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A Rare Causative Agent in Hospital-acquired Pneumonia: *Hafnia Alvei*

Hastane Kaynaklı Pnömonide Nadir Görülen Bir Etken: Hafnia Alvei

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Abstract

A 67-year-old male with lung cancer presented to the emergency department with complaints of dyspnea, fatigue, cough and sputum, and was admitted to the intensive care unit with a diagnosis of community-acquired pneumonia. Computed thoracic tomography revealed a cavitary consolidation lesion in the left lower lobe, and high C-reactive protein (CRP) and procalcitonin (PCT) were detected. The patient was subsequently transferred to the clinic, where a foul-smelling purulent sputum developed and CRP and PCT were increased. *H. alvei* was isolated form a sputum sample that was resistant to amoxicillin-clavulanate and susceptible to cephalosporins, ciprofloxacin, levofloxacin, carbapenems and piperacillin-tazobactam. The patient was treated with combined empirical antibiotics and then discharged.

Keywords: *H alvei, nasocomial pneumonia, respiratory infections.*

Öz

Nefes darlığı, halsizlik, öksürük ve balgam şikayeti ile acil servise başvuran 67 yaşında akciğer kanserli erkek hasta, yoğun bakım ünitesine toplum kökenli pnömoni tanısı ile yatırıldı. Bilgisayarlı toraks tomografisinde sol alt lobda kaviter konsolidasyon alanı görüldü, yüksek C-reaktif protein (CRP) ve prokalsitonin (PCT) tespit edildi. Sonrasında servise transfer edilen hastada kötü kokulu pürülan balgam gelişti ve CRP ve PCT' de artış tespit edildi, balgam örneğinde amoksisilin-klavulanata dirençli, sefalosporin, siprofloksasin, levofloksasin, karbapanem ve piperasilin-tazobaktam duyarlı *H. alvei* izole edildi ve kombine 14 günlük geniş etkili ampirik antibiyotik ile tedavi edildi.

Anahtar Kelimeler: *H alvei, hastanede gelişen pnömoni, solunum enfeksiyonları.*

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Hafnia alvei is a rod-shaped, gram-negative facultative anaerobic bacillus (1). *H. alvei* was first described by Dr. Bahr as an enterobacteria in 1919 (2), although the taxonomy of the species was not defined until 2010 (3). Although it was thought to be enteropathogenic in the 1990s, it was later determined to be the potential cause of infections in many systems (4,5).

We present here the case of a 67-year-old male with a history of COPD and lung cancer who was admitted to hospital with nosocomial pneumonia caused by *H. alvei*.

CASE

A 67-year-old male patient applied to the emergency service with dyspnea, weakness, cough and sputum was hospitalized in the intensive care unit. The patient had a 50 pack/year smoking history, squamous cell lung cancer diagnosed two years ago that was followed up without treatment over 6 months, and COPD.

A physical examination revealed a respiratory rate of 30 breaths per minute, a pulse of 120 bpm and oxygen saturation of 80% in room air. High levels of C-reactive protein (CRP) (161.8 mg/L) and procalcitonin (PCT) (0.17 microgram/L) were detected, while his leukocyte count (WBC) was normal.

A computed thorax tomography (CT) taken in the emergency room was compared with a CT scan taken 8 months earlier following the completion of cancer treatment. The first image revealed a cavity in the left lower lobe and atelectasis (Figure 1), while the CT scan in the emergency room revealed widespread bilateral emphysematous changes, a minimal pleural effusion in the left hemithorax, and an enlargement of the cavity and an area of homogeneous consolidation around the cavity (Figure 2). Intravenous (IV) cefepime initiated. In the qualified sputum specimen (more than 25 polymorphonuclear leukocytes and less than 10 epithelia in each field) on the first day upper respiratory tract flora bacteria grew. The patient was admitted to the Chest Diseases Service on the ninth day of hospitalization after a general improvement was noted in his condition.

