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Case of a Deep Neck Abscess During Treatment
for COVID-19

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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Patient: Male, 55-year-old
Final Diagnosis: COVID 19 infection • deep neck infection • pyogenic arthritis
Symptoms: Neck pain • shoulder pain
Medication: Antibiotics
Clinical Procedure: Incisional drainage
Specialty: Otolaryngology

Objective: Unusual clinical course

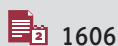
Background: COVID-19 is treated using antiviral and immunosuppressive drugs. Therefore, patients treated for COVID-19 may have an increased risk of secondary infection and a masked inflammatory response. We present a case of a deep neck abscess caused by pyogenic sternoclavicular arthritis during treatment for COVID-19.

Case Report: A 55-year-old man with COVID-19 was admitted to the hospital with hypoxemia. He was then treated with remdesivir, tocilizumab, and dexamethasone and was placed in the prone position. When his condition stabilized, pain in the left shoulder appeared. There was no fever or elevation in inflammation markers, and he was administered analgesics. However, the pain worsened and redness of the left neck appeared. Plain computed tomography (CT) showed swelling of the left neck muscles. Because cellulitis was suspected, he was treated with antibiotics, but his symptoms did not improve. Three days after the plain CT, contrast-enhanced CT showed sternoclavicular arthritis, deep neck abscess, and mediastinal abscess. Therefore, an emergency incisional drainage was performed under general anesthesia. Wound cleaning and drainage were continued after surgery, and after drainage tubes were removed, the patient was discharged on postoperative day 17.

Conclusions: Cervical infections after COVID-19 treatment have been reported in a few cases. Particularly, deep neck abscesses require more attention since they could be fatal if not treated immediately. If a secondary infection is suspected in a patient treated with immunosuppressive drugs for COVID-19, a thorough physical examination should be performed to avoid misdiagnosis.

Keywords: Abscess • COVID-19 • Prone Position

Full-text PDF: <https://www.amjcaserep.com/abstract/index/idArt/936034>



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Background

The number of patients with COVID-19 continues to increase worldwide. Anti-inflammatory drugs, including dexamethasone, tocilizumab, and baricitinib, are usually used to treat the hyperinflammation caused by the virus [1]. Due to the use of anti-inflammatory drugs, patients sometimes develop secondary infections [2,3]. However, the diagnosis of the infection can be delayed because the inflammatory response is often masked by treatment [4].

Deep neck abscess is a fatal disease usually caused by descending infection of the oral cavity or upper respiratory tract, such as tonsillitis or dental infection. Although few cases have been reported, pyogenic sternoclavicular arthritis can be a cause of deep neck abscess [5]. There are limited reports of cervical infections associated with COVID-19, and 1 report of a case with cervical abscesses [6].

In this report, we describe a case of a deep neck abscess due to pyogenic sternoclavicular arthritis during the course of treatment for COVID-19.

Case Report

A 55-year-old man with COVID-19 was admitted to our hospital because of hypoxemia. The patient also presented with fever and malaise. On the second day after symptom onset, he was diagnosed with COVID-19 based on the reverse transcriptase-polymerase chain reaction test for SARS-CoV-2, which was performed at a public health center. He was being followed

up at home before the admission. He had hypertension and sleep apnea, but no history of smoking. Computed tomography (CT) showed ground-glass opacities along the pleura of both lungs, which are typical of COVID-19. Therefore, treatment for COVID-19 (remdesivir 100 mg/day for 10 days, dexamethasone 6 mg/day for 9 days, tocilizumab 760 mg once) was initiated, and the patient was placed in the prone position. Although oxygenation temporarily deteriorated to nasal high flow (maximum 50 L/min, O₂ concentration 100%), the patient was weaned off from nasal high flow without intubation on day 12 of hospitalization.

On day 12 of hospitalization, the patient developed pain in the left shoulder. Although he was administered analgesics, the pain worsened, and redness and heat sensation in the left neck appeared (Figure 1A). The white blood cell (WBC) count was elevated ($20.2 \times 10^4/\mu\text{L}$), but the C-reactive protein (CRP) level was not (0.25 mg/dL). Plain CT revealed swelling of the left sternocleidomastoid muscle and left strap muscle and increased fatty tissue concentration in the superior mediastinum (Figure 2A-2C). Cervical cellulitis was suspected, and he was started on intravenous ceftriaxone 2 g/day and vancomycin 1.5 g/day. On day 17 of hospitalization, the WBC count decreased, but the pain persisted. Pus was observed around the site where the peripheral catheter had been inserted (Figure 1B). In addition, a central venous catheter had not been inserted from admission. A contrast-enhanced CT showed left sternoclavicular arthritis and abscesses in the left sternocleidomastoid muscle, left strap muscle, and superior mediastinum (Figure 2D-2F). On the same day, an emergency incisional drainage was performed under general anesthesia.

