Comparative evaluation among computed tomography and clinical evaluation in tumour/node stage and follow-up of oropharyngeal cancer

Rahil Muzaffar[1], Preeti Sharma[2], Sonika Kotwal[1], Ajaz ul Haq[2]

[1]Associate Professor, [3]Senior Resident, ENT and Head Neck Surgery, GMC Doda, India

[2]Senior Resident, [4]Assistant Professor, ENT and Head Neck Surgery, GMC Jammu, India

Corresponding author:

Ajaz ul Haq

Assistant Professor, ENT and Head Neck Surgery, GMC Jammu, India

Email ID : drajazulhaq54@gmail.com

ABSTRACT

Background: Oropharyngeal squamous cell carcinoma (OPSCC) is a malignant tumor arising from the epithelial lining of the oropharynx. The present study was conducted for evaluating among computed tomography and clinical evaluation in tumour/node stage and follow-up of oropharyngeal cancer.

Materials & methods: The study involved 20 patients diagnosed with oropharyngeal squamous cell carcinoma, aged 30–80 years, divided into two equal groups—Group A (untreated) and Group B (treated with surgery, radiotherapy, or chemotherapy). Patients with contrast contraindications were excluded. All participants underwent clinical and CT evaluation, with tumor staging based on TNM criteria. CT scans from skull base to mediastinum assessed tumor size, nodal status, bone invasion, and recurrence, and data were statistically analyzed using SPSS and Cohen's kappa with $p < 0.05$ considered significant.

Results: In Group A, interobserver agreement for T staging was significant ($p < 0.001$), while N-stage and overall staging were not. In Group B, no significant differences were found for T, N, or overall stage, likely due to post-therapeutic fibrosis and scarring that obscure imaging clarity. The results emphasize that post-treatment CT interpretation requires clinical and histopathologic correlation for accurate staging.

Conclusion: Tomographic assessment proved reliable for primary tumor delineation but posed challenges in post-treatment evaluation, reaffirming the importance of integrated diagnostic interpretation for optimal management of oral and oropharyngeal malignancies-

Keywords: Computed tomography, Tumour, Node

1. INTRODUCTION

Oropharyngeal squamous cell carcinoma (OPSCC) is a malignant tumor arising from the epithelial lining of the oropharynx—the middle segment of the pharynx located between the soft palate and the upper border of the hyoid bone. It encompasses vital structures such as the base of the tongue, tonsils, soft palate, and the lateral and posterior pharyngeal walls. Representing over 90% of all oropharyngeal malignancies, OPSCC is histologically characterized as squamous cell carcinoma. Clinically, it manifests with symptoms like persistent sore throat, dysphagia, and odynophagia, with confirmation achieved through biopsy. The disease may spread locally or via lymphatic and hematogenous routes, and management typically involves surgery, radiotherapy, chemotherapy, or a multimodal combination depending on the disease stage and histopathological findings.[1, 2]

The etiology of OPSCC can be broadly divided into HPV-associated and non-HPV-associated forms. HPV16 is the most

prevalent viral subtype linked to HPV-positive OPSCC, often transmitted through oral sexual practices and open-mouthed kissing. These cases typically occur in younger, non-smoking individuals. Conversely, non-HPV-associated OPSCC is predominantly related to chronic tobacco use and alcohol consumption. Additional contributory factors include poor nutrition, betel quid chewing, asbestos exposure, marijuana use, and genetic alterations such as P53 and CDKN2A (p16)

mutations. Globally, OPSCC ranks as the sixth most common cancer, with a higher incidence in men and a notable predilection for the tonsillar region and base of the tongue. While most HPV infections are transient and self-limiting, persistent infections can evolve into precancerous lesions that may progress to invasive carcinoma over a span of several years.[3-5]

Imaging studies play a crucial role in the accurate staging and comprehensive assessment of patients with oral cancer. They not only help delineate the tumor's size, depth, and local extent of invasion, but also allow precise evaluation of its relationship with adjacent soft tissues, musculature, and vital neurovascular structures. Advanced imaging modalities such as computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET) enable detection of bone infiltration, particularly in the mandible or maxilla, which is a critical determinant of the clinical stage and surgical planning.[6-8]Hence; the present study was conducted for evaluating among computed tomography and clinical evaluation in tumour/node stage and follow-up of oropharyngeal cancer.

