivity, specificity, and accuracy of ultrasound. In the present study, ultrasonography of the neck was more sensitive and specific than palpation for detecting cervical lymphadenopathy in patients with oral cavity cancer. Ultrasonography of the neck had a higher sensitivity (100% vs. 94%) and somewhat lower specificity (82.1% vs. 84%) than CT scanning[12]. The benefits of ultrasonography are that it is more cost-effective than CT scanning and patients are not exposed to radiation.

There were some limitations to this study. First, the included patients had various types of oral cavity cancer. The results of the current study may not be specific to any particular cancers. Second, only one radiologist participated in this study, so there was no inter-rater assessment. Finally, the study compared only ultrasonography and physical examination. Further study is needed with more radiologists (raters) that includes CT scanning of the neck as part of the comparison.

## Conclusion

Adjunct OPD ultrasound for pre-operative cervical lymph node staging in oral cavity cancer had high accuracy. In addition, the protocol took less time, was less expensive and safer than other methods. Adjunct OPD ultrasound is thus appropriate for pre-operative cervical lymph node staging for patients with oral cavity cancer as it could reduce adverse reactions from treatment.

## What is already known on this topic?

OPD Ultrasound for pre-operative cervical lymph node staging for patients with oral cavity cancer has high accuracy.

## What this study adds?

OPD ultrasound for pre-operative cervical lymph node staging of oral cavity cancer took less time, was less expensive and safer than CT scanning.


## Acknowledgements

This study was granted by Faculty of Medicine, Khonkaen University, Thailand (Grant Number IN58112) and Tawanchai Foundation for Cleft Lip-Palate and Craniofacial Deformities and the Center of Cleft Lip Cleft palate and Craniofacial Deformities, Khon Kaen University, under Tawanchai Royal Grant Project. We thank Mr. Bryan Roderick Hamman for assistance with the English-language presentation of the manuscript


## Potential conflicts of interest

The authors declare no conflicts of interest.

## References


1. Koontongkaew S, Phantumvanit P, Songpaisan Y, Harnirattisai C. Oral health of Thai population: current status, problems and suggestions. Bangkok: Thailand Research Fund; 1995.
2. Lin YS, Jen YM, Wang BB, Lee JC, Kang BH. Epidemiology of oral cavity cancer in Taiwan with emphasis on the role of betel nut chewing. ORL J Otorhinolaryngol Relat Spec 2005;67:230-6.
3. Woolgar JA, Rogers S, West CR, Errington RD, Brown JS, Vaughan ED. Survival and patterns of recurrence in 200 oral cancer patients treated by radical surgery and neck dissection. Oral Oncol 1999;35:257-65.

4. Cleland-Zamudio SS, Wax MK, Smith JD, Cohen JI. Ruptured internal jugular vein: a postoperative complication of modified/selected neck dissection. Head Neck 2003;25:357-60.
5. Santaolalla F, Anta JA, Zabala A, Del Rey SA, Martinez A, Sanchez JM. Management of chylous fistula as a complication of neck dissection: a 10-year retrospective review. Eur J Cancer Care (Engl) 2010;19:510-5.
6. Jank S, Robatscher P, Emshoff R, Strobl H, Gojer G, Norer B. The diagnostic value of ultrasonography to detect occult lymph node involvement at different levels in patients with squamous cell carcinoma in the maxillofacial region. Int J Oral Maxillofac Surg 2003;32:39-42.
7. Jayachandran S, Sachdeva SK. Diagnostic accuracy of color doppler ultrasonography in evaluation of cervical lymph nodes in oral cancer patients. Indian J Dent Res 2012;23:557-8.
8. Stuckensen T, Kovacs AF, Adams S, Baum RP. Staging of the neck in patients with oral cavity squamous cell carcinomas: a prospective comparison of PET, ultrasound, CT and MRI. J Craniomaxillofac Surg 2000;28:319-24.
9. Thomsen JB, Sorensen JA, Grupe P, Karstoft J, Krogdahl A. Staging N0 oral cancer: lympho-scintigraphy and conventional imaging. Acta Radiol 2005;46:492-6.
10. Hohlweg-Majert B, Metzger MC, Voss PJ, Holzle F, Wolff KD, Schulze D. Preoperative cervical lymph node size evaluation in patients with malignant head/neck tumors: comparison between ultrasound and computer tomography. J Cancer Res Clin Oncol 2009;135:753-9.
11. Ahmed MU, Khawar A, Ahmed J, Ajmal M, Bangash WK, Akhter MR. Occult metastasis in carcinoma of oral cavity. J Coll Physicians Surg Pak 2007;17:313-5.
12. Pandeshwar P, Jayanthi K, Raghuram P. Pre-operative contrast enhanced computer tomographic evaluation of cervical nodal metastatic disease in oral squamous cell carcinoma. Indian J Cancer 2013;50:310-5.