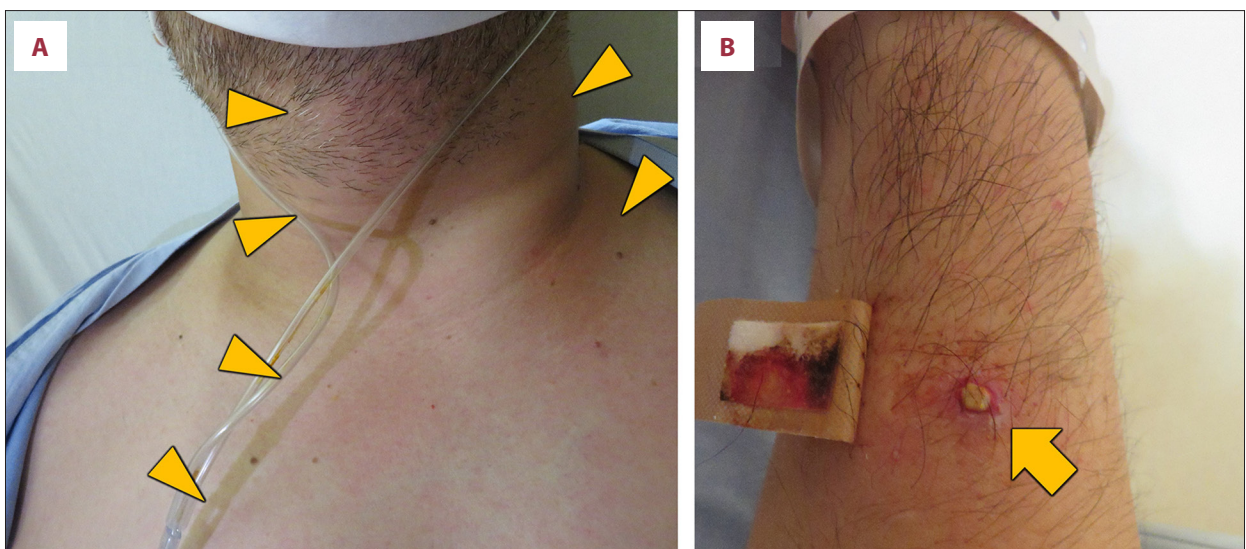


Figure 1. Physical examination findings on day 14 of hospitalization. On physical examination, redness and swelling were noted in the neck area, which the patient reported as painful (triangle) (A). Pus was present around the insertion site of the peripheral catheter (arrow) (B).

