European Review for Medical and Pharmacological Sciences 2023; 27: 3565-3568

Aggressive pulmonary destructive lesion caused by *aggregatibacter actinomycetemcomitans*: a pediatric case report in Saudi Arabia

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Abstract. – BACKGROUND: This study aimed to describe invasive pneumonia with rib destruction caused by *Aggregatibacter (Actinobacillus) actinomycetemcomitans* that mimicked malignancy and tuberculosis of the chest on initial presentation.

CASE PRESENTATION: We reported a case of *A. actinomycetemcomitans* pneumonia with rib destruction and reviewed similar published pediatric cases. It was noted in this case that *Aggregatibacter (Actinobacillus) actinomycetemcomitans* is a fastidious, slow-growing organism that caused pneumonia and rib destruction. It needed a long duration of therapy to eradicate the organism.

CONCLUSIONS: *Aggregatibacter (Actinobacillus) actinomycetemcomitans*, a fastidious gram-negative bacillus that is part of the oral flora, is frequently found in human periodontal cultures and is an important pathogen causing various invasive infections. Pneumonia caused by *A. actinomycetemcomitans* is rare and treatment protocols are not well established.

Key Words:
Aggregatibacter, Actinobacillus, Actinomycetemcomitans.

Introduction

Bacterium actinomycetemcomitans was described by Mauff et al[1] as coccobacillus bacteria isolated together with Actinomyces from actinomycotic lesions of man[1]. It was reclassified as *Actinobacillus actinomycetemcomitans* by Topley et al[2] and as *Haemophilus actinomycetemcomitans* by Potts et al[3] in 1985. In 2006, the *Aggregatibacter* genus was created to include *actinomycetemcomitans*, aphrophilus, and segnis species. It is a fastidious, gram-negative bacillus that is part of the oral flora and has been implicated as a pathogen in periodontal disease[3]. It has been isolated from actinomycotic lesions (mixed infection with certain Actinomyces species, in particular, *A. israelii*). It has subsequently been confirmed as present in at least 30% of actinomycotic lesions[4].

A. actinomycetemcomitans is a member of the HACEK group (*Haemophilus parainfluenza*, *Aggregatibacter species*, *Cardiobacterium hominis*, *Eikenella corrodens*, and *Kingella kingae*), which is considered to be the most common cause of pediatric Gram-negative infective endocarditis[5]. This case report describes invasive pneumonia with rib destruction that mimicked malignancy and tuberculosis of the chest on initial presentation. Based on the literature available, this is the first case to be reported in Saudi Arabia.

Case Report

A 12-year-old boy, not known to have a medical illness, was referred to our hospital as a case of left apical lung aggressive, destructive lesion for further evaluation. Symptoms started one month before his presentation with left shoulder pain, which was progressive with time associated with restriction of movement. There was a history of intermittent cough during the mentioned period and an unintentional weight loss of 5 kilograms over one month was observed. The patient was in contact with goats and camels but had no history of raw milk ingestion. There were no complaints of other joint involvement, fever, or skin rashes.

On physical examination, he was afebrile and maintaining hemodynamics. He was looking well and active with no respiratory distress. The left shoulder's active and passive movements were limited to around 45 degrees on abduction. There was minimal tenderness over the left clavicle medially. No overlying skin inflammatory changes. Chest auscultation revealed decreased air entry in

