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

Ayla Tabaksert¹*, Ravi Kumar¹, Veena Raviprakash² and Rajeev Srinivasan¹

**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 13.1×10⁹ 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 suprathyroid spaces. Tissue
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 CO₂ 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
| Reference                  | Age | Diagnosis                  | Concomitant organisms                               | Risk factor(s)               | Country       | Treatment                  | Sequelae         |
|----------------------------|-----|----------------------------|-----------------------------------------------------|-----------------------------|---------------|----------------------------|------------------|
| Rieger-Johnson et al., 2002 [5] | 59  | Hepatic abscess            | *Bacteroides fragilis*                              | Recent dental procedure     | USA           | Antibiotics (5 weeks)       | None             |
| Attar 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           | *Actinomyces europaeus*                             | Fistulac 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 | None             |
| Chudácková et al., 2010 [8] | 18  | Anorectal abscess          | *Bacteroides ureolyticus*, *Peptostreptococcus anaerobius* | None known                  | Czech Republic | Surgical +/- antibiotics None | None             |
| Chudácková et al., 2010 [8] | 28  | Buttock abscess            | None                                                | None known                  | Czech Republic | Surgical +/- antibiotics None | None             |
| Chudácková et al., 2010 [8] | 23  | Perianal abscess           | *Streptococcus milleri*, *Peptostreptococcus anaerobius* | None known                  | Czech Republic | Surgical +/- antibiotics None | None             |
| Chudácková et al., 2010 [8] | 28  | Pilonidal abscess          | *Staphylococcus aureus*                             | None known                  | Czech Republic | Surgical +/- antibiotics None | None             |
| Chudácková et al., 2010 [8] | 33  | Buttock abscess            | *Propionibacterium acnes*                           | Diabetes mellitus           | Czech Republic | Surgical +/- antibiotics None | None             |
| Chudácková et al., 2010 [8] | 65  | Scrotal gas gangrene       | *Prevotella spp.*                                   | Obesity, Rheumatoid arthritis, Diabetes mellitus | Czech Republic | Antibiotics Surgical | None             |
| Ong, Barnes and Senanayake, 2012 [9] | 73  | Left iliac fossa collection | None                                                | None known                  | Australia      | Antibiotics (30 weeks)       | None             |
| Müller et al., 2014 [10]   | 5   | Right cerebellar abscess   | *Proteus mirabilis*, *Peptostreptococcus haloplachus*, *Bacteroides thetaotaomicron*, *Anaerococcus hydrogenalis* | None known                  | New Zealand    | Antibiotics (>5 weeks) Surgical | Right lateral gaze palsy |
| Abdulrahman and Gateley, 2015 [11] | 22  | Right breast abscess       | *P. haeri*, *Staphylococcus epidermidis*            | 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                   | *Clostridium clostridiiforme*, *Escherichia coli*    | None known                  | Japan          | Antibiotics (4 weeks) Transvaginal drainage | None             |
| Oh, Abdul Malik and Keh, 2015 [14] | 25  | Pilonidal abscess          | *Prevotella bivia*, *Peptostreptococcus spp.*       | None known                  | Singapore      | Antibiotics (1 week) Surgical | None             |
| Eenhus 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) Surgical | None             |

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             | 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                      | *P. harei*            | 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                     | *E. coli*, *P. mirabilis*, 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 | *Peptostreptococcus spp.* | None known                             | USA       | Antibiotics (26 weeks), Surgical | None     |
| Current case                      | 56  | Supraglottitis, parapharyngeal and mediastinal abscess | *Enterococcus faecalis*, mixed anaerobes, *Streptococcus anginosus*, *Streptococcus constellatus* | 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.

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**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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