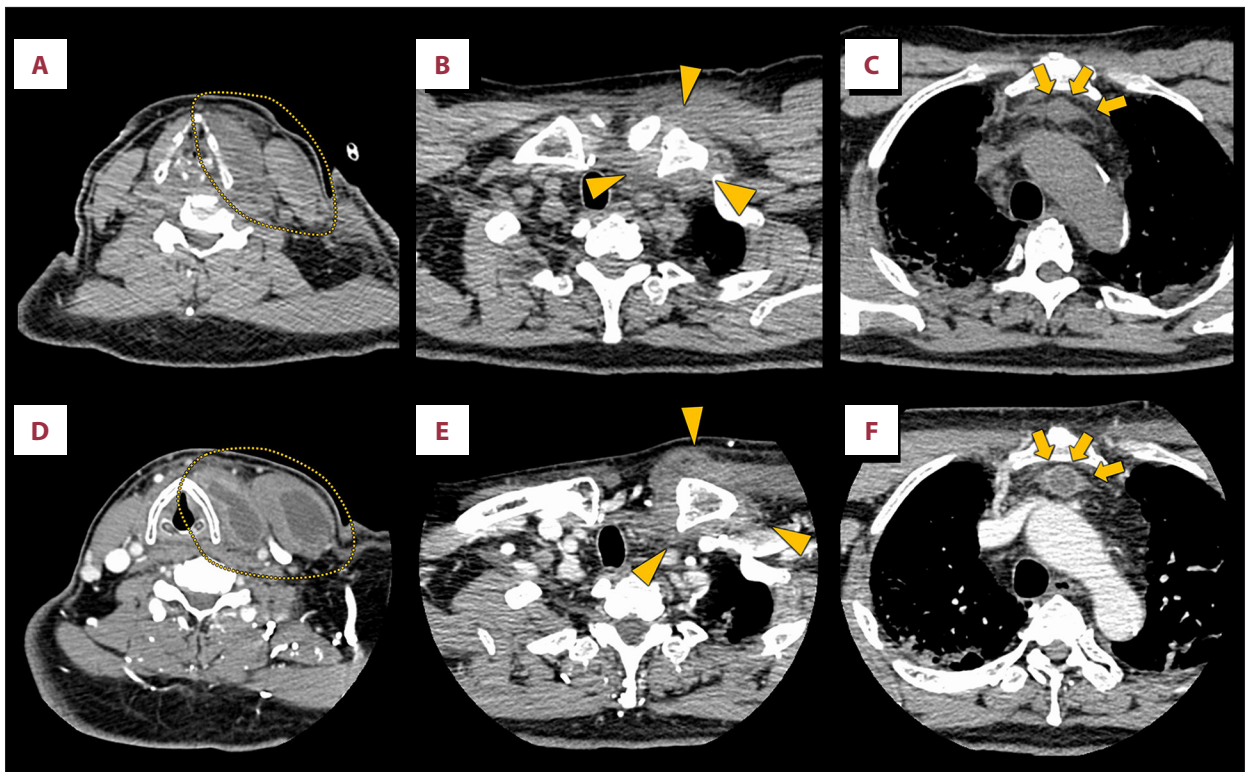


Figure 2. Computed tomography of the neck on day 14 (A-C) and day 17 (D-F) of hospitalization. Plain computed tomography (CT) on day 14 of hospitalization showing enhanced soft tissue shadows (A) in the left sternocleidomastoid muscle and the left strap muscles (dot area), (B) around the left sternoclavicular joint (triangle), and (C) in the superior mediastinum (arrow). (D) Contrast-enhanced CT on day 17 of hospitalization showing abscess formation in the left sternocleidomastoid muscle and the left strap muscles (dot area). (E) The left sternoclavicular joint shows an increased concentration of surrounding adipose tissue without bone destruction (triangle). (F) The abscess has also reached the superior mediastinum on the dorsal side of the sternum (arrow).

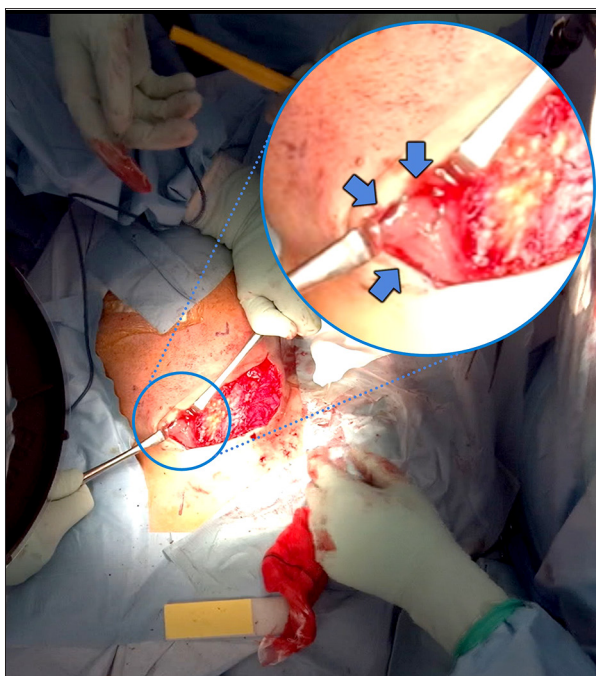


Figure 3. Pus drainage during surgery. The magnified anterior cervical wound is shown (blue circle). Grayish white pus with a foul odor was discharged after making an incision on the strap muscle (blue arrow). Pus drainage was also observed after the incision of the sternocleidomastoid muscle.

