

# *Actinomyces turicensis* parapharyngeal space infection in an immunocompetent host: first case report and review of literature

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## Abstract

*Actinomyces* are common commensals of the oral cavity, gastrointestinal tract and urogenital tract. They are anaerobic, Gram-positive, non-acid-fast bacilli, which can cause invasive infection and abscesses. We present the first reported case of supraglottitis and deep neck space abscess formation secondary to *Actinomyces turicensis* infection. The patient was managed with intravenous antibiotics, incision and drainage of a left parapharyngeal abscess and subsequent mediastinal abscess. After 6 weeks in hospital, the patient was successfully discharged to complete a 6-month course of oral amoxicillin.

## INTRODUCTION

Actinomycosis is a granulomatous condition characterized by subacute or chronic abscess formation. The responsible *Actinomyces* organisms are anaerobic, Gram-positive, non-spore-forming, non-acid-fast, filamentous, branching rods that are normal commensals of the oral cavity, gastrointestinal tract and urogenital tract. Severe infections can result if they breach the submucosa. Actinomycosis infection has been divided into three clinical forms: cervicofacial (50%), thoracopulmonary (30%) and abdominopelvic (20%). *Actinomyces israelii* is the most common causative agent in cervicofacial actinomycosis. Conversely, *Actinomyces turicensis* is rare [1]. Predisposing factors for cervicofacial infection include recent dental procedures, immunosuppression, smoking and excessive consumption of alcohol.

Supraglottitis is an infection of the epiglottis and surrounding structures, including the arytenoids, false vocal cords and laryngeal ventricles. It is a life-threatening condition due to the potential for upper airway obstruction, and is more common in males, with a similar risk factor profile to actinomycosis infections [2]. To our knowledge, this is the first reported case of *A. turicensis* implicated in deep space neck abscess as a complication of supraglottitis.

## CASE REPORT

A 56-year-old man presented to the emergency department with a 3-day history of sore throat and worsening left-sided

neck fullness, associated with odynophagia, dysphagia and fever. He reported a fit and active lifestyle with a history of well-controlled asthma. No risk factors for deep neck space infection were elicited from his medical background.

Upon assessment by the otolaryngology team, inspiratory stridor was noted. Flexible nasolaryngoscopy revealed epiglottic oedema and swelling in the left vallecula. His white cell count was  $13.1 \times 10^9 \text{ l}^{-1}$  and his C-reactive protein value was 306 mg/l. He was started on intravenous dexamethasone, ceftriaxone and metronidazole for empirical treatment of supraglottitis. Repeat flexible nasolaryngoscopy demonstrated progressive supraglottic oedema and impending airway obstruction. He was jointly managed with the anaesthetic team, intubated in theatre and transferred to the intensive therapy unit (ITU).

Computed tomography (CT) of the neck with contrast revealed extensive supraglottitis with left-sided phlegmon formation, but no evidence of a drainable abscess (Fig. 1). Inflammatory changes were seen within the superior mediastinum that were suggestive of superior mediastinitis. Intravenous ceftriaxone and metronidazole were continued.

Following a 3-day interval, due to minimal clinical improvement, a repeat CT scan was performed (Fig. 2). This revealed disease progression with probable abscesses tracking anteriorly and laterally to the thyroid cartilage. Incision and drainage were performed and pus was evacuated from the left parapharyngeal and central suprahyoid spaces. Tissue

Received 05 March 2021; Accepted 27 May 2021; Published 12 July 2021

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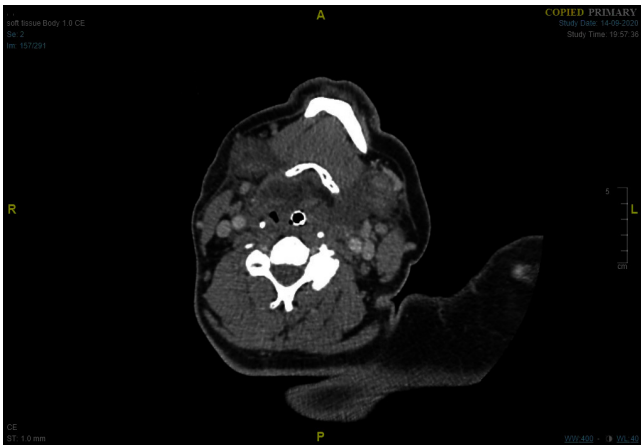
**Keywords:** *Actinomyces*; actinomycosis; parapharyngeal space; supraglottitis.

