



# Acute Suppurative Thyroiditis as a Presentation of Disseminated Methicillin-Resistant *Staphylococcus aureus* Infection in an Adult with Type 1 Diabetes

Nami Lee, Ja Young Jeon, Yong Jun Choi, Seung Jin Han

Department of Endocrinology and Metabolism, Ajou University School of Medicine, Suwon, Korea

Acute suppurative thyroiditis (AST) is a rare condition, more common in children than in adult, with an incidence rate of 0.1% to 0.7% among all thyroid disorders [1]. The thyroid gland is resistant to infection due to anatomical and physiological features. Consequently, AST is more likely to occur in patients with predisposing factors such as an immunocompromise state or presence of pyriform sinus fistula. However, AST is considered an endocrine emergency disease with a mortality rate ranging from 3.7% to 9.0%.

Subacute thyroiditis (SAT) is a more prevalent self-limiting disease, constituting 5% of all thyroid diseases [2]. The typical presentation of AST and SAT includes neck pain, fever, and elevated inflammatory parameters. AST is primarily caused by bacterial infection, whereas SAT is linked to viral infection. Because of some overlapping clinical features and the relatively high incidence of SAT, AST can be misdiagnosed as SAT. Herein, we present a case of AST that rapidly progressed to septic shock, posing challenges in differentiation from SAT.

A 32-year-old woman presented to the local clinic with complaints of swelling on the right side of her neck and dysphagia. SAT was diagnosed through ultrasound (US), and the patient had been prescribed oral prednisolone. Despite 3 days of treatment, symptoms worsened, leading to transfer to our emergency department. The patient has been treated for type 1 diabetes mellitus (T1DM), and the hemoglobin A1c level was 10.3%.

The initial physical examination showed tachycardia (124 beats/min), afebrile (36.0°C), and normal blood pressure (124/81 mm Hg). Mild right thyroid tenderness was noted, with no other signs. Four hours after visiting emergency department, the patient's blood pressure suddenly dropped to 74/44 mm Hg.

Laboratory findings revealed a severe inflammatory response, including white blood cell count  $16.0 \times 10^3/\mu\text{L}$ ; neutrophils 84.8%; erythrocyte sedimentation rate (ESR) 94 mm/hr; C-reactive protein (CRP) 34.23 mg/dL.

Thyroid stimulating hormone (TSH) and free thyroxine levels were 0.01  $\mu\text{IU/mL}$  and 5.13 ng/dL, respectively, consistent with thyrotoxicosis, but anti-TSH receptor and anti-thyroid peroxidase antibodies were not detected. Thyroid US showed that the right thyroid lobe was diffusely enlarged, had reduced vascularity, and was heterogeneous hypoechoogenicity with multiple cystic components (Fig. 1A). A computed tomography (CT) scan of the neck reported a multiloculated hypodense mass with peripheral enhancement consistent with an abscess in the right thyroid gland without anatomical anomalies (Fig. 1B).

Cardiac enzymes were elevated, and the precordial ST segment was elevated on the electrocardiography (ECG), consistent with acute pericarditis (Fig. 1C). The patient had cavitory lesions and scattered wedge-shaped nodules in the peripheries of both lungs consistent with pulmonary septic embolism, as well as a small amount of pericardial effusion (Fig. 1D, E). A CT

