

# Unusual source of recurrent *Corynebacterium* bacteraemia in an immunocompromised patient

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## SUMMARY

We describe a unique case of a patient with acute myeloid leukaemia (AML), with recurring infections during chemotherapy from chronic nasal carriage of non-diphtherial *Corynebacterium*, who was eventually diagnosed as she presented with neutropaenic sepsis. Identifying (often multiple) sources of infection in immunocompromised patients is crucial but deciding whether multiple organisms, which in health are considered as commensals, are actually pathogenic during vulnerable states—can be clinically difficult. Our case highlights the efforts to correctly identify the actual source of this rare organism and the recognition of its pathogenic potential when other illnesses present. We also review the literature of *Corynebacteria* in patients with haematological malignancies but believe this is the first case of AML to be infected with *Corynebacterium* presenting during the COVID-19 pandemic with a probable incidental positive swab for SARS-CoV-2.

## BACKGROUND

The immunocompromised state of acute myeloid leukaemia (AML) is caused by the depletion of bone marrow by blasts as well as the side effects of chemotherapy. With such an important arm of the immune system disabled, it is not uncommon for non-pathogenic and commensal organisms to become infectious.<sup>1–3</sup> One such group of organisms are the *Corynebacterium* species which in health are commensals of the nares<sup>4,5</sup> and play an important role in the nasal microbiome along with *Staphylococcus* species.<sup>5</sup> With improvements in microbiological identification techniques, a number of these organisms which were previously overlooked as non-pathogenic are now being recognised for their infectious potential. Various species of *Corynebacterium* related infections complicating cases of AML have been reported.<sup>6,7</sup> Herein, we report a unique case of recurrent bacteraemia from chronic nasal carriage of *Corynebacterium striatum* in a patient with AML presenting with likely coincidental mild COVID-19 symptoms. Photographs taken on her phone during previous chemotherapy treatments, led to a more thorough physical examination which revealed the source that had been overlooked on a number of prior admissions.

## CASE PRESENTATION

A 63-year-old woman with AML with NPM1 mutation, normal karyotyping and negative for FLT3 mutation, had received three cycles of chemotherapy with cytarabine and venetoclax. Her last cycle of chemotherapy was 3 months prior to her

current admission. After each chemotherapy, she had been hospitalised with neutropaenic sepsis (including an admission to an ITU at her cancer centre) and her blood cultures at these times had repeatedly grown a strain of *C. striatum*. Her peripherally inserted central catheter (PICC) line had been replaced three times during her various admissions with septicaemia as it was believed to be the source of the infections. She had controlled atrial fibrillation for which she was prescribed warfarin. Her most recent bone marrow biopsy was suggestive of AML remission.

She was admitted to our hospital with fever and malaise for 2 days. Her history was suggestive of exposure to SARS-CoV-2 virus with her family members experiencing a cough and she had recently been in hospital for several blood transfusions. Her temperature was 38.4°C, with a heart rate of 115/min in AF, blood pressure 130/80 mm Hg, respiratory rate 20 per minute and peripheral oxygen saturations were 97% on room air. She had mild nasal erythema.

## INVESTIGATIONS

Her full blood count showed pancytopenia with a haemoglobin of 92 g/L, platelet counts of  $11 \times 10^9/L$  and white cell counts of  $0.4 \times 10^9/L$  with  $0.1 \times 10^9/L$  neutrophils. Her UEs, LFTs, glucose, calcium were normal.

Oronasal swab PCR confirmed presence of SARS-CoV-2 RNA however her chest X-ray was normal with no peripheral nor lobar infiltrates nor consolidation. A CT scan of thorax, abdomen and pelvis was unremarkable. The patient was empirically initiated with piperacillin/tazobactam and transfusions of packed red cells and platelets. Over the course of her admission, she continued to be febrile and her CRP kept trending up while on piperacillin/tazobactam (figure 1).

Blood cultures from her PICC line and peripheral vein again grew *C. striatum*, resistant to penicillin and sensitive to vancomycin. This was the same organism that was grown while admitted to her cancer treatment centre, following her first two cycles of chemotherapy. Her serum galactomanan and beta-D-glucan were negative.

## DIFFERENTIAL DIAGNOSIS

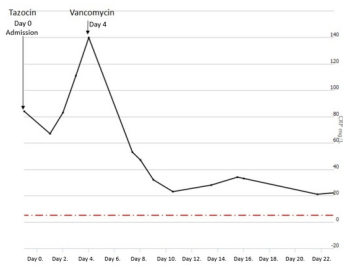
The source of her recurrent sepsis with *Corynebacterium* could be from the following:

- ▶ Infected PICC line: while a possibility, having been changed three times over a short period should prompt a search for an alternative source.



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**Figure 1** This graph demonstrates the improvement in CRP on addition of vancomycin to piperacillin-tazobactam antibiotic therapy.