A J-shaped incision was made from the mastoid process to the midline of the anterior neck, and the skin was elevated just below the broad neck muscle. An incision was made in the swollen area of the sternocleidomastoid muscle, and pus excretion was observed (Figure 3). Pus was also excreted when the strap muscle was incised, and the abscess cavity was observed to be continuous near the sternoclavicular joint. The abscess in the superior mediastinum was manually opened. After thorough lavage with saline, the operation was completed with the placement of 1 drain each in the sternocleidomastoid muscle, left side of the thyroid cartilage, and superior mediastinum. The wound was washed daily with saline through drain tubes. The pus and blood cultures showed methicillin-susceptible *Staphylococcus aureus*, and intravenous cefazolin

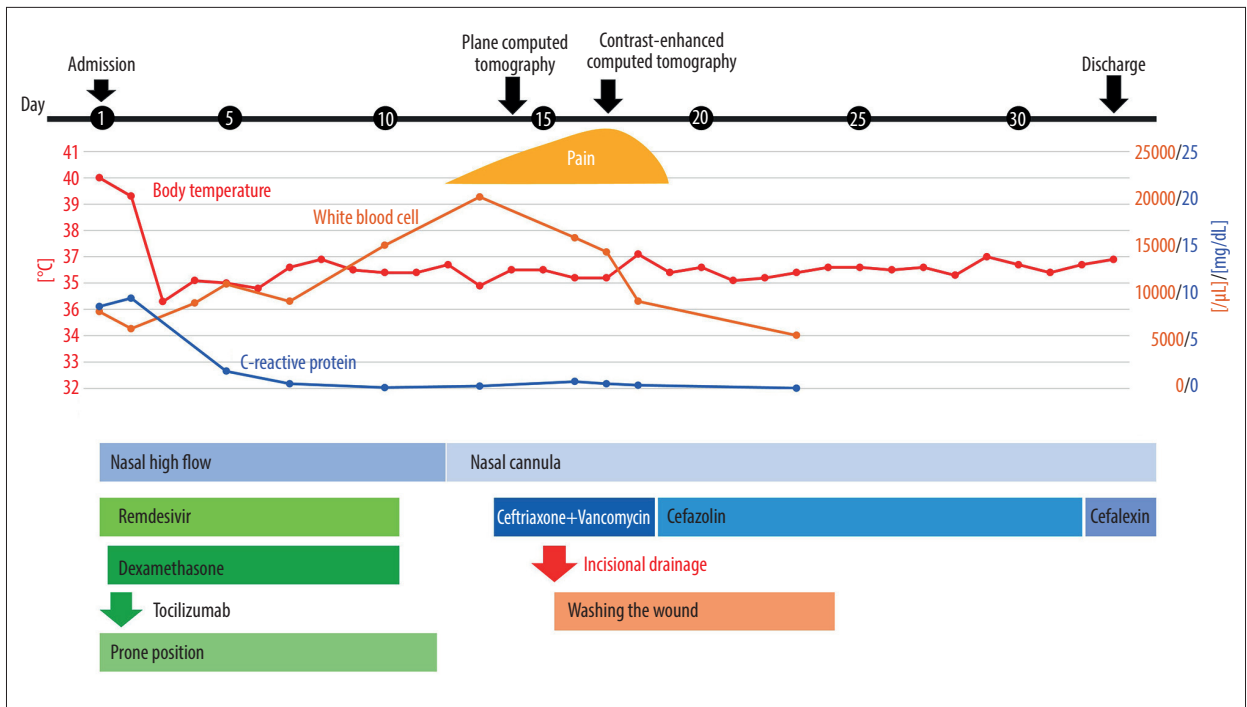


Figure 4. Clinical course of the patient.

4 g/day was initiated on day 17 of hospitalization. The WBC count improved quickly after surgery, and all drains were removed on day 26 of hospitalization. After the deep neck abscess was treated, the pain in the shoulder improved and was only mildly felt during physical movement. Postoperative magnetic resonance imaging showed a high signal intensity on the sternoclavicular joint, and pyogenic sternoclavicular arthritis was suspected. The patient was discharged on day 32 of hospitalization after the introduction of home oxygen therapy because he required oxygen supplementation (**Figure 4**).

Discussion

There were 3 noteworthy clinical findings in this case. First, this is the first report of a deep neck abscess associated with COVID-19 and its treatment. Second, immunosuppressive drugs for COVID-19 can make the diagnosis of severe infection, including a deep neck abscess, difficult because of the absence of an inflammatory response. Finally, pyogenic sternoclavicular arthritis can cause a deep neck abscess.