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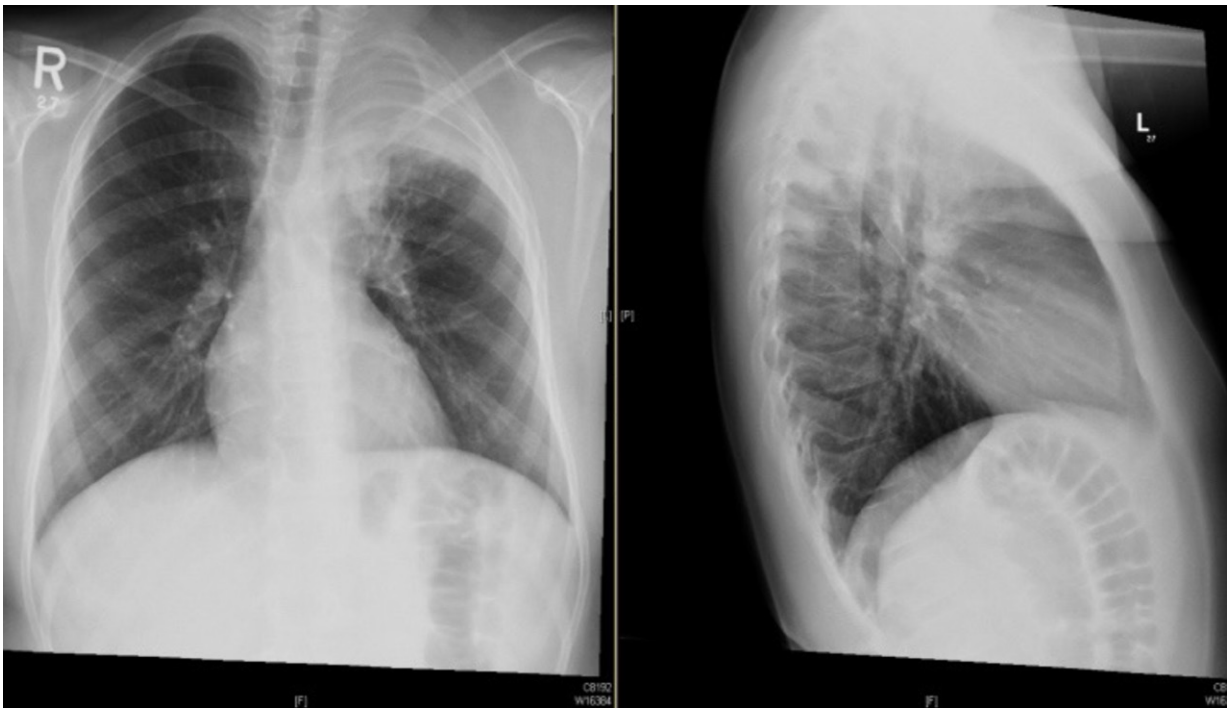

Figure 1. Chest radiograph.

the left upper zone. No palpable lymph node. The mouth exam was normal. The abdomen was soft and lax with no organomegaly. Other systemic examinations were not contributory.

Laboratory tests showed a white blood cell count (WBC) of 10.9×109 cells/L, with 71% neutrophils, hemoglobin 103 gm/L and platelets 646×109 cells/L. The Erythrocyte sedimentation rate (ESR) was 50 mm/h and the C-reactive protein was 179 mg/L. Blood chemistry revealed a total protein of 102 g/L and albumin of 34 g/L. Tuberculin skin test and Brucella titer were negative.

Chest radiograph (Figure 1) demonstrated left perihilar airspace opacity associated with left upper lobe opacity. Computed tomography (CT) of the chest (Figure 2) showed multiple left hilar lymph nodes with the collapse of the left upper lobe and multiple pulmonary nodules with cavitation and inflammatory changes around the left first rib with evidence of bone destruction and soft tissue inflammation. Findings were highly suggestive of tuberculosis.

The previously mentioned history and physical examination with the radiological findings raised the suspicion of malignancy, so the patient underwent a fine needle lung biopsy. Histopathology report revealed a fibro-inflammatory lesion with a predominance of plasma cells, surrounding normal nerve fibers with no malignant cells. Tissue culture grew *A. actinomycetemcomitans*.

The patient was started on intravenous cefotaxime (200 mg/kg/day) and clindamycin (40 mg/kg/day). His symptoms improved significantly within the first seven days of therapy. After completing 18 days of therapy, he was shifted to oral cefprozil (15 mg/kg/dose) and metronidazole (13 mg/kg/dose) for 4 months. Two months later, in a follow-up visit, shoulder pain and cough resolved, and his chest x-ray became normal.

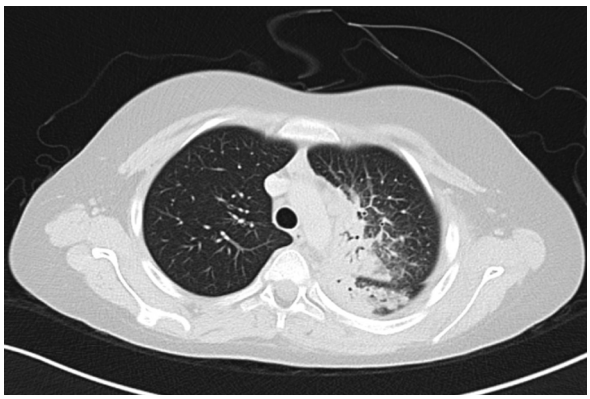

Figure 2. Chest computed tomography scan.