- ▶ Infective endocarditis: the absence of any murmurs or stigmata of endocarditis puts this low on the list of differentials.
  - ▶ Deep seated abscess: no localising symptoms and a normal CT thorax, abdomen and pelvis makes this unlikely.
  - ▶ Dentition, skin and soft tissue infection: she had no swollen gums or infected pockets on oral examination.
- Other causes of fevers do need consideration including:
- ▶ Vasculitides including giant cell arteritis.
  - ▶ Drug-related fever.
  - ▶ Atypical infections including tuberculosis or fungal infection.
  - ▶ Lymphoma.
  - ▶ Sarcoidosis.
  - ▶ COVID-19 and other viral infections.

However, in a neutropaenic patient with an organism isolated from repeat blood cultures, diagnosis and management of sepsis is the priority.

## TREATMENT

Initially thought to be a non-pathogenic organism, the rising inflammatory markers and persistent fevers prompted a switch of antibiotic over to vancomycin and the patient was re-examined for source. Her current examination revealed a mildly erythematous nose and swollen nares not previously documented in any of her hospital notes. On further review, the patient revealed that she had been experiencing recurrent swelling of her nose and crusting of her nasal mucosa with nasal discharge after each round of chemotherapy and she showed photographs (on her phone) from when she was unwell in her cancer specialist hospital with neutropenic sepsis (figure 2). An ENT opinion was sought, and the patient was treated with a 10-day course of vancomycin with improvement and subsequent negative blood cultures.

Regarding potential COVID-19 treatments, we withheld systemic steroids as she was not requiring supplemental oxygen. We did not prescribe remdesivir or other medications as she was improving, and we were concerned about drug interactions and bone marrow suppression. We believe the positive COVID-19 swab was asymptomatic carriage.

## OUTCOME AND FOLLOW-UP

She was discharged after 10 days of intravenous vancomycin on a 7-day course of oral amoxicillin/clavulanate. A repeat nasal PCR swab 3 weeks later was reported as a 'low positive' for COVID-19. In the absence of any clinical symptoms this most probably represents remnants of the viral genetic material. The patient was spared having her PICC line changed again which given her thrombocytopenia and anticoagulation for atrial fibrillation would have entailed a more significant risk.

We recommended careful surveillance and to monitor her nose carefully rather than remove her PICC line if she develops

further fevers. Nasal swabs and prophylactic antibiotics could be considered if ever she needs further chemotherapy.

## DISCUSSION

*C. striatum* is a gram positive non-diphtherial bacteria which colonises the normal nasopharynx as well as the skin overlying the face and torso.<sup>4 8</sup> The first description of this bacteria as a pathogen was in a patient with chronic lymphocytic leukaemia and a pulmonary infection.<sup>9</sup> Infections with *C. striatum* have been reported in patients with indwelling catheters and the immunocompromised.<sup>8</sup> We identified three case reports of *C. striatum* infections complicating cases of leukaemia,<sup>9-11</sup> of which one was of AML.<sup>10</sup> COVID-19 is increasingly reported in people with haematological malignancies<sup>12 13</sup> but we believe this is the first reported case of *C. striatum* infection along with likely COVID-19 in a patient with AML.

One peculiar aspect of our case was the repeated infection with *C. striatum* despite two previous courses of vancomycin to which, the bacterium had demonstrated sensitivity to in vitro. The nasal symptoms, positive swab, multiple changes of PICC line and no other obvious focus of infection on CT scans strongly suggests the nasal mucosa as the source of infection. The strain of *C. striatum* isolated from our patient demonstrated sensitivity only to vancomycin on multiple occasions, a finding corroborated by other studies reporting the multi-drug resistant potential of this bacterium.<sup>14 15</sup> With regards to nasal decolonisation therapy, mupirocin, although effective against staphylococcus and streptococcus, is not effective against *Corynebacteria* and other nasal colonisers.<sup>16</sup> The activity of povidone-iodine washouts against *Corynebacterium* is variable owing to its mycolic acid cell wall.<sup>17</sup> Due to a paucity of evidence of nasal antiseptics, we did not attempt nasal decolonisation. The risk of prophylactic vancomycin before/during next chemotherapy probably outweighs the benefits at this point but further chemotherapy is not being planned at this stage.

Alterations in the nasal microbiome have been found in patients whose nasopharyngeal swabs have detected the presence of SARS-CoV-2 including a statistically significant increase in abundance of *Propionibacterium* and a reduction in incidence of *Corynebacterium accolens* compared with those with negative



**Figure 2** This image shows the area of nasal inflammation with crusting evident around the right nostril.

SAR-CoV-2 swabs.<sup>18</sup> The effects of these microbiome changes on the incidence of actual systemic bacterial infections in patients with COVID-19 is unclear. Around 14% of COVID-19 cases appear to be complicated with secondary bacterial infections with *Mycoplasma pneumoniae*, *Haemophilus influenzae* and *Pseudomonas* being isolated most frequently.<sup>19</sup>

Our patient had a benign course with probable low grade COVID-19 infection, needing no other treatments, oxygen nor ventilatory support. We cannot be sure she was an asymptomatic carrier and the fever was solely due to *Corynebacterium* and the positive PCR for COVID-19 was an incidental finding. A recent population level case-control study from the US reported over 50% of people with haematological malignancies and COVID-19 required hospitalisation with a mortality of nearly 15%<sup>13</sup> so she was monitored very carefully in an isolation cubicle as per neutropaenic protocols.