2. MATERIALS & METHODS

Present study was conducted at GMC Doda during July 2024 to June 2025. The study included 20 patients diagnosed with oropharyngeal squamous cell carcinoma who underwent treatment for the same. All the patients belonged to age range of 30 to 80 years. All the participants were randomized into two groups of 10 each—one comprising untreated patients (Group A) and the other including those previously managed with surgery, radiotherapy, or chemotherapy (Group B). Patients with contraindications to intravenous contrast administration, such as renal impairment, multiple myeloma, or allergy, were excluded.All subjects underwent detailed clinical and computed tomographic (CT) evaluations. Tumor staging followed TNM criteria. CT scans were acquired from the skull base to the upper mediastinum. Soft-tissue and bone windows were assessed for tumor size, nodal involvement, bone invasion, recurrence, and post-treatment changes. Data were analyzed using SPSS software, and interobserver as well as clinical–radiologic concordance were determined via Cohen's kappa statistics, with a p-value <0.05 considered significant.

3. RESULTS

Group A consisted of 10 patients with histopathologically confirmed squamous cell carcinoma of the oral cavity and oropharyngeal region who had not undergone any prior treatment. Among them, 7 were males and 3 were females, with an age range of 39 to 75 years (mean age approximately 60.4 years). The majority of the lesions were located in the oropharynx (6 cases), followed by the floor of the mouth (2 cases), gingiva (1 case), and retromolar region (1 case). A significant proportion of these patients exhibited lifestyle risk factors, with 70% being smokers and 60% reporting alcohol consumption.Clinically, advanced stages predominated: T3N2M0 was the most frequent presentation, observed in five patients, while T2N0M0 and T4N2M0 stages were also reported. These findings indicate a trend toward late-stage presentation, particularly among habitual tobacco and alcohol users, which is consistent with the aggressive progression of untreated oropharyngeal carcinomas. Group B included 10 patients who had previously received surgical, radiotherapeutic, or chemo-radio-therapeutic management for oral or oropharyngeal carcinoma. The group comprised six males and four females, with ages ranging from 38 to 68 years (mean age approximately 52 years). Common primary sites were the oropharynx (4 cases), tongue (3 cases), floor of the mouth (2 cases), and retromolar region (1 case). Most of these patients had a history of tobacco and/or alcohol consumption, factors known to influence disease recurrence and treatment response.The predominant clinical stages were T3N1M0 and T2N1M0, reflecting locally advanced but operable disease at the time of diagnosis. Surgery combined with radiotherapy was the most frequently employed modality, followed by multimodal therapy (surgery, radio-, and chemotherapy) in advanced cases. Tumor recurrence was documented in two patients, both of whom had tongue carcinoma, indicating that this site may have a higher recurrence potential due to complex regional anatomy and limited surgical margins.Interobserver analysis of tomographic evaluation revealed varying levels of concordance between the two radiologists (Observer 1 and Observer 2). In Group A (non-treated patients), agreement for T staging was statistically significant (p < 0.001), suggesting high consistency in tumor size and extension assessment. However, N-stage (p = 0.327) and overall staging (p = 0.882) did not show significant concordance, indicating potential variability in detecting nodal involvement among untreated cases.In Group B (treated patients), interobserver concordance was moderate, with no statistically significant differences across T stage (p = 0.189), N stage (p = 0.551), or overall staging (p = 0.099). This could be attributed to post-therapeutic alterations such as fibrosis, scarring, and muscle atrophy, which can obscure residual disease margins and lymphatic changes on imaging. The findings highlight that tomographic interpretation in post-treatment cases is inherently more complex due to overlapping features of recurrence

and post-therapeutic tissue response, necessitating multidisciplinary correlation between imaging, clinical findings, and histopathology for accurate staging.

Table 1: Clinical data of non-treated patients (Group A).

S No.	Gender	Age	Smoker	Alcohol	Clinical TNM	Primary site
1	Male	53	Yes	No	T3N2M0	Oropharynx
2	Male	68	No	Yes	T1N0M0	Retromolar region
3	Female	65	No	No	T3N0M0	Oropharynx
4	Female	43	No	No	T3N2M0	Oropharynx
5	Male	39	Yes	Yes	T2N0M0	Gingiva
6	Male	66	Yes	Yes	T2N0M0	Oropharynx
7	Female	67	No	No	T3N2M0	Floor of mouth
8	Male	59	Yes	Yes	T3N2M0	Oropharynx
9	Male	69	Yes	Yes	T4N2M0	Floor of mouth
10	Male	75	Yes	Yes	T3N2M0	Oropharynx

Table 2: Clinical data of treated patients (Group B).

