

# Ga-68 DOTATATE Accumulation in Sarcoidosis

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**Abstract:** We aimed in this case series to show Ga-68 DOTATATE uptake in relation with disease activity in sarcoidosis cases. 8 patients with previous diagnosis of sarcoidosis were included to the study. Ga-68 DOTATATE PET/CT was performed to evaluate of disease activity. Disease activity was described clinically by chest disease specialist by evaluation of lung function tests, serum ACE measurements and thorax CT. Correlation between Ga-68 DOTATATE uptake and disease activity was analyzed. Ga-68 DOTATATE PET/CT as a combination of SSR scintigraphy and anatomical imaging might be beneficial in the evaluation of active sarcoidosis.

**Keywords:** Sarcoidosis, Ga-68 DOTATATE, Disease activity.

## INTRODUCTION

Sarcoidosis is a chronic inflammatory disease with unknown origin. Description of disease activity could be beneficial to decide the need of treatment in some patients [1]. Ga-67 scintigraphy has been performed to evaluate disease activity and it is reported a good correlation exists between Ga-67 accumulation and active disease. Especially intense Ga-67 uptake in hilar and paratracheal lymph nodes is very specific for sarcoidosis [2]. Also somatostatin receptor scintigraphy has revealed superior than Ga-67 scintigraphy especially in the evaluation of extrapulmonary involvement [3].

Ga-68 is generator produced radionuclide that decays by positron emission (42%) and electron capture (%41) into Zn-68 and has 68 minutes physical half-life. Several synthetic somatostatin analogues including DOTATATE have been labeled by Ga-68. Somatostatin receptor(SSR)s are expressed surface of the inflammatory cells as well as well differentiated neuroendocrine tumors. There were 5 different subtypes of SSRs. Ga-68 DOTATATE has high affinity to SSR subtype 2 and 5. As a positron emission tomography (PET) agent Ga-68 labeled somatostatin analogues have superior spatial resolution and higher sensitivity than single photon emission tomography (SPECT) agents. In the literature SSR expression of sarcoidosis has been showed by SPECT imaging. However as far as we know, role of positron emission tomography by Ga-68 labeled SSR scintigraphy has not been reported.

We aimed in this case series to show Ga-68 DOTATATE uptake in relation with disease activity in sarcoidosis cases.

## MATERIAL AND METHOD

8 patients with previous diagnosis of sarcoidosis were included to the study. A Ga-68 DOTATATE PET/CT was performed to evaluate of disease activity. Ga-68 was eluted from 740 MBq Ge-68/Ga-68 generator system (Scintomics GmbH, Fürstenfeldbruck, Germany). PET/CT images were acquired with Discovery ST PET/CT scanner (General Electric, Milwaukee, Wisconsin, USA). Synthesis of Ga-68 DOTATATE was performed by automated synthesis unit (Scintomics GmbH, Fürstenfeldbruck, Germany). >95% purity was checked before administration to patient. Images were obtained approximately 1 hour after an intravenous injection of approximately 100 MBq of Ga-68 DOTATATE. Whole body PET/CT imaging was performed while patients were in supine position from the vertex to the mid thighs. CT image was obtained from the integrated PET/CT scanner with the use of a standardized protocol involving 140 kV, 70 mA, a tube rotation time of 0.5 s per rotation, a pitch of 6 and a section thickness of 5 mm. immediately after the CT part, PET images were acquired for 5 minutes per bed position. PET images were reconstructed using non-contrast CT data for attenuation correction. PET/CT images were evaluated by visually for regions of pathologically increased tracer uptake that could not be accepted as normal physiologic activity.

Disease activity was described clinically by chest disease specialist by evaluation of lung function tests, serum Angiotensin Converting Enzyme (ACE) measurements and thorax CT. Correlation between Ga-68 DOTATATE uptake and disease activity was analyzed.

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## RESULTS

8 patients (mean age:  $48 \pm 13.2$ , min-max: 27-60, 6F; 2M) with previous diagnosis of sarcoidosis were included to the study. Mean serum ACE level of patients was calculated as  $24.2 \pm 15.6$  (min-max: 2-54). While thorax CT was totally normal in 3 patients, mediastinal-hilar lymph nodes were detected in the rest of them.

In 3 out of 8 patients who had chronic inactive disease, Ga-68 DOTATATE PET/CT was normal. In the remaining 5 patients with active disease, different degree pathological Ga-68 DOTATATE accumulation was seen in the mediastinal lymph nodes (Figure 1a, 1b, 2, 3). Additionally, in one patient Ga-68 DOTATATE accumulation was detected in the parotid glands, in one patient in jugular, iliac and inguinal lymph nodes and in one patient both lungs which were accepted disease involvement.

## DISCUSSION

Usage of somatostatin receptor scintigraphy in benign diseases has been described previously [4]. In chronic inflammatory diseases such as sarcoidosis, expression of somatostatin receptors has been known. Presence of somatostatin receptor subtype 2 was demonstrated on epithelioid cells and giant cells. The role of somatostatin receptor scintigraphy by In-111 Octreotide and Tc-99m HYNIC-TOC in sarcoidosis has been showed in several studies [5, 6].

Kwekkeboom *et al* have reported that lymph node involvement of 34 out of 46 patients have detected by SSR scintigraphy, whereas detection rate was 29 out of 46 patients by CT and radiography. They have also reported a high accuracy rate in the detection of active parenchymal lung disease although it is lower in the detection of skin and liver involvements [7]. Lebtahi *et al*. have been compared Ga-67 and SRS scintigraphies. They reported that SRS scintigraphy has higher accuracy in the detection of both affected patients and affected sites [3]. Piotrowski *et al*. have compared the relation between clinical/laboratory markers and SSR scintigraphy in sarcoidosis. They claimed that discrepancies between scintigraphy and markers might be related with low resolution and specificity of scintigraphy [8].

