Original Article

Puffed-Cheek CT Improved Evaluation of Buccal Mucosal Neoplasm in Contest to Conventional CT Scan

Most Razina Jubaida[1], Khaleda Parvin Rekha[2], Md S M Aftab E Alam[3], Khalada Parvin Deepa[4]

Abstract

Background: *Oral cancer is a frequent cancer in our country, most people are affected by this cancer are older age. Accurate evaluation of this cancer difficult due to close proximity of bones and soft tissue. So for improve diagnostic accuracy Puffed cheek maneuver should be used with traditional Multidetector Computed Tomography (MDCT).*

Objective: *To determine the improved diagnostic accuracy of Puffed cheek Computed Tomography (PCCT) in evaluation of buccal mucosa tumors in contest to non puffed cheek Computed Tomography.*

Materials and Methods: *This descriptive cross sectional study was carried out in Radiology and Imaging department of Khwaja Yunus Ali Medical College and Hospital from 2022(January) to 2023(July). Cases were referred from different department. After meeting the inclusion criteria patients were subjected for CT scan. Imaging was performed from paranasal sinus and neck region with axial sections from pituitary fossa to arch of aorta, after injection of intravenous iodinated contrast media, multiplanar sagittal, coronal reformation images were obtained. Puffed cheek manoeuvre was performed to separate gingival and oral buccal mucosa in all the cases for improved detailed evaluation. The CT result were then compared with non puffed cheek scans results.*

Results: *Among 30 patients 7 cases were missed by conventional CT scan, thirteen patients showed a mass in the oral cavity that were inseparable from 2 mucosal surfaces. Puffed-cheek images clearly showed the mass and surface of tumor involvement. Other 10 patients in conventional CT showed mass in the margins of tongue, oral cavity but extension and infiltration of surrounding structures by the lesion could not be well delineated, puffed-cheek images clearly showed the specific location, extension, adjacent muscles and other structures infiltration.*

Conclusion: *Puffed cheek CT gives better performance to diagnosis the small buccal mucosal tumors, any irregularity, thickening, more detailing of mucosal surface of oral cavity than conventional CT scan, so can helps in choosing the management & surgical approach also.*

Keywords: *Puffed Cheek MDCT, Conventional MDCT, Buccal Mucosal Neoplasm.*

Introduction

The sixth most frequent cancer in the world is oral cancer.[1] Oral cancer is the second and third most common cancer in Bangladesh, respectively among both males and females.[2] Elderly people who are above 50 are frequently affected.[3] Oral cancer is however, more common in young female populations who are under 45 years old.[4] Due to closeness of soft tissue, glandular structures and osseous relationships as well as the possibility of artifacts from metallic dentures and opposing mucosal surfaces, radiologists find it difficult to accurately diagnose oral cavity lesions using imaging techniques. Due to its accessibility and ability to acquire images more quickly, multidetector computed tomography (MDCT) is frequently used as a first-line investigation to comprehensively discriminate disease processes.[5-7] On conventional CT studies large bulky tumors are visible, but may not be able to determine the surface of origin of tumor and small mucosal tumors of the oral cavity are usually not visible. To overcome this problem by a special maneuver, ''puffed-cheek'' view, is use for well visualization of oral cavity. The question is that does ''puffed-cheek'' view able to play a satisfactory role in the evaluation oral cavity and its lesions? Aim of this study to

1. Assistant Professor, Department of Radiology and Imaging, Khwaja Yunus Ali Medical College and Hospital, Enayetpur, Sirajganj, Bangladesh

2. Assistant Professor, Department of Radiology and Imaging, Khwaja Yunus Ali Medical College and Hospital, Enayetpur, Sirajganj, Bangladesh

3. Assistant Professor, Department of Radiology and Imaging, Khwaja Yunus Ali Medical College and Hospital, Enayetpur, Sirajganj, Bangladesh

4. Assistant Professor and associate consultant, Department of Radiology and Imaging, Ibrahim Cardiac Hospital and Research Institute, Shahbag, Dhaka, Bangladesh

Corresponding author: Most Razina Jubaida, Assistant Professor, Department of Radiology and Imaging, Khwaja Yunus Ali Medical College and Hospital, Enayetpur, Sirajganj, Bangladesh. **Cell**: +880 1715-012712, **E-mail:** jubaidarazina@gmail.com

observe the role of "puffed-cheek" view, for improved diagnostic accuracy in the evaluation of oral cavity cancer.