Deep neck abscesses can develop during the treatment of COVID-19. There have been many reports of co-infections with COVID-19. The incidence of bacterial and fungal infections in patients with COVID-19 is reported to be approximately 8% [7], with the most frequent co-infections being pneumonia and bacteremia [8]. Co-infections can be due to the immunosuppression caused by dexamethasone or tocilizumab, weakened host

immunity by COVID-19, ventilators and central venous catheters for critically ill patients, and prolonged hospitalization [2,3]. We found 2 cases of cervical infections after COVID-19 treatment in the literature [6,9]. These 2 cases were diagnosed as acute epiglottitis and retropharyngeal abscess. Both cases occurred more than 20 days after the onset of COVID-19 and showed elevated inflammatory findings, including CRP. In the case of acute epiglottitis, an emergency tracheotomy was performed, in addition to the infusion of cefuroxime and metronidazole. The case of retropharyngeal abscess was treated with infusion of piperacillin-tazobactam and vancomycin, followed by incisional drainage. Moreover, both patients showed improvement after treatment. In both cases, treatment for COVID-19 was not specified in the reports, and it was not possible to determine whether COVID-19 itself or immunosuppression caused by the COVID-19 treatment was responsible for the onset of cervical infection. Our patient had a severe case of COVID-19 in which nasal high flow with a high oxygen concentration was required, although he did not receive mechanical ventilation. After the COVID-19 had stabilized, pain in the left shoulder appeared. Since the onset of the pain occurred on day 12 of hospitalization, there was a possibility that abscess formation had begun at this time. A deep neck abscess developed from pyogenic sternoclavicular arthritis. In addition, the previous 2 cases developed more than 3 weeks after COVID-19 treatment was initiated [6,9]. It is not clear if there is a direct relationship between COVID-19 infection and a deep cervical abscess. However, even after the treatment course for COVID-19 has been completed, deep neck abscesses can be a complication.

The treatment of COVID-19 involves antiviral and immunosuppressive drugs. It was reported that patients with COVID-19 who received tocilizumab and dexamethasone did not show an increase in CRP levels due to secondary infection. Moreover, tocilizumab has a half-life of approximately 10 days and has a long-term anti-inflammatory effect [4]. Therefore, secondary infection may not be noticeable even after a few weeks. In patients with connective tissue disease during treatment with tocilizumab, an elevated CRP level and fever may not be present, which can mask the signs of infection in the patient. However, it was also reported that 94% of the patients who were administered tocilizumab had symptoms despite having normal CRP levels and temperature, with no delays in the detection of infection [10]. In our case, non-infectious orthopedic diseases, such as periarthritis of the shoulder, were initially suspected, and the patient was administered analgesics because there were few inflammatory findings. The lack of an inflammatory response may have been due to the anti-inflammatory drugs (tocilizumab and dexamethasone) used for COVID-19. A deep neck abscess was only considered because the pain did not improve, and a detailed physical examination revealed redness and mild swelling in the same area. Because we suspected infection around the deep neck, we performed a plain CT of the neck, which revealed a deep neck abscess. In the case of secondary infection in patients with COVID-19 on immunosuppressive therapy, it is important to carefully monitor their symptoms and perform a physical examination with thorough infection prevention. Furthermore, imaging studies such as CT should be considered.

Pyogenic sternoclavicular arthritis can result in a deep neck abscess. The infection may spread by arthrocentesis breakthrough or through lymphatic dissemination [11]. In our case, a bloodstream infection at the site of the intravenous infusion might have led to the hematogenous development of pyogenic sternoclavicular arthritis. Furthermore, the damage to the joint capsule caused by the prone position performed as treatment may have contributed to the onset of pyogenic sternoclavicular

arthritis and progression to a deep neck abscess. Treatment consisted of urgent surgery for cervical and mediastinal abscesses and concurrent antibiotic therapy. Abscess formation in the posterior sternum occurs in 28% of cases and can lead to life-threatening complications, such as mediastinitis and superior vena cava syndrome [5,12]. Pyogenic sternoclavicular arthritis and deep neck abscess are both fatal diseases and, even in patients with COVID-19, invasive treatment should be performed to prevent infection.

Conclusions

COVID-19 can rarely complicate cervical infections, including deep neck abscesses, after the acute phase. Attention should be paid to severe secondary infections, such as deep neck abscesses and pyogenic sternoclavicular arthritis. When immunosuppressive drugs are used for the treatment of COVID-19, the inflammatory response can be masked. Careful physical examination is necessary because physical findings can provide clues on the presence of infection.

Department and Institution Where Work Was Done

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Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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