



Original Article

USEFULLNESS OF PUFFED CHEEK COMPUTED TOMOGRAPHY TECHNIQUE IN BUCCAL MUCOSA TUMORS

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ABSTRACT

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Objective: To determine the diagnostic accuracy of Puffed cheek Computed Tomography (PCCT) in evaluating buccal mucosa tumors taking histopathology as gold standard.

Material & Methods:

Study Design: Cross sectional study

Setting: Department of Radiology Jinnah Postgraduate Medical Centre (JPMC), Karachi

Subjects: Patients having mass in buccal mucosa, weight loss and difficulty in chewing were included.

Patients with contraindication to intravascular contrast, known cases of squamous cell carcinoma of buccal mucosa, and pregnant women were excluded.

Patients meeting the inclusion criteria after referring from OPD were evaluated in this study after taking consent. PCCT was performed. The diagnosis was confirmed through histopathology. Data was analyzed by SPSS version 16.0.

Results: A total of 116 patients were enrolled in this study. The mean age of enrolled participants was 41.5 ± 8 years. Males were 53.2% and male to female ratio was 1.1:1. 84% of patients proved to be true buccal mucosa tumors among all the suspected patients of oral cavity tumors on CT scan. The overall sensitivity of MDCT was 86.2%, specificity 95.3% and diagnostic accuracy was 93.6%. Stratified analysis (based on age) showed that those patients who were ≥ 40 years of age had diagnostic accuracy of 93.2% and those who were < 40 years of age had diagnostic accuracy of 94%. Stratified analysis (based on sex) showed that those patients who were males had diagnostic accuracy of 95.2% and those who were females had diagnostic accuracy of 92%.

Conclusion: Puffed cheek CT scan is very sensitive and specific test for diagnosis of buccal mucosa tumors.

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Key Words: buccal mucosa tumors, diagnostic accuracy, puffed cheek CT scan, histopathology, JPMC

INTRODUCTION

The buccal mucosa tumor is a common malignancy in Pakistan, it accounts

about 25-35% of all primary head & neck cancers, and it is the second commonest tumor after bronchogenic carcinoma in males and breast carcinoma in females. Squamous cell carcinoma (SCC) accounts for the vast majority of malignancies of the oral cavity.¹

Radiological diagnosis of oral cavity lesions are challenging for radiologists because of close proximity of soft tissue, glandular structures and osseous relations and it can also be obscured by artefacts from metallic dentures and opposed mucosal surfaces.

Multidetector computed tomography (MDCT) is readily available technique and offers faster image acquisition; therefore, it is usually used as a first-line investigation to broadly distinguish pathological processes. In imaging head and neck cancer, MDCT provides a better assessment of cortical bone involvement.²⁻³⁻¹³ however small mucosal tumors of the oral cavity are usually not visible on conventional MDCT examination and in case of large bulky tumors, which are apparent, but MDCT may not be able to ascertain the surface of origin of a bulky tumor. To overcome this difficulty dynamic maneuver of 'puffed cheek' is used to distend the normally collapsed lumen and facilitate in the evaluation of extent of tumor spread, which helps in treatment. This is called puffed cheek computed tomography (PCCT).⁴

MATERIAL & METHODS

Patients meeting the inclusion criteria of Suspected soft tissue density mass of buccal mucosa on examination, after referring from OPD were evaluated in this study, then after taking proper consent from patient and maintaining all ethical issues PCCT was performed.

The study was conducted in the Department of Radiology

J.P.M.C Karachi from 26 March 2011 to 25 September 2011. The sampling technique was purposive non-probability type.

All examinations were performed on Toshiba Acquilion 16-slice CT scanner. The scanning range is programmed from the base of skull to the inferior edge of the mandible. Nonionic iodinated contrast with a concentration of 370mg/ml at a rate of 1.5-2ml/kg by 18 gauge canula preferably inserted into the antecubital vein was given. A 1-mm section thickness provides optimal spatial resolution. The pitch and table speed are selected so as to contain the acquisition time within 10 seconds.

Images were interpreted on console by two radiologists having experience of more than 5yrs for following variables.

1. Size of lesion
2. Enhancement pattern and relation of adjacent structure and bone invasion.

DATA ANALYSIS

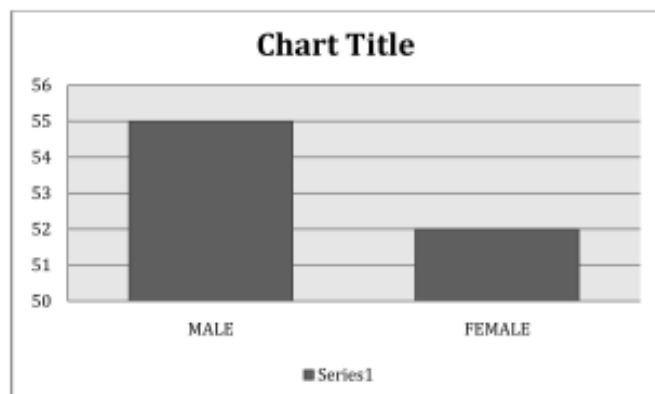
Data was analyzed on SPSS version 16.0. A 2x2 table was constructed and sensitivity, specificity, positive predictive value, negative predictive value, accuracy of PCCT was estimated by using histopathology as a gold standard.

