Can $^{18}$Fluoro-deoxy-glukose-Positron Emission Tomography/Computed Tomography be a Useful for Decision of Elective Surgery in Thoracic Aortic Aneurysm

Abstract
Thoracic aortic aneurysm (TAA) should be treated before the complications with prophylactic surgery. However, important number of ruptures have been occurred below the cut-off size for surgery. In addition, in some cases, who in the cut-off value limit, decision of surgery may sometimes be difficult. $^{18}$Fluoro-deoxy-glukose positron emission tomography/computed tomography ($^{18}$FDG-PET/CT) may useful such situations. We present a case that, TAA in $^{18}$FDG-PET/CT in a patient with larynx carcinoma. He had a TAA with near the cut-off value and increased metabolic activity in baseline imaging. After 3 months, $SUV_{max}$ value increased and elective surgery was performed. We think that aneurysms may be another pathology that $^{18}$FDG-PET/CT potentially be useful apart from imaging malignant diseases.

Keywords: $^{18}$Fluoro-deoxy-glukose-positron emission tomography/computed tomography, aneurysm, surgery

Introduction
Thoracic aortic aneurysm (TAA) is a rare, asymptomatic disease. In general, it is associated with connective tissue pathologies. The mortality rate is very high if acute complications are occurred such as dissection or rupture.[1] Determining to the risk of complications is very important for the decision of prophylactic surgery. The basic predictive parameter for this purpose is size. However, some of the small aneurysms can be ruptured. In addition, if the patient’s aneurysm is at the near the cut-off value and if there is another important pathology in the patient, decision of the surgery may be more difficult. At this point, some additional parameters might be facilitating to decision of prophylactic surgery. It has been reported that $^{18}$Fluoro-deoxy-glucose positron emission tomography/computed tomography ($^{18}$FDG-PET/CT) is associated with inflammatory response in aortic aneurysms and may be an independent parameter for the prediction of rupture.[2,3] However, its use is often overlooked except in malignant cases. We present an interesting case that, the decision of prophylactic surgery was facilitated by $^{18}$FDG-PET/CT.

Case Report
A 67-year-old male patient was diagnosed as larynx carcinoma about a year ago. After the six cycles of chemotherapy, $^{18}$FDG-PET/CT was performed. There were not any findings consistent with primary disease or metastasis. However, a lesion was detected about 50.4 mm × 40.8 mm of size in the upper mediastinum. Its $SUV_{max}$ was 2.97 and thought as TAA. Elective surgery was not a first choice of the surgeon due to two main reasons. First, the patient had laryngeal carcinoma. Second, size of TAA was near the cut-off value. He underwent close follow-up. Three months later, $^{18}$FDG-PET/CT was performed. Lesion’s size was 51.5 mm × 42.1 mm, and the $SUV_{max}$ value was 3.72. Comparison of the images was shown in Figure 1. Then, contrast-enhanced CT was obtained. Contrast-enhanced CT, unenhanced CT, fusion images are shown in Figure 2. Because of the following findings, it was decided that risk of rupture was high after the second imaging. Size of TAA was near the cut-off value in first $^{18}$FDG-PET/CT and increased in the second. $SUV_{max}$ was >2.5 in both images.

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and increased in the second. Thoracic endovascular aortic repair was performed electively and patient underwent follow-up. Informed consent forms were obtained before each procedure.

**Discussion**

The TAA should be treated before the complications, due to high mortality rates. The cut-off value for prophylactic surgery accepted as >5.0 cm generally. Important number of the ruptures occurred in <5.0 cm. On the other hand, if cut-off value is reduced, the number of surgery candidates are increased dramatically as a disadvantage. In addition, if the patient’s aneurysm is at the near the cut-off value and if there is another important pathology in the patient, decision of the surgery may be more difficult. At this point, considering also mortality rates as high as 8% after the elective surgery, additional parameters may be facilitating the decision.