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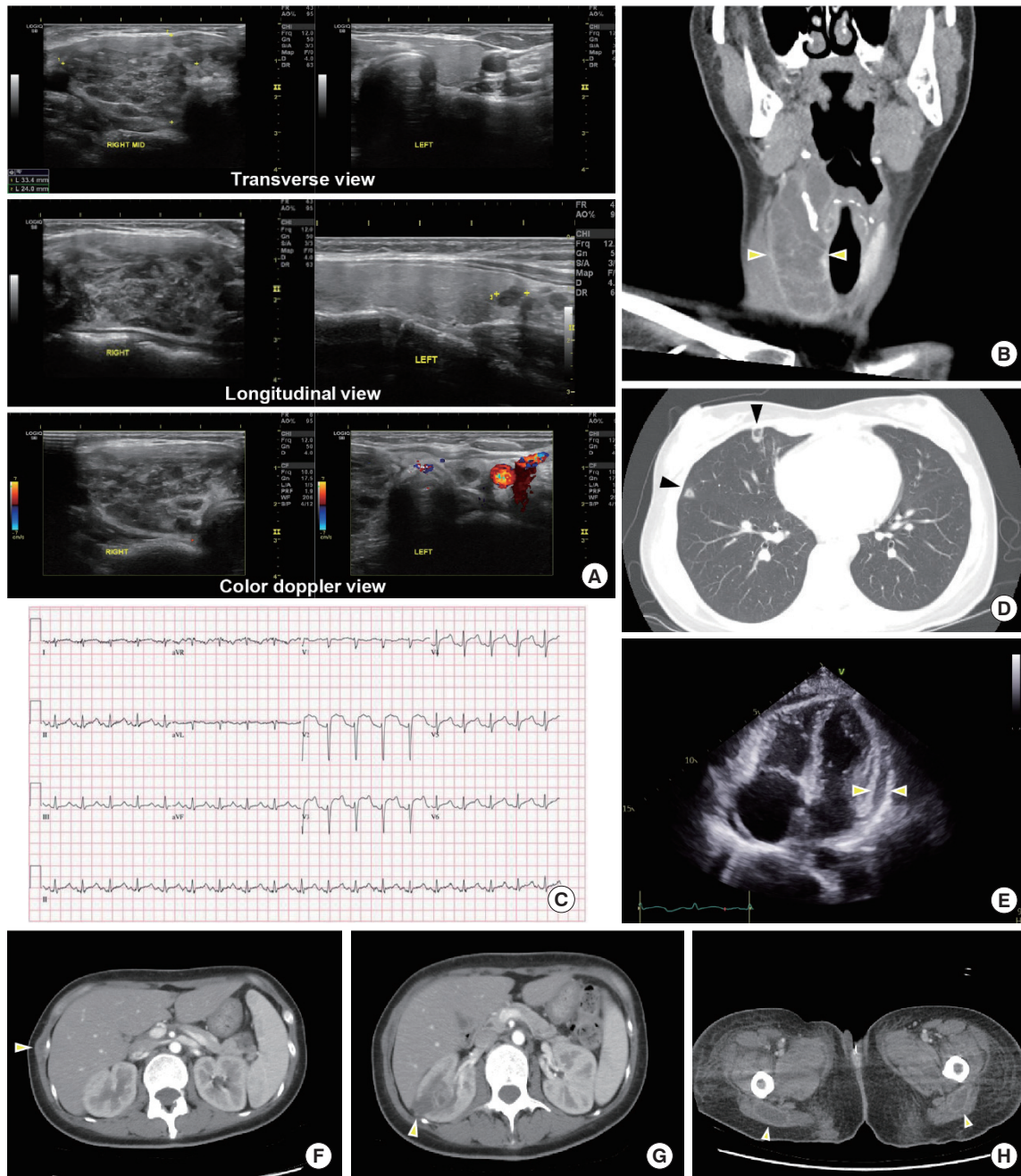
Corresponding author: Seung Jin Han

Department of Endocrinology and Metabolism, Ajou University School of Medicine, 164 World cup-ro, Yeongtong-gu, Suwon 16499, Korea