Materials and Methods

This cross sectional study was carried out in Radiology and Imaging department of Khwaja Yunus Ali Medical College and Hospital with the duration from 2022(January) to 2023(July). Cases were referred from different (ENT, dental and oncology) department. Patients were subjected for CT scan examination on Philips 128 slice Ingenuity Core CT scanner made in Netherlands with following parameters- tube voltage 120kv, tube current auto calculate mAs, collimation 64 mm (FOV). Images were acquired in axial, reconstructed in coronal and sagittal plane with slice thickness 0.625mm from paranasal sinus and neck region from skull base to clavicles. After injection of intravenous iodinated contrast media, multiplanar sagittal and coronal reformation images were also obtained by using Multi Planar Imaging (MIP) and 3D reconstruction algorithm. Puffed cheek manoeuvre was performed to separate gingival and oral buccal mucosa in all the cases for improved details evaluation. The CT results were then compared with non puffed cheek and puffed cheek scan results. All the CT image were independently evaluated by radiologist without knowing the histopathological report to avoid bias.

Results

Among 30 patients, 18 patients were male and 12 female. Range of the age was from 31 to 80 years with mean of 54.94±12.4 years. Seven patients in whom conventional CT found no abnormality but puffed-cheek CT clearly showed very small mass among them as subtle mucosal thickening, two lesion arises from buccal mucosa, three from lateral margin of tongue, two from retromolar trigone. The conventional CT studies in thirteen patients showed a mass in the oral cavity that was inseparable from two mucosal surfaces but the puffed-cheek images clearly showed which surface the tumor involved. Among them three cases were from superior gingivo-buccal sulcus, five from gingival surfaces of buccal mucosa involving whole length of mucosa, five from lateral margin of tongue involving floor of mouth. In the other 10 patients, conventional CT showed a mass in the margins of tongue and oral cavity, but extension and infiltration of surrounding structures by the lesion could not be well delineated. The puffed-cheek images clearly showed the specific location, extension, adjacent muscles and other structures infiltration. Three cases involved margin of tongue with involvement of mylohyoid muscle, five involve almost half of tongue including genioglossus, geniohyoid, hyoglossus, mylohyoid muscles, floor of mouth without any bony involvement. Two cases had bone involvement with perineural infiltration. All the CT images were independently evaluated by two expert radiologist.
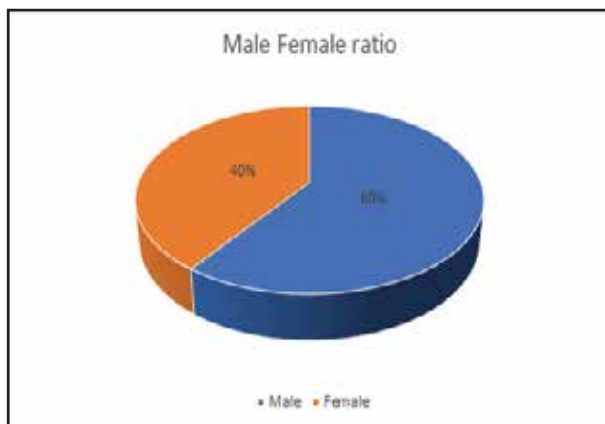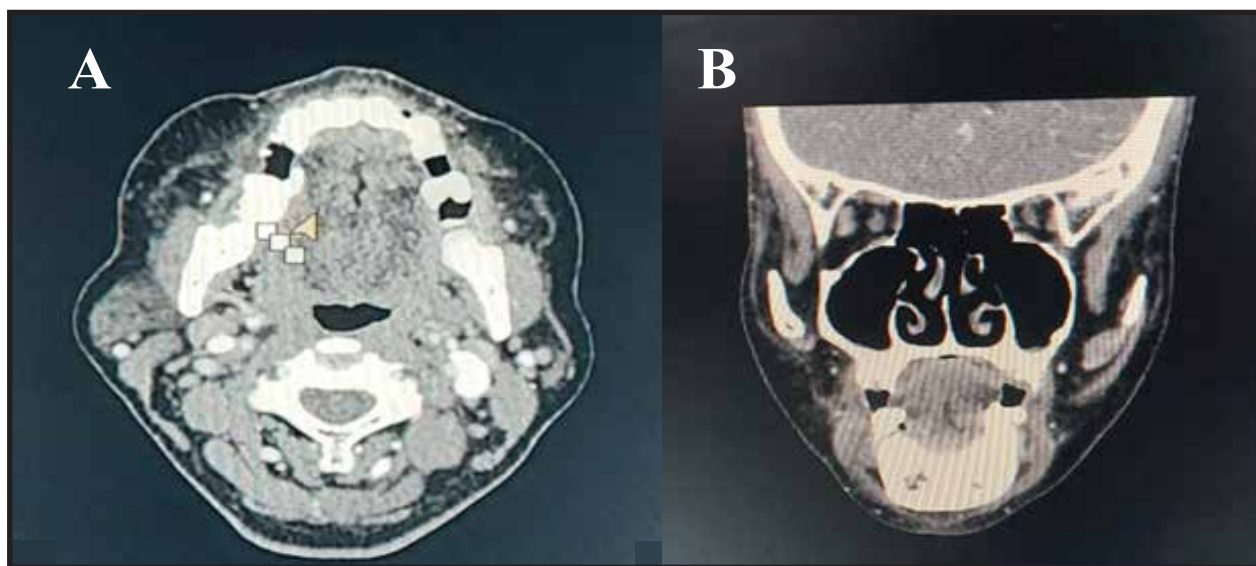
Figure 1: Gender distribution n=30.

