

## *Arcanobacterium haemolyticum* – case report

### *Arcanobacterium haemolyticum* – studium przypadku

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#### KEYWORDS:

*Arcanobacterium haemolyticum*,  
peritonsillar abscess, patchy rash

#### SUMMARY

*Arcanobacterium haemolyticum* is a gram-positive, facultatively anaerobic, non-spore-forming, non-motile, catalase-negative bacteria. It is a rare cause of pharyngitis infections in teenagers and young adults. Although complications such as peritonsillar abscess, Lemierre's syndrome, septicemia, orbital necrotizing fasciitis, or osteomyelitis are infrequently reported in the literature in the pediatric population, they might have far-reaching consequences.

We present a case of a patient who presented to the emergency department with symptoms of sore throat, fever, difficulty swallowing, and a patchy rash on the arms, legs, and back. A peritonsillar abscess was diagnosed and drained. After admission to the hospital, the patient received treatment with intravenous antibiotics, and *Arcanobacterium haemolyticum* infection was confirmed. However, the patient experienced recurrent symptoms, leading to a suspicion of immunodeficiency. A tonsillectomy was performed, and the patient was prescribed allergy testing.

#### SŁOWA KLUCZOWE:

*Arcanobacterium haemolyticum*, ropień  
okołomigdałkowy, plamista wysypka

#### STRESZCZENIE

*Arcanobacterium haemolyticum* jest Gram-dodatnią, fakultatywnie beztlenową, nietworzącą przetrwalników, nieruchliwą bakterią katalazo-ujemną. Jest ona rzadką przyczyną zapalenia gardła u nastolatków i młodych dorosłych. Chociaż powikłania po infekcji, takie jak: ropień okołomigdałkowy, zespół Lemierre'a, posocznica, martwicze zapalenie powięzi oczodołu czy zapalenie kości i szpiku, są rzadko opisywane w literaturze, mogą mieć poważne konsekwencje.

Przedstawiamy przypadek pacjenta, który zgłosił się na oddział ratunkowy z powodu bólu gardła, gorączki, trudności w połykaniu oraz plamistej wysypki zlokalizowanej na ramionach, nogach i plecach. Zdiagnozowano i zdrenowano ropień okołomigdałkowy. Po przyjęciu do szpitala wdrożono antybiotykoterapię dożylną. Wynik posiewu potwierdził infekcję *Arcanobacterium haemolyticum*. Po zakończonym leczeniu u pacjenta wystąpił nawrót objawów, co nasuwało podejrzenie niedoboru odporności. Wykonano wycięcie migdałków, przepisano pacjentowi antybiotyki i wykonano testy alergiczne.

#### INTRODUCTION

*Arcanobacterium haemolyticum* (formerly *Corynebacteria haemolyticum*) is a gram-positive, facultatively anaerobic, non-spore-forming, non-motile, catalase-negative bacteria (1). It is a rare cause of pharyngitis infections in teenagers and young adults. Although complications such

as peritonsillar abscess (2), Lemierre's syndrome, septicemia (3), orbital necrotizing fasciitis, or osteomyelitis (4) are infrequently reported in the literature in the pediatric population, they might have far-reaching consequences. Herby, we present a case of recurrent pharyngitis complicated by peritonsillar abscesses.

### CASE REPORT

A 16-year-old male patient presented to the emergency department with trismus, sore throat, fever of 39.5°, and elevated CRP (187.6 mg/l). The symptoms (fever, sore throat, and swallowing difficulties) started a month before. The patient reported that his pediatrician initially treated him with cefuroxime and the improvement was observed.

However, the symptoms returned four days later, after completing the antibiotic therapy. Treatment with amoxicillin and clavulanic acid was initiated, and clindamycin was added after six days due to no improvement. After two days of the modified therapy, the patient experienced abdominal pain, vomiting, and a patchy rash without itching located on the arms, legs, and back (fig. 1a-c). The decision was made to discontinue the antibiotic therapy.



Fig. 1a-c. A. Patchy rash located on the legs. B. Patchy rash located on the right leg. C. Patchy rash located on the right hand

During the physical examination at the Emergency Department, a peritonsillar abscess on the left side was diagnosed and drained with a purulent discharge. Specimens for culture were obtained and the patient was admitted to the hospital. An empiric intravenous antibiotic therapy was initiated with metronidazole, cefuroxime, and fluconazole. On admission, CRP was elevated (16.8 mg/dl), and WBC was 18.39 (norm 4.0-10.0) [ $10^3/\mu\text{L}$ ]. After nephrological and allergology consultations, IgA-related vasculitis was ruled out. The culture was positive for *Arcanobacterium haemolyticum* which was sensitive to benzylpenicillin and resistant to ciprofloxacin, moxifloxacin, and clindamycin. Crystalline penicillin was administered for 14 days, and the improvement of the patient's condition was observed. The patient was discharged from the hospital and a four-day treatment with phenoxypenicillin was prescribed.