Table I. Summary of *Aggregatibacter Actinomycemcomitans* pneumonia in children with soft tissue and rib destruction.

	Our case	Case 1[8]	Case 2[8]
Age/sex	12 years/Male	12 years/Male	14 years/Male
Underlying disease	Healthy	Diabetes mellitus	Neurofibromatosis type 1
Symptoms duration	1 month	2 months	4 months
WBC count	10.9×10^9 cells/L	15.4×10^9 cells/L	14.1×10^9 cells/L
Treatment duration	5 months	1 year	> 3 months

Discussion

Aggregatibacter actinomycetemcomitans is a common oral commensal in around 20% of healthy subjects[6]. In recent years it has been found that it is the commonest cause of periodontitis and necrotizing ulcerative gingivitis in adolescents and young adults where it accounts for 75-100% of cases[6]. As a member of the HACEK group, *A. actinomycetemcomitans* causes infective endocarditis which ranks as the commonest cause in this group[6].

On rare occasions, *A. actinomycetemcomitans* has been reported to cause invasive systemic infections including brain abscess, osteomyelitis, endophthalmitis, pericarditis, pneumonia, UTI, and sepsis in pregnancy[7].

Shilo et al[8] reported 2 cases with a similar presentation to our case where both had soft tissue and bone destruction associated (Table I). The average age was 12.3 years. Case #1 with insulin-dependent diabetes mellitus in which the duration of the treatment was observed to be one year, this may be attributed to that diabetes affected *A. actinomycetemcomitans*-induced tissue destruction by significantly increasing the inflammatory response, leading to increased bone loss and apoptosis of epithelial and connective tissue cells[9]. However, in their case, tissue culture was negative and *A. actinomycetemcomitans* was identified by 16S RNA PCR. Therefore, it will be better to pursue further testing in cases where the organism could not be isolated by routine culturing. Al-Nafeesah[10] reported a similar case recently in which the patient was having a A.actinomycetemcomitans pneumonia with rib destruction and was treated with almost similar regimen.

Soft tissue and bone destruction were the distinct radiological manifestations noticed in these 15 reported cases and this can be explained by the components of *Aggregatibacter actinomycetemcomitans* like lipopolysaccharides, proteolysis-sensitive factors in micro-vesicles, surface-associated materials, etc., inhibit osteoblast proliferation and synthetic activity. They cause activation of bone resorption and induction of osteoclast proliferation[9].

A. actinomycetemcomitans shows a high *in vitro* susceptibility to 2nd and 3rd generation cephalosporin, aminoglycoside, fluoroquinolone, cotrimoxazole, rifampicin, clarithromycin, azithromycin, and tetracycline. Susceptibility to penicillin, amoxicillin, and metronidazole is variable and resistance may arise quickly, especially if used alone. Most isolates are resistant to erythromycin, clindamycin, and vancomycin. The most appropriate treatment is monotherapy with a third-generation cephalosporin or fluoroquinolone. Some recommend a combination therapy of ampicillin and rifampicin[11]. The most important guide to therapy is testing the isolated organism for antibiotic susceptibility and choosing the most appropriate antibiotic accordingly[12]. The optimal duration of therapy is not known, but a prolongation of antibiotic therapy is needed which mainly depends on the extent of tissue involvement, resolution of the symptoms as well as the infective process on follow-up radiography. More studies are needed to emphasis more about the appropriate duration of therapy.

Conclusions

Aggregatibacter (Actinobacillus) actinomycetemcomitans, a fastidious gram-negative *bacillus* that is part of the oral flora, is frequently found in human periodontal cultures and is an important pathogen causing various invasive infections. Pneumonia caused by *A. actinomycetemcomitans* is rare. Diagnosis and treatment protocols need to be improved; however, long duration of treatment is warranted in such organisms.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Informed Consent
Consent was taken from the patient and explained him in local language.

Ethics Approval
Not applicable.

Authors' Contribution
Conceptualization: Abdulrahman Bin Alamir; Case data collection: Mohammed Alshaalan; Manuscript write up and review: Abdulrahman Bin Alamir, Mohammed Alshaalan.

Funding
The authors extend their appreciation to the deputyship for Research & Innovation, Ministry of Education in Saudi Arabia for funding this research work through the project number IFP-2020-102.

Availability of Data and Materials
Not applicable.

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