Cases	Conventional CT	Puffed cheek CT
13 cases	Inseparable from the surface.	Separable from surface.
10 cases	The extension could not be well delineated.	Extension well delineated.
7 cases	Not found.	Found as mucosal thickening.

Table I: Shows the diagnostic accuracy difference between Conventional CT and Puffed cheek CT.
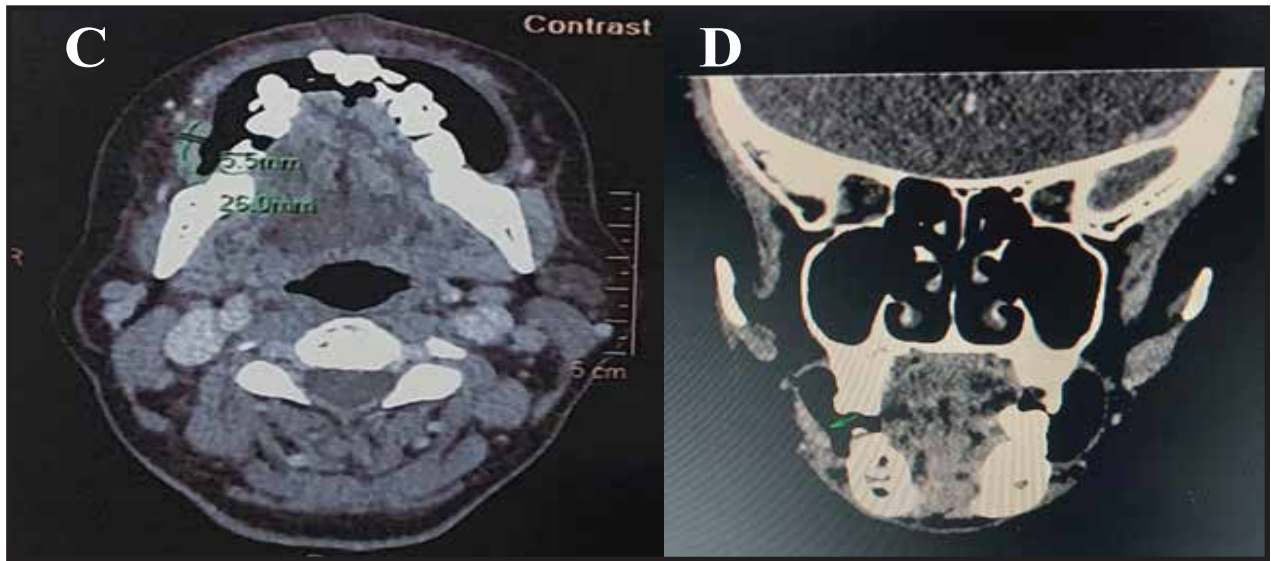
FIG 2: 55-year-old woman with invasive squamous cell carcinoma of the right buccal mucosa. (a, b) Conventional axial, coronal CT scan through the occlusal plane is normal. (c, d) Puffed-cheek axial, coronal CT scan shows