S No.	Gender	Age	Smoker	Alcohol	Clinical TNM	Primary site	Treatment	Tumoral recurrence
1	Male	38	Yes	Yes	T2N1M0	Tongue	Surgery and radiotherapy	No
2	Male	51	Yes	No	T32N1M0	Oropharynx	Surgery and radiotherapy	No

3	Female	53	No	Yes	T3N1M0	Floor of mouth	Surgery	No
4	Male	49	No	Yes	T3N1M0	Tongue	Radio- and chemotherapy	Yes
5	Female	41	No	Yes	T3N2M0	Oropharynx	Surgery and Radiotherapy	No
6	Male	62	Yes	Yes	T3N1M0	Oropharynx	Surgery and radiotherapy	No
7	Male	53	Yes	Yes	T3N0M0	Tongue	Surgery	Yes
8	Male	68	Yes	Yes	T2N2M0	Floor of mouth	Surgery and radiotherapy	No
9	Female	61	No	No	T3N0M0	Retromolar region	Surgery	No
10	Female	49	Yes	Yes	T3N0M0	ropharynx	Radio-, chemotherapy and surgery	No

Table 3: Concordance of tomographic evaluation of tumour/node (TN) stage in non-treated patients and treated patients

Group	Interobserver agreement	T stage	N stage	Staging
Group A	Observer 1 × Observer 2	P-value< 0.001	P-value = 0.327	P-value = 0.882
Group B	Observer 1 × Observer 2	P-value= 0.189	P-value = 0.551	P-value = 0.099

4. DISCUSSION

Oropharyngeal squamous cell carcinoma (OPSCC) arises in the posterior third of the tongue, tonsils, soft palate, or posterior pharyngeal wall, with the tonsillar region and tongue base being the most frequently affected sites. These areas, rich in lymphoid tissue, exhibit a strong correlation with human papillomavirus (HPV)-associated squamous cell carcinoma.Clinical examination alone is not enough to establish the true extent of local involvement and regional metastases. It has been suggested that computed tomography (CT) may provide valuable information for pretreatment staging. The role of lymphoscintigraphic analysis has not been investigated extensively in oral and oropharyngeal carcinoma.[7-10]Hence; the present study was conducted for evaluating among computed tomography and clinical evaluation in tumour/node stage and follow-up of oropharyngeal cancer.

In the present study, group A comprised 10 untreated patients (7 males, 3 females; mean age 60.4 years). Most lesions were in the oropharynx (6 cases), followed by floor of mouth, gingiva, and retromolar region. Seventy percent were smokers

and 60% consumed alcohol, with T3N2M0 being the predominant stage. The findings showed a late-stage presentation trend among habitual tobacco and alcohol users, consistent with aggressive tumor progression in untreated cases.Group B included 10 previously treated patients (6 males, 4 females; mean age 52 years). Common sites were the oropharynx, tongue, and floor of mouth, with T3N1M0 and T2N1M0 as major stages. Most had a history of tobacco/alcohol use. Surgery with radiotherapy was the primary treatment, and tumor recurrence occurred in two tongue carcinoma cases, likely due to limited surgical margins.In Group A, interobserver agreement for T staging was significant (p < 0.001), while N-stage and overall staging were not. In Group B, no significant differences were found for T, N, or overall stage, likely due to post-therapeutic fibrosis and scarring that obscure imaging clarity. The results emphasize that post-treatment CT interpretation requires clinical and histopathologic correlation for accurate staging. de Souza Figueiredo PT et al assessed the agreement between contrast-enhanced CT (CECT) and MRI in detecting metastatic cervical lymph nodes in oral cancer patients. Ten subjects underwent both imaging modalities, and four radiologists (two oral and maxillofacial, two medical) independently analyzed the scans twice using Cohen's kappa and Wilcoxon tests.Results showed that oral and maxillofacial radiologists demonstrated excellent concordance for N-stage evaluation on both CECT and MRI, whereas medical radiologists showed only moderate or inconsistent agreement. Although CECT detected slightly more metastatic nodes than MRI, the difference was not statistically significant. The study concluded that variations between radiologist groups highlight the importance of a multidisciplinary approach in interpreting neck imaging and suggest the need for further research to determine the optimal modality for lymph node evaluation.[10]