Tel: +82-31-219-5126, Fax: +82-31-219-4497, E-mail: hanseungjin@hanmail.net

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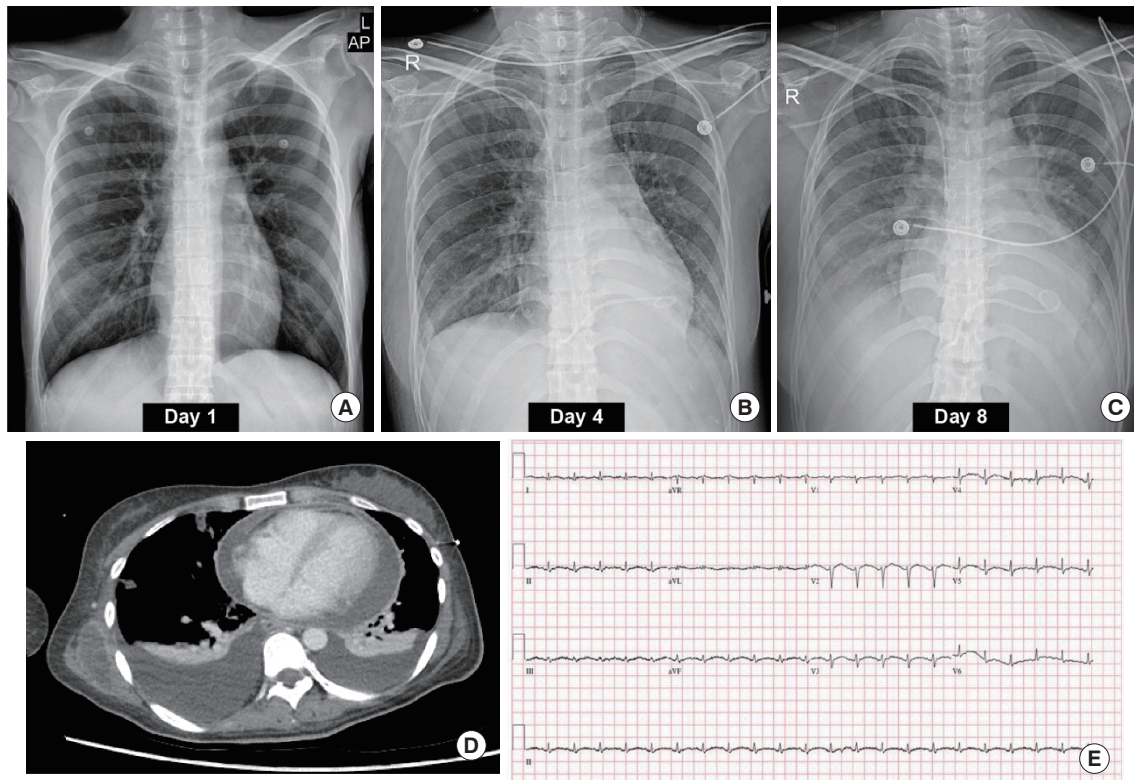


**Fig. 1.** Initial examination. (A) Thyroid ultrasonography, (B) neck computed tomography (CT), (C) electrocardiography, (D) chest CT, (E) echocardiogram, (F, G) abdomen, and (H) lower extremity CT. Each arrowhead in B, F, G, and H indicates an abscess. The arrowheads in D and E indicate septic emboli and pericardial effusion, respectively.

scan also revealed disseminated abscesses throughout the body (Fig. 1F-H). Laboratory examinations for respiratory viruses, human immunodeficiency virus, autoimmune-related antibodies, and tumor markers were all negative.

Methicillin-resistant *Staphylococcus aureus* (MRSA) was isolated from the blood and urine. The vancomycin was adminis-

tered, and prednisolone was discontinued. Purulent fluid aspirated from the thyroid abscess grew MRSA. The patient complained of worsening chest discomfort and dyspnea. Compared with the initial imaging studies (Figs. 1D, 2A), chest X-ray and CT scan showed the cardiomegaly and bilateral pleural effusion, which gradually worsened over time (Fig. 2B-D), and the ECG



**Fig. 2.** Follow-up examination during admission. (A, B, C) Chest X-ray, (D) chest computed tomography, and (E) electrocardiography.