an enhancing nodule on the right buccal mucosa. The buccal mucosa and buccinator muscle together form a irregular soft tissue band.
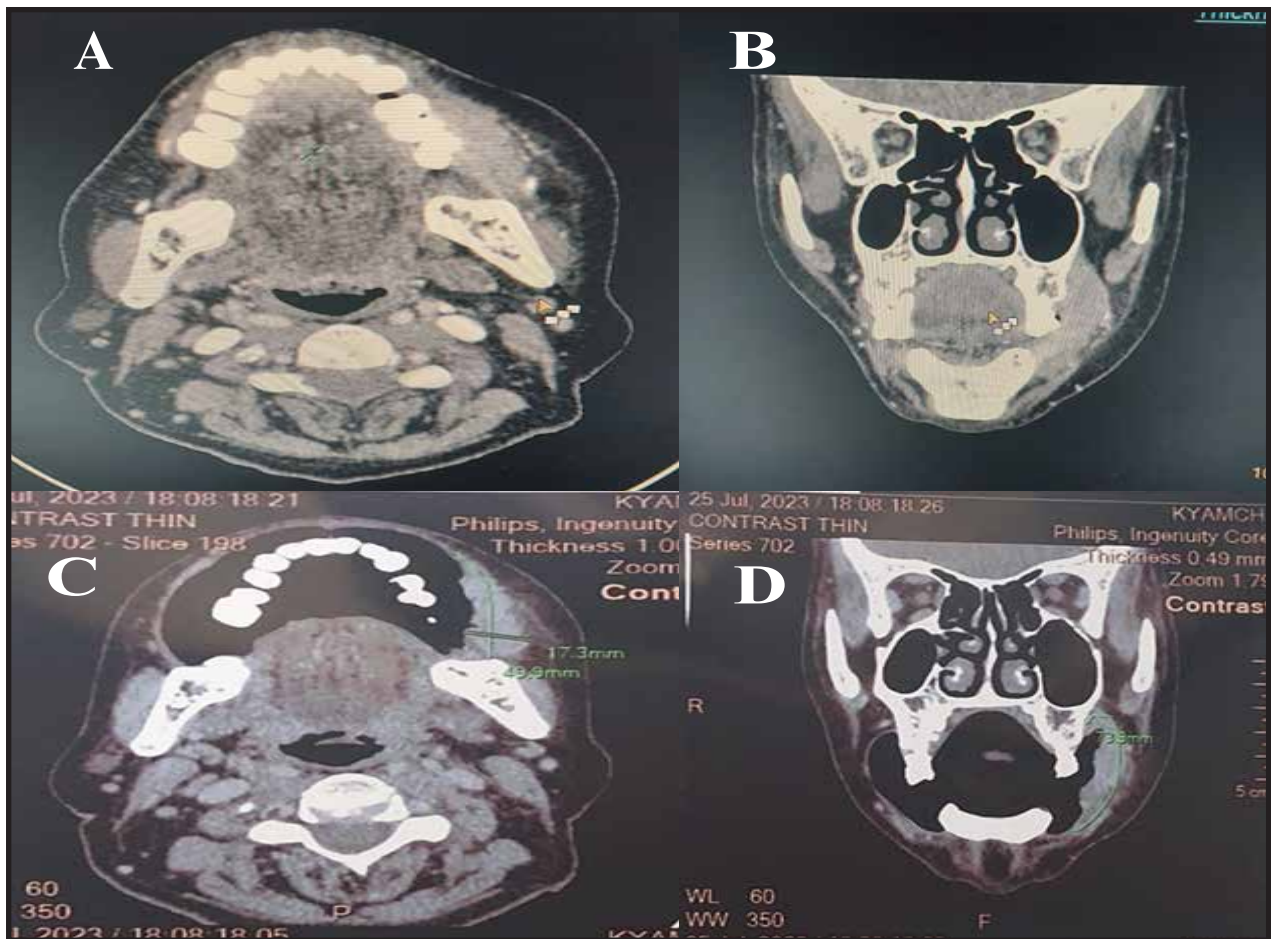

FIG 3. 61-year-old man with invasive squamous cell carcinoma of the left buccal mucosa. (a, b) Conventional axial, coronal CT scan through the occlusal plane shows enhancing thickening along left buccal mucosa. (c, d) Puffed-cheek axial, coronal CT scan shows an enhancing soft tissue lesion on the left buccal mucosa. The buccal mucosa and buccinator muscle together, infiltrating superior gingiva-buccal sulcus.