In conclusion, we describe a case of a *Corynebacterium* bloodstream infection from chronic nasal carriage in an immunocompromised woman with AML, who concomitantly swabbed positive for SARS-CoV-2. Antimicrobial therapy against what was previously considered a commensal perhaps prevented a much more turbulent course in the presence of COVID-19.

### Learning points

- ▶ A thorough physical examination including an oral cavity/dentition assessment as well as a skin examination is an essential part of septic screening.
- ▶ A low threshold for use of antimicrobial therapy should be maintained in patients who are immunocompromised.
- ▶ Certain commensals possess a pathogenic potential in the immunocompromised and must prompt liaising with the local microbiological team for treatment.
- ▶ Source removal is one of the cornerstones of management of sepsis.

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### REFERENCES

- 1 Ambesh P, Stroud S, Franzova E, *et al*. Recurrent *Lactobacillus* bacteremia in a patient with leukemia. *J Investig Med High Impact Case Rep* 2017;5:232470961774423.
- 2 Clauwaert M, Druwé P, Depuydt P. Meningitis in a patient with neutropenia due to *Rothia mucilaginosa*: a case report. *J Med Case Rep* 2019;13:84.
- 3 Levenga H, Donnelly P, Blijlevens N, *et al*. Fatal hemorrhagic pneumonia caused by infection due to *Kytococcus sedentarius*—a pathogen or passenger? *Ann Hematol* 2004;83:447–9.
- 4 Somerville DA. A taxonomic scheme for aerobic diphtheroids from human skin. *J Med Microbiol* 1973;6:215–24.
- 5 Ramsey MM, Freire MO, Gabrilksa RA, *et al*. *Staphylococcus aureus* shifts toward Commensalism in response to *Corynebacterium* species. *Front Microbiol* 2016;7:1230.
- 6 Sato K, Uchiyama M. *Corynebacterium jeikeium* bacteraemia and pulmonary infiltrates in a patient with acute myelogenous leukaemia. *BMJ Case Rep* 2012;2012:bcr1120115097.
- 7 Wallet F, Marquette CH, Courcol RJ. Multiresistant *Corynebacterium xerosis* as a cause of pneumonia in a patient with acute leukemia. *Clin Infect Dis* 1994;18:845–6.
- 8 Martínez-Martínez L, Suárez AI, Rodríguez-Baño J, *et al*. Clinical significance of *Corynebacterium striatum* isolated from human samples. *Clin Microbiol Infect* 1997;3:634–9.
- 9 Bowstead TT, Santiago SM. Pleuropulmonary infection due to *Corynebacterium striatum*. *Br J Dis Chest* 1980;74:198–200.
- 10 Guy B, O'Loughlin S, Petriw L, *et al*. A case of *Corynebacterium striatum* disseminated infection and pneumonia in a patient with relapsed acute myeloid leukemia. *Chest* 2016;150:197A.
- 11 Katayama Y, Kyo K, Iwato K, *et al*. [Philadelphia chromosome-positive acute lymphoblastic leukemia complicated by concomitant *Achromobacter xylosoxidans* and *Corynebacterium striatum* bacteremia following allogeneic hematopoietic stem cell transplantation]. *Rinsho Ketsueki* 2017;58:2250–5.
- 12 García-Suárez J, de la Cruz J, Cedillo Ángel, *et al*. Impact of hematologic malignancy and type of cancer therapy on COVID-19 severity and mortality: lessons from a large population-based registry study. *J Hematol Oncol* 2020;13:133.
- 13 Wang Q, Berger NA, Xu R. When hematologic malignancies meet COVID-19 in the United States: infections, death and disparities. *Blood Rev* 2021;47:100775.
- 14 Hahn WO, Werth BJ, Butler-Wu SM, *et al*. Multidrug-Resistant *Corynebacterium striatum* associated with increased use of parenteral antimicrobial drugs. *Emerg Infect Dis* 2016;22.
- 15 Nudel K, Zhao X, Basu S, *et al*. Genomics of *Corynebacterium striatum*, an emerging multidrug-resistant pathogen of immunocompromised patients. *Clin Microbiol Infect* 2018;24:1016.e7–1016.e13.
- 16 Conly JM, Johnston BL. Mupirocin - are we in danger of losing it? *Can J Infect Dis* 2002;13:157–9.
- 17 Lachapelle J-M, Castel O, Casado AF, *et al*. Antiseptics in the era of bacterial resistance: a focus on povidone iodine. *Clin Pract* 2013;10:579–92.
- 18 Mostafa HH, Fissel JA, Fanelli B, *et al*. Metagenomic next-generation sequencing of nasopharyngeal specimens collected from confirmed and suspect COVID-19 patients. *mBio* 2020;11:e01969–20.
- 19 Langford BJ, So M, Raybardhan S, *et al*. Bacterial co-infection and secondary infection in patients with COVID-19: a living rapid review and meta-analysis. *Clin Microbiol Infect* 2020;26:1622–9.

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