Size of buccal mucosa tumor was considered and their effects on outcome were also analyzed during this study.

RESULTS

A total of 116 patients were enrolled in this study. The mean age of enrolled participant was 41.5±8 years. (Graph1) Males were 53.2% and male to female ratio was 1.1:1. 84% of patients proved to be true buccal mucosa tumors among all the suspected patients of oral cavity tumors on PCCT scan. (Graph2) The overall sensitivity of PCCT was

GRAPH. 1
MEAN AGE BETWEEN GENDER IN STUDY



GRAPH. 2
BUCCAL MUCOSA TUMOR DIAGNOSED ON HISTOPATHOLOGY (n=116)

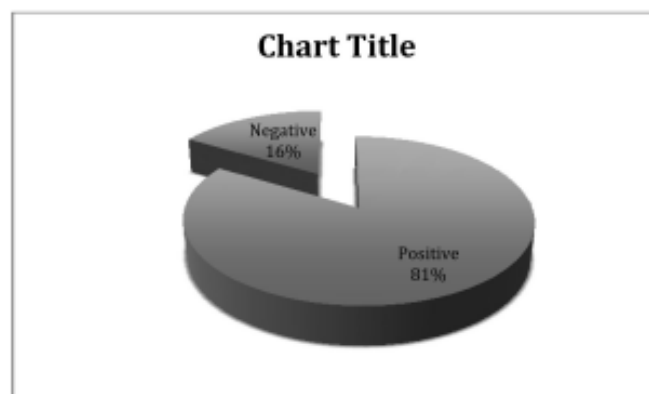


TABLE NO. 1
DIAGNOSTIC ACCURACY OF PCCT IN DIAGNOSIS OF STAGE I BUCCAL MUCOSA TUMORS

MDCT	Histopathology		Total
	BUCCAL MUCOSA TUMOR	No TUMOR	
BUCCAL MUCOSA TUMOR	94	6	100
No TUMOR	3	13	16
Total	97	19	116

- Sensitivity: 96 %
- Specificity: 68 %
- Positive predictive value: 94%
- Negative predictive value: 81%
- Diagnostic accuracy: 93.6

86.2%, specificity 95.3% and diagnostic accuracy was 93.6% (Table No: 1). Stratified analysis (based on age) showed that those patients who were of ? 40 years of age had diagnostic accuracy of 93.2% and those who were of ? 40 years of age had diagnostic accuracy of 94%. Stratified analysis (based on sex) showed that those patients who were males had diagnostic accuracy of 95.2% and those who were females had diagnostic accuracy of 92%.

DISCUSSION

Oral cavity tumors especially buccal mucosa squamous cell carcinoma(BMSCC) is an aggressive oral cancer associated with poor survival and high locoregional recurrence. Despite recent improvements in diagnosis and treatment survival has remained around 50 per cent over the last two decades.

On conventional MDCT images, the buccal and gingival mucosa is not separated and hence separate involvement is difficult to opine and define.⁴ also lesions involving the gingival mucosa can involve the buccal mucosa and vice versa.

Since the oral cavity is highly accessible to clinical examination, radiologic studies are not a primary diagnostic tool.⁶Visual inspection and bimanual palpation are the cornerstones of the diagnosis of oral cavity disease.⁷However, it is possible to miss or underestimate pathologic processes in the gingival and buccal mucosa on clinical examination.⁸

Clinical examination often “under stages” the deep spread of oral cavity tumors.¹ Puffed Cheek Computed tomography (PCCT) provides additional staging information that helps determine more precisely the exact local extent of a tumor. Moreover, PCCT helps in nodal staging at the same time. However, because the mucosal surfaces, the muscle tissues, and the surrounding facial planes in the oral cavity are in close relationship with each other, it is usually difficult to

delineate anatomic structures by conventional MDCT alone.

In our study overall diagnostic accuracy of helical computed tomography with puffed cheek technique shows sensitivity and specificity as 88.23% and 94.7% respectively. Positive predictive value and negative predictive value was found to be as 95.71% and 85.71% respectively.

To date, there is no evidence that the puffed cheek maneuver obscures findings.

The puffed-cheek maneuver is easily taught, and patients comply readily. Initially, the patients were asked to suspend respiration for the duration of the maneuver. Subsequently, it became apparent that it is possible to puff out the cheeks and continue breathing quietly. This further improved patient compliance and the quality of the study.

The puffed-cheek maneuver added a negligible amount of time to the total scan duration.