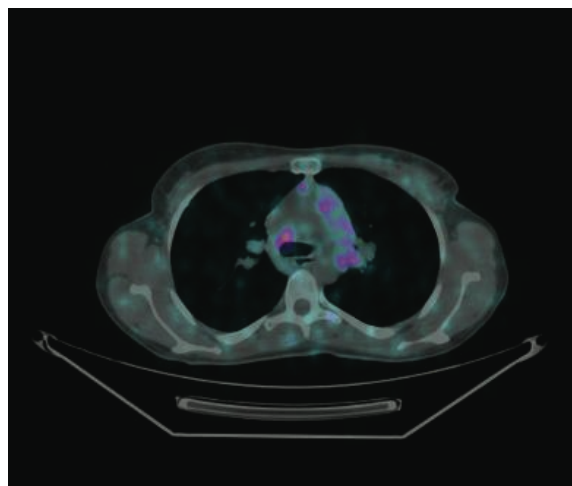
It is known that Ga-68 DOTATATE PET/CT has higher sensitivity than In-111 or Tc-99 m labeled somatostatin SPECT because of higher spatial resolution of PET. For this reason Ga-68 DOTATATE

PET/CT might be more accurate than SSR SPECT. Because of lower specificity of SSR expression, Ga-68 DOTATATE PET/CT can be performed in just previously histopathologically diagnosed patients. Additionally, it might have a role in the detection of extrathoracic involvement. Additionally, procedure of Ga-68 DOTATATE PET/CT is easier than Ga-67 scintigraphy because there is not need of special preparation of patient and all procedure could be completed within 2 hours period. Another advantage of Ga-68 DOTATATE PET/CT is lower effective whole body radiation dose than Ga-67 citrate [7, 8]. For this reasons, Ga-68 DOTATATE PET/CT could be an alternative for evaluation of disease activation of sarcoidosis patients.

We did not compare Ga-68 DOTATATE accumulation with serum markers because it would not be meaningful in limited number of patients. In this stage, we would like to share our initial results by reporting our case series. As a result of this limited number of patients, in addition to clinical examination and other laboratory parameters, Ga-68 DOTATATE PET/CT as a combination of SSR scintigraphy and anatomical imaging might be beneficial in the evaluation of active sarcoidosis.

## CASE 1

26 years old, female patient underwent Ga-68 DOTATATE PET/CT for evaluation of activation of sarcoidosis. 15 days before she has been diagnosed as sarcoidosis by mediastinal lymph node biopsy after presentation with weakness and weight loss. In Contrast Enhanced Thorax CT, multiple enlarged mediastinal lymph nodes were detected. Serum ACE



(1a)

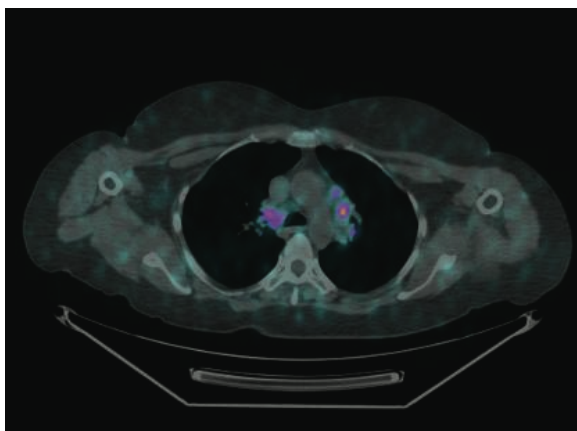
level was measured as 15U/L. Intense Ga-68 DOTATATE accumulation was seen in mediastinal, bilateral hilar and bronchopulmonary lymph nodes in transaxial fused images of thorax (Figure 1a) and maximum intensity projection (MIP) images of whole body (Figure 1b).



(1b)

## CASE 2

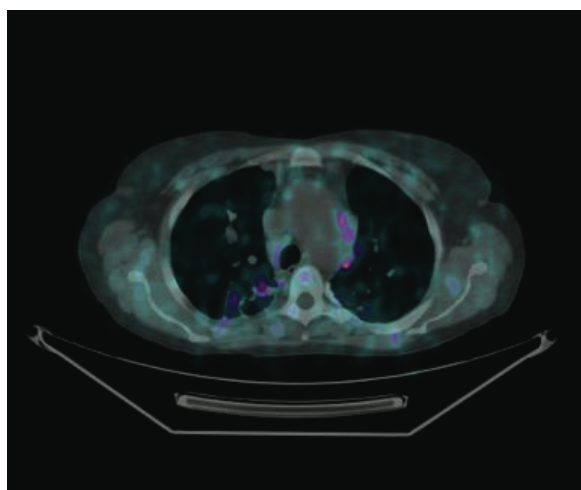
54 years old female patient who has been followed up for sarcoidosis for several years. She underwent Ga-68 DOTATATE PET/CT following Ga-67 planar imaging for evaluation of disease activity because withdrawal of steroid treatment was planned. Intense Ga-68 uptake was seen in paratracheal, prevascular and subcarinal lymph nodes in transaxial fused images of thorax (Figure 2). Steroid treatment was continued in that patient.



(2)

## CASE 3

53 years old, female patient, she underwent Ga-68 DOTATATE PET/CT for initial evaluation of disease activity. Serum ACE level was measured as 13U/L and thorax CT revealed mediastinal and bilateral hilar lymph nodes. In axial fused images of thorax (Figure 3) Ga-68 DOTATATE accumulation was seen in mediastinal, bilateral hilar lymph nodes and bilateral lung parenchyma.



(3)

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