**Abbreviation:** NSTI, necrotising soft tissue infection.

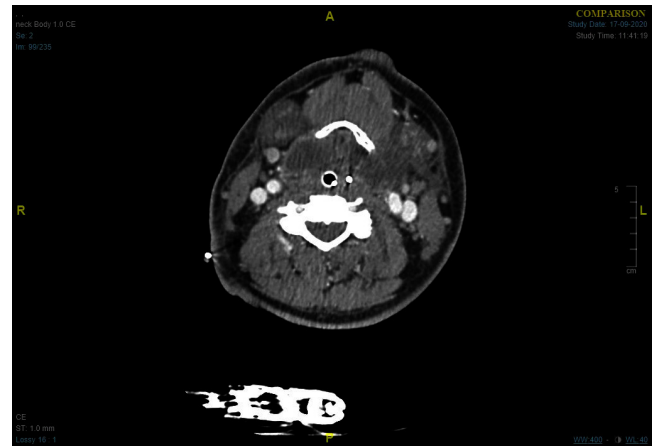
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**Fig. 1.** Computed tomography (CT) of the neck with contrast, axial plane, performed on the day of presentation, revealing extensive supraglottic inflammatory changes but no sign of drainable abscess.



**Fig. 2.** CT of the neck with contrast, axial plane, performed 3 days following initial presentation, revealing disease progression and small abscess/phlegmon noted anterolateral to both sides of thyroid cartilages.

submitted for histological analysis showed fibro fatty tissue with foci of acute inflammation, without atypia or malignancy.

The evacuated pus sent to the microbiology laboratory was inoculated onto blood agar plates incubated in added CO<sub>2</sub> at 35–37 °C, a MacConkey agar incubated aerobically at 35–37 °C and a chocolate agar plate with a metronidazole 5 µg disc incubated anaerobically. In addition, enrichment cultures in Robertson cooked meat broth were incubated at 35–37 °C. Cultures of the abscess revealed moderate growth of *A. turicensis* sensitive to penicillin; *Enterococcus faecalis* sensitive to amoxicillin, teicoplanin, vancomycin and linezolid; *Streptococcus anginosus* sensitive to penicillin, clindamycin and erythromycin; and moderate growth of *Streptococcus constellatus* sensitive to penicillin, levofloxacin and vancomycin and resistant to erythromycin, clindamycin and tetracycline. All the organisms, including *A. turicensis*, were identified using matrix-assisted desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) and antimicrobial susceptibility was determined using the minimum inhibitory concentration (MIC) per the European Committee on Antimicrobial Susceptibility Testing (EUCAST) methodology.

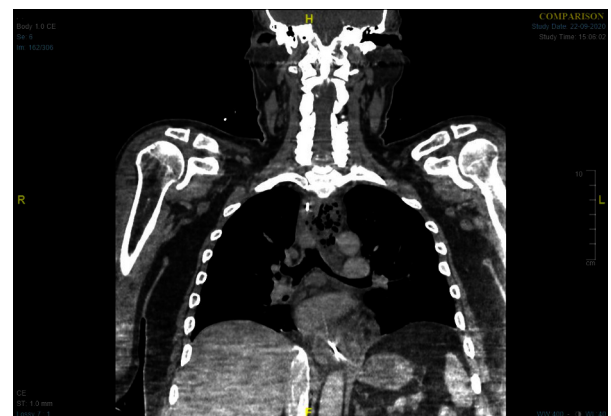
Four days post-operatively, the patient became persistently pyrexial and blood tests revealed a raised white cell count. The antibiotics were changed to meropenem and metronidazole based on microbiological advice. A repeat CT scan was performed which noted mediastinal abscess formation (Fig. 3.). Electrocardiography (ECG) revealed widespread ST elevation, compared to a baseline normal sinus rhythm. Echocardiography demonstrated evidence of a pericardial effusion. The troponin T was not elevated, and these changes were diagnosed as pericarditis. The patient underwent an incision and drainage of mediastinal abscess and surgical tracheostomy, jointly performed by the otolaryngological and cardiothoracic teams. Copious purulent liquid was expressed from the superior and posterior mediastinum. Cultures

here revealed *E. faecalis* sensitive to amoxicillin, linezolid, vancomycin and teicoplanin with extended-spectrum beta-lactamase-producing *Escherichia coli* (both on enrichment only) and mixed anaerobes.

Meropenem and metronidazole were stopped after 2 weeks. In light of the *Actinomyces* isolate, intravenous amoxicillin 2 g three times daily was commenced for 3 weeks, with a plan to switch to oral amoxicillin 1 g three times daily for 6 months.

Six weeks after admission, the patient was decannulated, able to mobilize with a frame and was recommencing oral nutrition. He was successfully discharged home.

At the time of writing (2 months following discharge from hospital), the main sequela reported by the patient is a higher pitched voice, although this is gradually improving. He is managing oral intake at a pre-morbid level and has



**Fig. 3.** CT of the neck and thorax with contrast, coronal plane, performed 7 days following initial presentation, revealing a mediastinal collection measuring 36×34 mm above the level of the aortic arch.