**Table 1.** Thyroid Function Tests, Thyroid Antibodies, and Inflammatory Markers

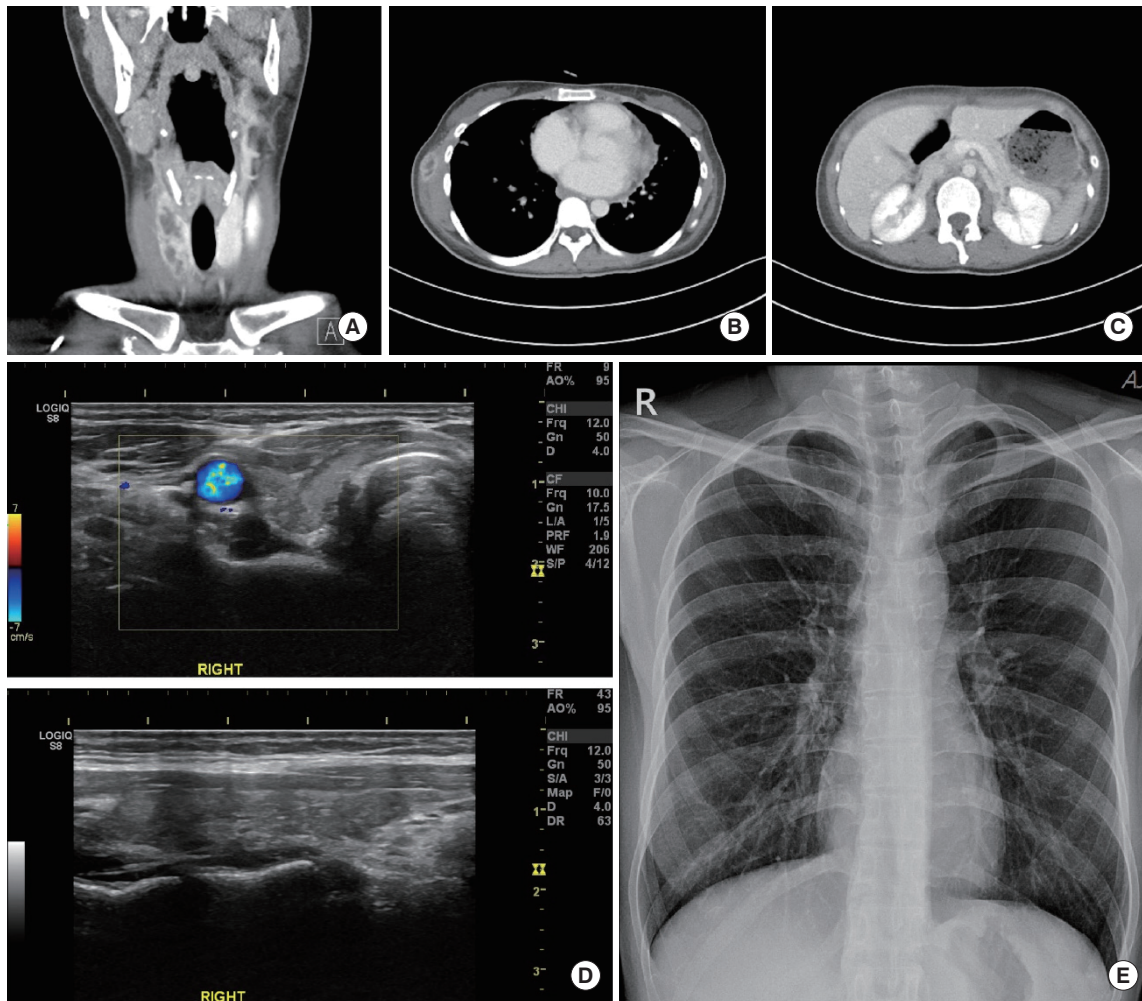
Tests/Treatment	Reference range	Aug 28, 2023	Sep 4, 2023	Sep 11, 2023	Oct 10, 2023	Oct 26, 2023	Jan 23, 2024
TSH, $\mu$ IU/mL	0.27–4.20	0.01	0.02	6.13	2.70	2.84	2.70
Free T4, ng/dL	0.93–1.70	5.13	1.36	0.44	1.02	1.11	1.14
T3, ng/dL	80.0–200.0	103.0	69.6	42.2	154.0	74.8	-
TR Ab, IU/L	0.0–1.5	0.6	-	-	-	-	-
TPO-Ab, U/mL	0–60	565	-	-	-	-	-
TG-Ab, U/mL	0–60	$\leq 11$	-	-	-	-	-
ESR, mm/hr	0–25	94	46	37	27	-	-
CRP, mg/dL	0.00–0.50	34.23	19.74	15.20	0.94	0.25	-
Levothyroxine, $\mu$ g/day				50	50	50	50