The $^{18}$FDG-PET/CT may be beneficial about the subject. As known, $^{18}$FDG is a glucose analogue and if there is a high uptake in the aneurysm wall, rupture/dissection risk is increased. Sakalihasan et al. reported that acute complication rate was 67% in $^{18}$FDG-PET/CT-positive cases whereas this rate was 20% in negative ones. Similarly; 82% of the patients with SUV$_{\text{max}}$ >2.5 developed progressive disease, whereas stable disease/regression was detected in 55% of patients with <2.5 without surgical treatment. Tahara et al. found a correlation between aneurysm dissection and doubling time of $^{18}$FDG uptake. In a recent case report, abdominal aortic aneurysm was detected in a patient. Lesion’s SUV$_{\text{max}}$ value was 3.68. When the patient was receiving medical treatment, intermittent $^{18}$FDG-PET/CTs were performed. Lesion’s last SUV$_{\text{max}}$ value was calculated as 5.18. Authors reported that this patient died due to rupture after the last imaging.

Our patient had larynx carcinoma, and TAA with near the cut-off value for elective surgery. At this point, we thought that, needed an additional parameter to decision. Lesion’s SUV$_{\text{max}}$ was above the 2.5 in first imaging and increased approximately 25% within 3 months. We have also considered these additional findings and decided to elective surgery. Then, the patient underwent follow-up.

$^{18}$FDG-PET/CT may be an additional and useful method for the decision of elective surgery in TAA patients who near cut-off value and had another important pathology. We think that aneurysms may be another pathology that $^{18}$FDG-PET/CT potentially be useful apart from imaging malignant of diseases. Prospective studies may clarify this subject.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.
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Conflicts of interest

There are no conflicts of interest.

References

1. Kuzmik GA, Sang AX, Elefteriades JA. Natural history of thoracic aortic aneurysms. J Vasc Surg 2012;56:565-71.
2. Courtois A, Nusgens B, Garbacki N, HusinxD, Gomez P, Defraigne JO, et al. Circulating micro RNAs signature correlates with positive [18F] fluorodeoxyglucose-positron emission tomography in patients with abdominal aortic aneurysm. J Vasc Surg 2018;67:585-96.
3. Singh P, Almarzooq Z, Salata B, Devereux RB. Role of molecular imaging with positron emission tomographic in aortic aneurysms. J Thorac Dis 2017;9:S333-42.
4. Weinsaft JW, Devereux RB, Preiss LR, Feher A, Roman MJ, Basson CT, et al. Aortic dissection in patients with genetically mediated aneurysms: Incidence and Predictors in the GenTAC Registry. J Am Coll Cardiol 2016;67:2744-54.
5. Hiratzka LF, Bakris GL, Beckman JA, Bersin RM, Carr VF, Casey DE Jr., et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM. Guidelines for the diagnosis and management of patients with thoracic aortic disease. A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine. J Am Coll Cardiol 2010;55:e27-129.
6. Gazoni LM, Speir AM, Kron IL, Fonner E, Crosby IK. Elective thoracic aortic aneurysm surgery: Better outcomes from high-volume centers. J Am Coll Surg 2010;210:855-9.
7. Sakalihasan N, Nienaber CA, HusinxD, Lovinfosse P, El Hachemi M, Cheramy-Bien JP, et al. (Tissue PET) Vascular metabolic imaging and peripheral plasma biomarkers in the evolution of chronic aortic dissections. Eur Heart J Cardiovasc Imaging 2015;16:626-33.
8. Kuehl H, Eggebrecht H, Boes T, Antoch G, Rosenbaum S, Ladd S, et al. Detection of inflammation in patients with acute aortic syndrome: Comparison of FDG-PET/CT imaging and serological markers of inflammation. Heart 2008;94:1472-7.
9. Tahara N, Hirakata S, Okabe K, Tahara A, Honda A, Igata S, et al. FDG-PET/CT images during 5 years before acute aortic dissection. Eur Heart J 2016;37:1933.
10. Tsuruda T, Nagamachi S, Nishimura M, Nakamura K, Kitamura K. Multiple 18F-fluorodeoxyglucose positron emission tomography scans showing progression of abdominal aortic aneurysm: A case report. Medicine (Baltimore) 2016;95:c3650.