Table 1. Reported cases of *Actinomyces turicensis* infection

Reference	Age	Diagnosis	Concomitant organisms	Risk factor(s)	Country	Treatment	Sequelae
Riebert-Johnson et al., 2002 [5]	59	Hepatic abscess	<i>Bacteroides fragilis</i>	Recent dental procedure	USA	Antibiotics (5 weeks)	None
Altar et al., 2007 [6]	33	Right breast abscess	Mixed anaerobes	Obesity Ulcerative colitis	UK	Antibiotics (3 weeks) Surgical	None
Zautner et al., 2009 [7]	23	Right knee joint	<i>Actinomyces europaeus</i>	Fistulae excision 6 months prior	Germany	Antibiotics (2 weeks) Surgical	None
Chudácková et al., 2010 [8]	18	Pilonidal cyst	None	None known	Czech Republic	Surgical+/-antibiotics	None
Chudácková et al., 2010 [8]	18	Anorectal abscess	<i>Bacteroides ureolyticus</i> , <i>Fusobacterium nucleatum</i>	None known	Czech Republic	Surgical+/-antibiotics	None
Chudácková et al., 2010 [8]	28	Buttock abscess	None	None known	Czech Republic	Surgical+/-antibiotics	None
Chudácková et al., 2010 [8]	23	Perianal abscess	<i>Streptococcus milleri</i> , <i>Peptostreptococcus anaerobius</i>	None known	Czech Republic	Surgical+/-antibiotics	None
Chudácková et al., 2010 [8]	28	Pilonidal abscess	<i>Staphylococcus aureus</i>	None known	Czech Republic	Surgical+/-antibiotics	None
Chudácková et al., 2010 [8]	33	Buttock abscess	<i>Propionibacterium acnes</i>	Diabetes mellitus	Czech Republic	Surgical+/-antibiotics	None
Chudácková et al., 2010 [8]	65	Scrotal gas gangrene	<i>Prevotella</i> spp.	Obesity Rheumatoid arthritis Diabetes mellitus Hypertension	Czech Republic	Antibiotics Surgical	None
Ong, Barnes and Senanayake, 2012 [9]	73	Left iliac fossa collection	None	Obesity	Australia	Antibiotics (30 weeks)	None
Miller et al., 2014 [10]	5	Right cerebellar abscess secondary to otitis media	<i>Proteus mirabilis</i> , <i>Peptomiphilus harei</i> , <i>Bacteroides thetaiotaomicron</i> , <i>Anaerococcus hydrogenalis</i>	None known	New Zealand	Antibiotics (>5 weeks) Surgical	Right lateral gaze palsy
Abdulrahman and Gateley, 2015 [11]	22	Right breast abscess	<i>P. harei</i> , <i>Staphylococcus epidermidis</i>	Nipple piercing >1 year prior	UK	Antibiotics (>26 weeks) Needle aspiration	None
Kottam et al., 2015 [12]	30	Eustachian valve endocarditis and hepatic abscess	None	Intrauterine device placed 2 years ago	USA	Antibiotics (8 weeks) Surgical	None
Hagiya et al., 2015 [13]	80	Pyometra	<i>Clostridium clostridioforme</i> , <i>Escherichia coli</i>	None known	Japan	Antibiotics (4 weeks) Transvaginal drainage	None
Oh, Abdul Malik and Keh, 2015 [14]	25	Pilonidal abscess	<i>Prevotella bivia</i> , <i>Peptostreptococcus</i> spp.	None known	Singapore	Antibiotics (1 week) Surgical	None
Eenhuis et al., 2016 [15]	42	Pelvic-abdominal peritonitis	Anaerobes	Intrauterine device placed 5 years ago	The Netherlands	Antibiotics (30 weeks) Surgical	None
Gatti et al., 2017 [16]	64	Anterior abdominal wall NSTI	None	Obesity Hypertension	Italy	Antibiotics (5 weeks) Surgical	None
Cobo, 2018 [17]	44	Right breast abscess	None	None known	Spain	Antibiotics (10 days)	None