The introduction and routine use of puffed cheek CT multislice has been a major advance in the assessment of buccal mucosa tumor. The ability to make very fine cuts and high quality reconstructions at various levels of the lesion allowed to have a spatial view of the same pathology which is useful to the clinician as well as the surgeon, who would have otherwise difficulty in correlation if we use only the axial plane.

Puffed cheek images are useful for the assessment of both benign and malignant disease. The one false-negative finding in this study was a mass (facial artery aneurysm) deep within the cheek. The lack of a mucosal component may explain the inability of CT to show the aneurysm. However, an even greater limiting factor may have been the pronounced streak artifacts from the young patient's

orthodontic appliances.

The current study includes only CT studies. The same maneuver could be used with MR imaging, although it might be slightly more awkward for patients to sustain the puffed-cheek maneuver for 3 to 5 minutes required for even a fast spin-echo MR pulse sequence.

CONCLUSION

It is concluded from this study that PCCT is a sensitive and specific test for diagnosis of buccal mucosa tumors. It provides additional staging information that helps determine more precisely the exact local extent of a tumor. Moreover, PCCT helps in nodal staging at the same time. We recommend that PCCT should serve as screening procedure and only for grey cases, invasive procedure like biopsy may be considered.

REFERENCES

1. Musani MA, Jawed I, Marfani S, Khambaty Y, Jalisi M, Khan SA, et al. Carcinoma Cheek: regional pattern and management. *J Ayub Med Coll.* 2009; 21(3):87-91.
2. Mukherji SK, Isaacs DL, Creager A, Shockley W, Weissler M, Armao D. CT Detection of Mandibular Invasion by Squamous Cell Carcinoma of the Oral Cavity. *AJR* 2001; 177:237-243
3. Henort P, Blum A, Toussaint B, Troufleau P, Stines J, Roland J. Dynamic Maneuvers in Local Staging of Head and Neck Malignancies with Current Imaging Techniques: Principles and Clinical Applications. *RadioGraphics* 2003; 23:1201-1213.
4. Taori KB, Mitra K, Kimmattkar SV. Puffed cheek Ct technique as an imaging protocol for the evaluation of oral vestibule. *Indian J Radiol Imaging* 2002;12:333-4.
5. Bredesen K, Aaløkken TM, Kolbenstvedt A. CT of the oral vestibule with distended cheeks. *Acta Radiol* 2001;42(1):84-7.
6. Bhurgri Y. Cancer oral cavity trends in Karachi South. *Asian Pac J Cancer Prev* 2005; 6: 22-6.
7. Tart RP, Kotzur IM, Mancuso AA, Glantz MS, Mukherji SK. CT and MR imaging of the Buccal space and buccal space masses. *RadioGraphics* 1995; 15:53-50.
8. DuBrul EL. Oral anatomy. 8th ed. St Louis, Mo: Ishivaku EuroAmerica, 1988; 162-165,301-304.
9. Zhang HM, Yan YP, Qi KM, Wang JQ, Liu ZF. Anatomical structure of the buccal fat pad and its clinical adaptations. *Plast Reconstr Surg.* 2002; 109(7): 2509-18.
10. Tart RP, Mukherji SK, Avino AJ, Stringer SP, Mancuso AA. Facial lymph nodes: normal and abnormal CT appearance. *Radiology* 1993; 188: 695-700.
11. Wei Y, Xiao J, Zou L. Masticator space: CT and MRI of secondary tumor spread. *AJR Am J Roentgenol.* 2007;189(2):488-97.
12. Stambuk HE, Karimi S, Lee N, Patel SG. Oral cavity and oropharynx tumours. *Radiol Clin N Am* 2007;45:1-20.
13. Mukherji SK, Isaacs DL, Creager A, Shockley W, Weissler M, Armao D. CT detection of mandibular invasion by squamous cell carcinoma of the oral cavity. *AJR Am J Roentgenol* 2001;177:237-43
14. Henrot P, Blum A, Toussaint B, Troufleau P, Stines J, Roland J. Dynamic Maneuvers in Local Staging of Head and Neck Malignancies with Current Imaging Techniques: Principles and Clinical Applications. *RadioGraphics* 2003; 23:1201-1213
15. Imola MJ, Gapany M, Grud F, Djalilian H, Fehling S, Adams G. Technetium 99m single positron emission computed tomography scanning for assessing mandible invasion in oral cavity cancer. *Laryngoscope* 2001; 111(3): 373-81
16. Imaizumi A, Yoshino N, Yamada, Naguma I, Amagasa K, Omura T, et al. A potential pitfall of MR imaging for assessing mandibular invasion of squamous cell carcinoma in the oral cavity. *AJNR Am J Neuroradiol* 2006; 27(1): 114-22
17. Goerres GW, Schimid DT, Schuknecht B, Enrich GK. Bone invasion in patient with oral cavity cancer: comparison of conventional CT with PET/CT and SPECT/CT. *radiology* 2005;237: 281-87