Discussion

Oral cavity is eminently accessible to clinical examination, CT and MR studies are not primary diagnostic tools.[8] CT and MR further reconfirm the clinical examination by delineating extension of tumors, bone erosion and identifying metastatic cervical lymphnodes. CT and MRI are complementary to each other. However CT scan is considered to be the modality of choice due to easy availability and faster image acquisition than MRI.[7,9] Conventional CT examinations of oral cavity tumors have few limitations, like small mucosal tumor usually remain invisible, specific location could not be determined, like which surface it arises from, inseparable from angle of mouth due to multiple muscles around angle produce a mass like bulk, subtle mucosal irregularity, lips, gingival sulcal, pterygomandibular raphe, retromolar trigon involvement could not be seen due to mucosal surfaces remain closely apposed to each other, infiltration of buccinator muscle can be missed. As The primary role of CT imaging is to evaluate the depth of invasion by tumor, specific location, extension of lesion. Puffed-cheek CT scans can show the tumor location when the location might otherwise not be known.[10] In puffed-cheek CT scan of the oral cavity, air separates these mucosal surfaces, so oral cavity can highlight any kind of bulky exophytic mass, subtle wall thickening, ulceration because here air acts as an excellent "contrast medium". Puffed-cheek images also show unfamiliar normal anatomy that could be mistaken as disease.[11] Another helpful maneuver is to have the patient move the tongue away from the palate and gingiva before inflating the cheeks, which allows the radiologist to distinguish the tongue from the floor of the mouth and from the gingiva. It also provides additional information about the cheek's rigidity secondary to infiltration. Limitation of puffed-cheek maneuver is, it added a negligible amount of time to the total scan duration. Bredesen et al reported that 53 of 54 patients in their series were able to perform cheek distension in accordance with a recorded voice instruction.[8] Our patients were asked to suspend respiration for the duration of the maneuver, two of them were not able to comply, one due to rigidity of buccal mucosa for extensive infiltration, another one could not able to follow the command.

Conclusion

CT with puffed cheek gives better performance to diagnosis the small buccal mucosal tumors, any irregularity, thickening than conventional CT scan. Also provide a clearer and more detailed evaluation of the mucosal surfaces of the oral cavity than conventional CT. As it can delineate the disease level as well as can helps in choose the management & surgical approach.

Acknowledgement

References

1. Christopher M, Harris, GE Ghali. Oral cancer; Etiology, Diagnosis, Classification and Staging. In M Miloro, G Ghali, P Larsen, P Waite (Eds.) Principles of Oral and Maxillofacial Surgery. 2012; (3rd Edn.). 2: 1772.

2. Hussain SA, Sullivan R. Cancer Control in Bangladesh. Japanese Journal of Clinical Oncology. 2013; 43(12): 1159-1169.

3. Tandon P, Dadhich A, Saluja H, Bawane S, Sachdeva S. The Prevalence of Squamous cell carcinoma in Different sites of oral cavity at our Rural health Care Centre in Loni, Maharashtra- a retrospective 10-years study. Contemporary Oncology. 2017; 21(2): 178-173.

4. Sultana N, Malik M. The Overview of Oral Cancer and Risk Factors in Bangladesh. International Journal of Dental Sciences and Research. 2014; 2(5A): 8-10

5. 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

6. 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; 23:1201–121

7. 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;177:237–243

8. Gale DR. CT and MRI of the oral cavity and oropharynx. In: Valvassori GE, Mafee MF,Carter BL,eds, Imaging of the Head and Neck. New York: Thieme; 1995:445-472.

9. Stambuk HE, Karimi S, Lee N, Patel SG. Oral cavity andoropharynx tumours. Radiol Clin N Am2007;45:1–20 [PubMed].

10. Bredesen K,Aalekken TM, Kolbenstvedt A.CT of the oral vestibule with distended cheeks. Acta RadioI2001;42(l):84-87.

11. Jane L. Weissman and Richard L. Carrau "Puffed-cheek" CT Improves Evaluation of the Oral CavityAJNR Am J Neuroradiol 2001; 22:741–744.