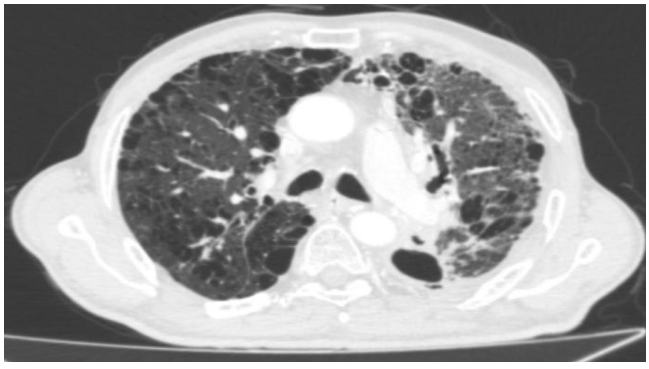

Figure 1: *CT upon the completion of the cancer treatment showing the cavity in the left lower lobe and atelectasis*

Figure 2: *Emergency room CT revealing the cavitary consolidation in the left lower lobe*

Foul-smelling purulent sputum developed during follow-up, and an increase was detected in acute phase reactants (CRP 234.6 mg/L, WBC 13.8 and PCT 0.2 microgram/L), and so empirical IV meropenem and amikacin initiated. The *H. alvei* isolated from the qualified sputum specimen examined before the empirical antibiotic change was resistant to amoxicillin-clavulanate and susceptible to cefepime, cefotaxime, ceftazidime, ceftriaxone, ciprofloxacin, levofloxacin, imipenem, meropenem and piperacillin-tazobactam. Following an antibiotic susceptibility test performed to EURCAST 2023 standards, the patient was started on a 14-day program of combined empirical antibiotics and then discharged.

DISCUSSION

H. alvei, known more formerly as *Enterobacter hafniae* or "*paracolon*" bacterium, is a member of the Enterobacteriaceae family and is a facultative anaerobic gram-negative bacillus. It is rarely considered pathogenic in immunocompetent patients, and it is generally referred to as oropharyngeal and enteric commensal (6). *H. alvei* can thrive in several different environments, such as fish farms, rivers, polluted waters and sewage (7,8). The bacterium can also be found in the digestive tracts of many animals (9). Some *H. alvei* strains have developed as opportunistic pathogens in several animal species, including fish, birds, mammals and insects (10), and have been linked to several diseases in humans (4,7).

H. alvei was considered enteropathogenic in 1991, but has since come to be known to cause wound infections, septicemia, meningitis, urinary tract infections and pneumonia (5). The most frequently reported *H. alvei* infections are those of the urinary tract, followed by intra-abdominal, bloodstream, respiratory tract, and bone or soft tissue infections (4). Most reported cases are hospital-acquired although the origin of the infections has not

been well established (2). *H. alvei* is rarely identified in community-acquired pneumonia in immunocompetent adults (11).

H. alvei can cause serious infections in adults, especially those hospitalized with chronic diseases, subjected to invasive procedures or under antibiotic therapy (12,13). The presented case had COPD and lung cancer, and was treated with broad-spectrum antibiotics upon hospitalization.

Klapholz et al. (6) reported seven cases with H.alvei-positive sputum cultures in a hospital over a 3-year period, all of whom had comorbidities, but only one had a pure growth of *H alvei* confirmed by a culture obtained from a bronchoscopic protected brush specimen. All of the *H. alvei* isolates identified in were resistant to conventional antibiotics, including penicillin and cephalosporins (6). Our patient resembled these reported cases in many aspects, including his serious comorbidity and the *H alvei* isolated from his sputum culture.

H. alvei is resistant to penicillin, amoxicillin/clavulanate and macrolides (6), and as a result of this resistance to so many first-line antibiotics, *H. alvei* pneumonia is generally treated with carbapenems or cephalosporins. In the case reported by Lim et al. (11), *H. alvei* was resistant to amoxicillin/clavulanate, and sensitive to ceftriaxone, cefotaxime, piperacillin/tazobactam, levofloxacin, ciprofloxacin, gentamicin, meropenem and imipenem, leading them to treat their patient with empiric amoxicillin/clavulanate and clarithromycin. Our case had similar antibiogram findings from the sputum culture. ERS/ESICM/ESCMID/ALAT HAP and VAP guideline, in patients without XDR and PDR, it is recommended to treat with a single drug according to antibiotic susceptibility (14). The long-term hospitalization of our patient, the previous broad-spectrum antibiotic therapy and the presence of a cavity supported the decision to start the patient on combined antibiotic therapy.

H. alvei is rare in cases of hospital-acquired pneumonia, and its sensitivity to empirical broad-spectrum antibiotics, as the generally preferred treatment. This sensitivity leads to its good prognosis. A culture examination revealed our patient to be sensitive to such a treatment, leading us to opt for a 14-day combined empirical antibiotic approach, and the patient was duly discharged.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - S.D., Ö.B.; Planning and Design - S.D., Ö.B.; Supervision - S.D., Ö.B.; Funding - S.D., Ö.B.; Materials - S.D.; Data Collection and/or Processing -; Analysis and/or Interpretation -; Literature Review - S.D.; Writing - S.D.; Critical Review - S.D.

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