Wolfensberger M et al conducted a comparative study involving 40 patients with oral cavity or oropharyngeal carcinoma, correlating CT findings with clinical assessments, surgical observations, and pathological reports to determine CT's role in preoperative staging. Although clinical staging proved more accurate than radiologic evaluation (73% vs. 55% correct T-stages), CT provided valuable supplementary information regarding tumor extent and anatomical involvement. The authors concluded that CT imaging remains a useful adjunct in the preoperative assessment of most oral and oropharyngeal carcinomas, enhancing diagnostic precision despite its limitations in staging accuracy.[11]Freire AR et alPiyush et al. analyzed 48 patients with oral and oropharyngeal squamous cell carcinoma, assessing clinical, tomographic, and lymphoscintigraphic findings in relation to tumor characteristics such as age, gender, site, size, and lymph node status. The sensitivity of homolateral clinical examination and CT for detecting nodal metastases was 77% and 55%, respectively, while contralateral sensitivity was 66% and 16%. Specificity values were 71% (clinical) and 76% (CT) for homolateral assessment, and 100% (clinical) and 90% (CT) for contralateral evaluation.Lymphoscintigraphy revealed the drainage pathway of (99m)Tc-Dextran 500 in 64.6% of cases. Homolateral drainage predominated in T1–T2 tumors without nodal involvement, whereas bilateral drainage was observed in midline or near-midline lesions. Non-drainage correlated with larger tumors (>3.5 cm), T3–T4 stages, and clinically evident metastases. The study concluded that clinical examination was more reliable than CT for detecting nodal metastasis and emphasized that lymphoscintigraphy is valuable in early-stage (I and II) disease for mapping lymphatic drainage, though further standardization is required.[12]

5. CONCLUSION

Collectively, these data underscore that oropharyngeal and floor-of-mouth carcinomas were the most prevalent in both groups, with a strong association with tobacco and alcohol use. Non-treated cases typically presented with advanced-stage disease, whereas treated patients demonstrated variable response and occasional recurrence. Tomographic assessment proved reliable for primary tumor delineation but posed challenges in post-treatment evaluation, reaffirming the importance of integrated diagnostic interpretation for optimal management of oral and oropharyngeal malignancies.

REFERENCES

[1] Lydiatt WM, Patel SG, O'Sullivan B, Brandwein MS, Ridge JA, Migliacci JC, Loomis AM, Shah JP. Head and Neck cancers-major changes in the American Joint Committee on cancer eighth edition cancer staging manual. CA Cancer J Clin. 2017 Mar;67(2):122-137.

[2] Turner L, Mupparapu M, Akintoye SO. Review of the complications associated with treatment of oropharyngeal cancer: a guide for the dental practitioner. Quintessence Int. 2013 Mar;44(3):267-79.

[3] Fried JL. Confronting human papilloma virus/oropharyngeal cancer: a model for interprofessional collaboration. J Evid Based Dent Pract. 2014 Jun;14 Suppl:136-46.e1.

[4] Helgadottir H, Höiom V, Jönsson G, Tuominen R, Ingvar C, Borg A, Olsson H, Hansson J. High risk of tobacco-related cancers in CDKN2A mutation-positive melanoma families. J Med Genet. 2014 Aug;51(8):545-52.

[5] Gillison ML, Koch WM, Capone RB, Spafford M, Westra WH, Wu L, Zahurak ML, Daniel RW, Viglione M, Symer DE, Shah KV, Sidransky D. Evidence for a causal association between human papillomavirus and a subset of head and neck cancers. J Natl Cancer Inst. 2000 May 03;92(9):709-20.

[6] Eckardt A, Barth EL, Kokemueller H, Wegener G. Recurrent carcinoma of the head and neck: treatment strategies and survival analysis in a 20-year period. Oral Oncol 2004;40:427–432

[7] Rumboldt Z, Day TA, Michel M. Imaging of oral cavity cancer. Oral Oncol 2006;42:854–865

[8] Cavalcanti MG, Ruprecht A, Quets J. Progression of maxillofacial squamous cell carcinoma evaluated using computer graphics with spiral computed tomography. DentomaxillofacRadiol1999;28:238–244

[9] Pickard RK, Xiao W, Broutian TR, He X, Gillison ML. The prevalence and incidence of oral human papillomavirus infection among young men and women, aged 18-30 years. Sex Transm Dis. 2012 Jul;39(7):559-66.

[10] de Souza Figueiredo PT, Leite AF, Barra FR, Dos Anjos RF, Freitas AC, Nascimento LA, Melo NS, Guerra EN. Contrast-enhanced CT and MRI for detecting neck metastasis of oral cancer: comparison between analyses performed by oral and medical radiologists. DentomaxillofacRadiol. 2012 Jul;41(5):396-404.

[11] Wolfensberger M, Jecklin A, Franze I, Kikinis R. Der Beitrag der Computertomographiezurpräoperativen Klassifikation von Mundhöhlen- und Oropharynxkarzinomen [Computed tomography for the preoperative classification of oral cavity and oropharyngeal carcinomas]. LaryngolRhinolOtol (Stuttg). 1987 Jun;66(6):324-8.

[12] Freire AR, Lima EN, Almeida OP, Kowalski LP. Computed tomography and lymphoscintigraphy to identify lymph node metastases and lymphatic drainage pathways in oral and oropharyngeal squamous cell carcinomas. Eur Arch Otorhinolaryngol. 2003 Mar;260(3):148-52.