Hyperphysiological F-18 Fludeoxyglucose Uptake of Masticator Muscles in a Case of Awake Bruxism

Abstract

F-18 FDG is a tracer of glucose metabolism, which is commonly used in PET/CT for oncological diagnosis and staging. F-18 FDG uptake represents the glycolytic activity in the cell. Physiological FDG concentration may be noted often in the muscles of head and neck, tongue, muscles on mastication, extra ocular muscles due to eye movements, cricopharyngeus and posterior cricoarytenoid muscles on phonation, etc. Here we report a case of Awake Bruxism, who came for F-18 FDG PET/CT for evaluation of Pyrexia of unknown origin (PUO), showing intense F-18 FDG uptake symmetrically in masticator muscles. Bruxism is a habit of involuntary spasmodic grinding or clenching of teeth. Many factors like psychosocial, genetic, certain medications and sleep disorders are known to be associated with bruxism. Therefore knowledge of physiological F-18 FDG uptake as well as artifactual uptake is essential for nuclear medicine physicians, to avoid ambiguity in diagnosis.

Keywords: *Artifactual fluoro-2-deoxyglucose uptake, bruxism, F-18 fluoro-2-deoxyglucose positron emission tomography/computerized tomography, muscles of mastication*

J Sai Moulika, S Aparna Reddy[1], VS Krishna Mohan, Ranadheer Manthri, TC Kalawat

Departments of Nuclear Medicine and PET CT and [1]Rheumatology, Sri Venkateswara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India

Introduction

Bruxism refers to a habit of involuntary spasmodic nonfunctional grinding or clenching of teeth that can cause dental trauma. Although the etiology of bruxism is not clear, some morphological and anatomical factors of the dental system are known to be associated with bruxism. Many psychosocial factors such as stressful life, genetic factors, certain medications (dopaminergic agonists, dopaminergic antagonists, tricyclic antidepressants, selective serotonin reuptake inhibitors, amphetamines, alcohol, cocaine, etc.), pathophysiological factors (diseases, trauma, genetics, smoking, alcohol, caffeine intake, illicit drugs, and medications), and sleep disorders (sleep apnea and snoring) are also known to be associated with bruxism.[1]

Bruxism can occur during wakefulness or sleep. Bruxism during daytime is commonly semi-voluntary, and is known as "Awake Bruxism" (AB) or diurnal bruxism. AB is commonly associated with stress caused by familial responsibility or work pressure. Bruxism during sleep either during daytime or night is known as "Sleep Bruxism."[2]

Here, we report a case of AB, who came for F-18 fluoro-2-deoxyglucose positron emission tomography/computerized tomography (F-18 FDG PET/CT) for evaluation of pyrexia of unknown origin, showing intense uptake in masticator muscles.

Case Report

A 49-year-old female, homemaker by occupation, presented with complaints of fever for 21 days, which was low grade, intermittent, and not associated with rash. She had generalized arthralgia involving bilateral shoulder, elbow, wrist, knee, ankle, and small joints of hands and feet, not associated with swelling of the joints or morning stiffness. There was no history of trauma. She had no other comorbidities such as diabetes, hypertension, asthma, or epilepsy. She had no past history of tuberculosis, coronary artery disease, or chronic kidney disease. She was hysterectomized 6 years ago for uterine fibroid. She was evaluated for inflammatory arthritis, negative for rheumatoid factor, and antinuclear antibody profile. Her liver and renal function tests, serum aspartate aminotransferase, alanine aminotransferase, serum calcium, and uric acid were within

How to cite this article: Sai Moulika J, Aparna Reddy S, Krishna Mohan VS, Manthri R, Kalawat TC. Hyperphysiological F-18 fludeoxyglucose uptake of masticator muscles in a case of awake bruxism. Indian J Nucl Med 2018;33:342-4.

Address for correspondence:
Dr. TC Kalawat, Department of Nuclear Medicine and PET CT, Sri Venkateswara Institute of Medical Sciences, Tirupati - 517 501, Andhra Pradesh, India.
E-mail: kalawat.svims@gmail.com

Access this article online

Website: www.ijnm.in

DOI: 10.4103/ijnm.IJNM_71_18

Quick Response Code:

normal limits. Given inconclusive conventional imaging workup, she was referred to F-18 FDG PET/CT for further evaluation.

The patient underwent F-18 FDG PET/CT, which showed a normal FDG biodistribution within the body. Intense F-18 FDG concentration was noted symmetrically involving the bilateral masticator muscles (bilateral temporalis and medial and lateral pterygoid muscles), with no obvious morphological abnormality on corresponding CT images. Rest of the whole body survey was unremarkable [Figure 1].

On retrospective probing, she gave a history of AB, which might be the cause for the abnormal FDG concentration in the masticator muscles due to overuse. Furthermore, the patient had a past history of posthysterectomy depression, for which she was put on amitriptyline (a tricyclic antidepressant), which might be the cause for bruxism in this patient.

Discussion

F-18 FDG is a structural analog of 2-deoxyglucose, which is used as a tracer of glucose metabolism. F-18 FDG is delivered to all the cells through glucose transporters. F-18 FDG is converted into F-18 FDG-6-phosphate by the enzyme, hexokinase, and it is metabolically trapped within the cell.