TSH, thyroid stimulating hormone; T4, thyroxine; T3, triiodothyronine; TR Ab, TSH receptor antibody; TPO-Ab, thyroid peroxidase antibody; TG-Ab, thyroglobulin antibody; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein.

showed low voltage (Fig. 2E). She underwent pericardial window surgery. MRSA was also isolated in pericardial fluid.

She developed hypothyroidism and commenced levothyroxine therapy (Table 1). The ESR and CRP levels decreased, and the abscess was reduced in a follow-up CT scan (Fig. 3A-C). Three months after discharge, thyroid abscess, pericardial effusion, and pleural effusion had resolved (Fig. 3D, E), and the patient remained euthyroid while taking levothyroxine.

We report a rare case of destructive AST due to disseminated MRSA infection in a patient with T1DM without other predisposing factors. AST is rare and predominantly occurs in children, while SAT is more prevalent and primarily manifests in adults [2]. Diagnosing AST is challenging because of the common symptom of neck pain shared with both diseases. However, the treatment approaches for each disease differ due to distinct etiologies.



**Fig. 3.** Follow-up images at 5 weeks after admission and at 3 months after discharge. (A) Neck computed tomography (CT), (B) chest CT, (C) abdomen CT, (D) thyroid ultrasonography, and (E) chest X-ray.

Fever is more common and tends to be more severe in AST than in SAT, and neck tenderness occurs more frequently in SAT than in AST [1]. Elevated ESR levels are observed in both conditions, while leukocytosis, especially neutrophilia, is predominantly seen in AST. Thyrotoxicosis, commonly present in SAT, is a rare feature in AST.

In this case, the diagnosis of SAT was established based on initial symptoms, including neck pain with tenderness, afebrile status, and the presence of thyrotoxicosis, along with elevated ESR and CRP levels in laboratory tests. However, the symptoms worsened after prednisolone treatment. Follow-up US and neck CT scan revealed a thyroid abscess, ultimately leading to the diagnosis of AST. This case highlights the importance of considering AST in patients initially diagnosed with SAT who do not respond to glucocorticoid treatment.

MRSA-associated AST are rare and often reported in individuals with predisposing factors such as intravenous drug use (IVDU), type 2 diabetes mellitus (T2DM), and immunocompromised states [3,4]. Yedla et al. [3] reported a case of AST due to MRSA bacteremia derive from a urinary tract infection in a patient with T2DM, acquired immunodeficiency syndrome, and IVDU. Another patient with T2DM and IVDU was described as a case of AST seeded from MRSA infective endocarditis [4]. Both T1DM and T2DM are the important predisposing risks factors for bacterial infection [5]. Among individuals with diabetes, patients with T1DM showed a higher risk of sepsis and death from infection than those with T2DM. To our knowledge, this case is the first report of AST as the presenting manifestation of disseminated MRSA infection in an individual with T1DM, without additional immunocompromising factors.

Euthyroid is common in AST, but in rare cases, thyrotoxicosis or hypothyroidism may present [1]. Thyroid hormone levels may not serve as a diagnostic test to differentiate between AST and SAT.

Vague symptoms may cause an erroneous diagnosis, and initial US and thyroid hormone levels may not always be conclusive in the early phase of AST. This report emphasizes the need for vigilance in AST diagnosis, especially if steroid treatment proves ineffective or if the patient's condition deteriorates rapidly, warranting prompt CT scan and US-guided fine-needle aspiration.

The requirement for informed consent was waived for this case report by the Ajou University Hospital Institutional Review Board (AJOUIRB-EX-2024-254).

### CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

### ORCID

Nami Lee <https://orcid.org/0000-0003-0343-5619>

Seung Jin Han <https://orcid.org/0000-0003-4783-6799>

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