Continued

Table 1. Continued

Reference	Age	Diagnosis	Concomitant organisms	Risk factor(s)	Country	Treatment	Sequelae
Kocsis et al., 2018 [18]	43	Mastoiditis and meningitis	None	Alcohol abuse	Hungary	Antibiotics Surgical	Death
Panwar et al., 2019 [19]	45	Right thigh NSTI	Anaerobes	Obesity Diabetes mellitus	USA	Antibiotics Surgical	None
Vassa et al., 2019 [20]	61	Cervicofacial actinomycosis	None	Previous radiotherapy for oral cancer Recent oral surgery	USA	Antibiotics (6 weeks) Surgical	None
Le Bihan, Ahmed and O'Driscoll, 2019 [21]	43	Right breast abscess	<i>P. laevis</i>	Persistent lactation	UK	Antibiotics (7 weeks)	None
Kansara et al., 2020 [22]	52	Pyelonephritis and abscess	None	Ureteric stones	USA	Antibiotics (2 weeks) Surgical	None
Jin et al., 2020 [23]	50	Adrenal gland abscess	<i>E. coli</i> , <i>P. mirabilis</i> , anaerobes	Poor oral hygiene	PR China	Antibiotics (11 weeks) Percutaneous drainage	Not known
Barnes, Kaur and Augenbraun, 2020 [24]	53	Prostate, left inguinal cord and right facial abscess	<i>Peptostreptococcus</i> spp.	None known	USA	Antibiotics (26 weeks) Surgical	None
Current case	56	Supraglottitis, parapharyngeal and mediastinal abscess	<i>Enterococcus faecalis</i> , mixed anaerobes, <i>Streptococcus anginosus</i> , <i>Streptococcus constellatus</i>	None known	UK	Antibiotics (32 weeks) Surgical	None

not suffered any recurrent or new infections. Screening for an underlying immunodeficiency has been negative and he remains under regular review.

## DISCUSSION

This is the first case of *A. turicensis* reported as a causative organism in deep neck space infection arising from supraglottitis. Although a mucosal commensal and found within a polymicrobial abscess, it is extremely rare, and clinically significant when isolated from sterile deep-seated locations [1]. Notably, while deep neck space and cervicofacial *Actinomyces* infections have risk factors in common, the patient featured in this case had none of these reported in their history, and further investigations have not yielded an underlying cause. Growth of *Actinomyces* can take up to 15–20 days and due to its facultatively anaerobic character, careful transport and anaerobic processing of specimens suspected to harbour *Actinomyces* are required, which may partially account for its rarity. Penicillin G and amoxicillin are the antibiotics of choice for *Actinomyces* infections because of their susceptibility to beta-lactams. Patients typically require a prolonged course of treatment, for a maximum of 12 months, with a minimum of 3 months where optimal surgical resection is thought to have been achieved [3].

Since the advent of widespread immunization against *Haemophilus influenzae*, supraglottitis is most commonly caused by *Streptococcus pneumoniae*, *Staphylococcus aureus* and *Neisseria meningitidis*. Non-bacterial causes, including viruses, trauma, chemoradiotherapy and chemical irritants, are less common [2]. Some cases may mimic malignancy or cancer relapse [3]. Adults with supraglottitis commonly present with severe sore throat, odynophagia, dysphagia, dysphonia, pyrexia and, less commonly, stridor. There may be associated cervical lymphadenopathy and anterior neck tenderness, but not necessarily in the early stages. Diagnosis is made by flexible nasolaryngoscopy to reveal erythema and oedema of the supraglottis. Acute management includes supplemental oxygen, nebulized adrenaline, intravenous dexamethasone and empirical intravenous antibiotics in line with local antimicrobial guidelines. Tracheostomy or endotracheal intubation are required in patients with severe oedema and those who are unresponsive to medical management. There is sparse evidence in the literature quantifying supraglottitis progression to abscess formation, but one multicentre study involving 202 patients suggested a 22% incidence of epiglottic abscess in patients with acute supraglottitis [2, 4].

Isolates of *A. turicensis* have most commonly been described to involve the abdomen and soft tissue outside the head and neck. There are 26 previously reported cases of *A. turicensis* causing infection in humans, but no reports of association with supraglottitis or deep neck space abscess. Table 1 summarizes a literature review of *A. turicensis* infections. The 26 cases include 9 with *A. turicensis* only, and 17 with concomitant organisms. A predisposing factor was reported in 16 cases. At least 22 cases included abscess formation requiring 1 or more surgical procedures, which is replicated

in our report. Notably, low mortality has been recorded, as all but one case survived. It is unclear why the patient in our case had *A. turicensis* isolated in the parapharyngeal space – on questioning he had no reported abdominal or genitourinary symptoms prior to his presentation.

*A. turicensis* can feature as a causative micro-organism in supraglottitis, and may predispose to higher disease severity in the context of abscess formation within the deep neck spaces. Where *A. turicensis* is isolated, clinicians must be prepared to intervene surgically as part of the management plan. Microbiological samples should be obtained and transported carefully and promptly, as *A. turicensis* is a facultative anaerobe. This is key to determining the correct antimicrobial treatment. In our case, the first attempts to treat the infection (with ceftriaxone and metronidazole) were unsuccessful. A long duration (at least 6 months) of amoxicillin or penicillin G is indicated, and a multidisciplinary approach is essential for successful patient management.

### Funding information

The authors received no specific grant from any funding agency.

### Conflicts of interest

The authors declare that there are no conflicts of interest.

### Ethical statement

Verbal and written consent was obtained from the patient.

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