F-18 FDG uptake represents the metabolic activity in the tissue. Physiological FDG concentration is normally seen in brain, oropharynx, esophagus, myocardium, bowel, kidneys, urinary bladder, and at times in gonads. Physiological FDG concentration may also be noted often in the muscles of head and neck, genioglossus muscles of tongue, pterygoid muscles on mastication, extraocular muscles with eye movements, cricopharyngeus, and posterior cricoarytenoid muscles on phonation.[3]

In anxious patients, intense FDG concentration may be noted in strap muscles, sternocleidomastoids, and also paraspinal muscles, which can simulate nodal involvement. Conversely, it may also lead to false-negative interpretation due to obscuring of tumor that is present underlying the lymph nodes.[4] Usually, muscle uptake is linear and can be traced from the origin to insertion on PET-CT images. This uptake can be reduced by giving benzodiazepines before FDG injection. Furthermore, patients are instructed to stay calm and avoid eating, talking, and chewing after FDG injection.[4] Another important factor for muscle uptake is insulin, which, when given before FDG PET/CT, leads to diffusely increased muscle uptake than focal uptake, thus deteriorating the image quality.[4]

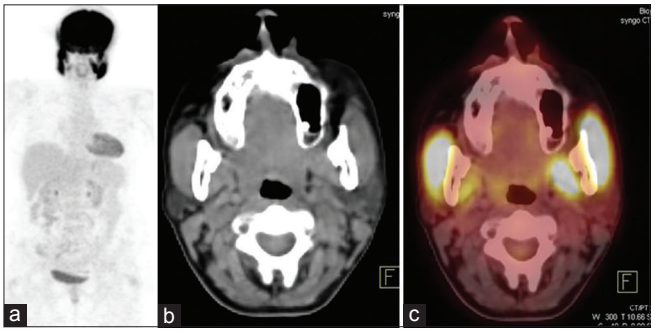

Figure 1: Maximum intensity projection image (a) and axial computed tomography (b) and positron emission tomography computed tomography fused (c) images showing abnormally increased F-18 fluoro-2-deoxyglucose concentration symmetrically involving bilateral masticator muscles, with no corresponding morphological abnormality

Brown fat or brown adipose tissue is another site for physiological FDG uptake that can be confused with pathological uptake. The most common sites of brown fat uptake include supraclavicular, paravertebral, mediastinal, para-aortic, and suprarenal regions. It can also be seen around the visceral organs. Sympathetic stimulation of brown adipocytes leads to hypermetabolism in the brown fat, making it FDG avid. However, the uptake is more of symmetrical type. Furthermore, these regions show a typical attenuation of fat (−50 to − 150 Hounsfield units) on corresponding CT images. Precise fusion of PET/CT images and knowledge on brown fat uptake can minimize the errors in diagnosis.[4] FDG uptake in brown fat can be reduced pharmacologically with beta-blockers and benzodiazepines.

Pinna *et al*., in 2014, reported a case of solitary pulmonary nodule, demonstrating intense 18F-FDG uptake in masticator muscles on 18F-FDG PET/CT images, with no morphological abnormality on CT images, when the patient was anxious and was continuously clenching his teeth. The same patient, after 12 weeks, demonstrated no abnormal 18F-FDG uptake in the muscles.[5]

Bai *et al*., in 2015, reported a case of anaplastic large-cell lymphoma showing diffuse 18F-FDG uptake in different muscles such as biceps and pectoralis major. Further history taking revealed that the patient had strenuous exercise 4 days before the scan.[6]

Conclusion

F-18 FDG can localize in any part of the body where there is increased physiological activity. These can constitute a potential source of false-positive interpretation. Even, we might miss out the lesions underlying the muscles with intense uptake.[7] Therefore, the basic knowledge of physiological F-18 FDG uptake as well as artifactual uptake and proper interpretation of PET/CT scans is essential for nuclear medicine physicians to avoid potential pitfalls in image interpretation and ambiguity in diagnosis.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that

her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Murali RV, Rangarajan P, Mounissamy A. Bruxism: Conceptual discussion and review. J Pharm Bioallied Sci 2015;7:S265-70.
2. De Laat A, Macaluso GM. Sleep bruxism as a motor disorder. Mov Disord 2002;17 Suppl 2:S67-9.
3. International Atomic Energy Agency. Standard Operating Procedures for PET/CT: A Practical Approach for Use in Adult Oncology, IAEA Human Health Series No. 26. Vienna: International Atomic Energy Agency; 2013.
4. Purohit BS, Ailianou A, Dulguerov N, Becker CD, Ratib O, Becker M, *et al*. FDG-PET/CT pitfalls in oncological head and neck imaging. Insights Imaging 2014;5:585-602.
5. Pinna AE, Walter J, Fulham MJ. Bruxism – Before and after images – On 18F-FDG PET/CT. Clin Nucl Med 2014;39:564-6.
6. Bai X, Wang X, Zhuang H. Long-lasting FDG uptake in the muscles after strenuous exercise. Clin Nucl Med 2015;40:975-6.
7. Yeung HW, Grewal RK, Gonen M, Schöder H, Larson SM. Patterns of (18)F-FDG uptake in adipose tissue and muscle: A potential source of false-positives for PET. J Nucl Med 2003;44:1789-96.