Three weeks later, the patient presented with a recurrence of symptoms, including a sore throat, fever, enlargement of the left cervical and bilateral submandibular lymph nodes, and trismus with an enlarged left tonsil. The laboratory examination revealed an elevated WBC to 13 ( $10^3/\mu\text{L}$ ) with a neutrophilic smear and a 15 mg/dL CRP level. The strep test was negative. A suspicion of a recurrent left peri-tonsillar abscess was made. An ultrasound examination showed an enlarged left tonsil (34 x 36 x 46 mm) with congestion and a hypoechoic heterogeneous fluid space (29 x 22 x 32 mm). A puncture of the peritonsillar area was performed, with no purulent discharge observed. Intravenous treatment with benzylpenicillin was initiated. After two days, the abscess was drained, and piperacillin with tazobactam was added. An improvement in the patient's condition was noticed. Benzylpenicillin was discontinued after five days.

The culture revealed the presence of *Arcanobacterium haemolyticum*, among other oral flora. The antibiotic therapy was continued according to the antibiogram, with the addition of amoxicillin with clavulanic acid. The treatment with piperacillin with tazobactam was continued for up to 10 days, with an observed improvement, while amoxicillin with clavulanic acid was continued for up to 7 days. On the 10<sup>th</sup> day of the antibiotic therapy with piperacillin and tazobactam and the 4<sup>th</sup> day of the amoxicillin and clavulanic acid treatment, the patient exhibited signs of recurrent infection, including tonsillar enlargement, sore throat with redness, lymphadenopathy, and swallowing difficulty. Laboratory tests revealed leukocytosis with increased inflammatory parameters. PCR identified adenovirus infection. Symptoms resolved after four days. Given the recurrent and severe nature of the infection, immunodeficiency was suspected. Immunoglobulin, BNK T-lymphocyte subpopulation, IgG subclass, and neutrophil oxidative burst assay were ordered. All results were within the normal limits. The patient was qualified for tonsillectomy and phenoxy penicillin was prescribed before the surgery. For days after, the tonsillectomy was performed without complications. Subsequently, the

patient was prescribed amoxicillin with clavulanic acid for a 4-day course. The exams revealed that immunoglobulin A, G, and M levels were within the normal limits, while IgE levels were elevated. Molecular test Alex showed sensitization to inhalant allergens. Given the possibility of a correlation with the antibiotics the patient was taking, allergy testing was ordered. With the overall clinical picture and laboratory test results, a correlation between the skin lesions and clindamycin intake was still possible. However, an infection was the most likely cause.

## DISCUSSION

*Arcanobacterium haemolyticum* was first described and isolated in 1946 by MacLean from American soldiers and natives in the Pacific Islands during nasopharyngeal and skin infections (5). It is a gram-positive facultatively anaerobic, non-spore-forming, non-motile, and catalase-negative bacteria (6). Growth is sparse on ordinary media but is enhanced by blood or serum (2). Although *A. haemolyticum* is usually not part of the normal oral flora, some studies have described the bacterium as a commensal of the nasopharynx and skin. However, the bacterium can be isolated from healthy and asymptomatic patients (6-8). *Arcanobacterium haemolyticum* is responsible for 0.5% to 2.5% of bacterial pharyngitis cases, especially among pediatric and adolescent patients (9). According to Mackenzie et al. study, the highest incidence of *A. haemolyticum*-related pharyngitis was observed in the pediatric and adolescent population, with the maximum incidence (2.5%) in the 15-18-year-old age group (10). In the elderly population, *A. haemolyticum* is more often associated with soft tissue infection in immunocompromised individuals or those with diabetic mellitus (11). Tan et al. reported that 94% were cultured from patients with soft-tissue infections, and 72% of all patients had concomitant diabetes mellitus (12). It seems that the transmission of the bacterium is through droplet exposure. *A. haemolyticum* occurs often in polymicrobial infections with pathogens such as streptococci group A or B (5).

*Arcanobacterium haemolyticum* infection is mostly associated with throat pain (13), followed by cervical lymphadenopathy, tonsillar exudates (14), and rash (6). Pharyngitis often precedes the rash by 1-4 days (16). The characteristics of this rash vary between erythematous, urticarial, macular, maculopapular, or scarlatiniform (1, 11). Frequently described as "goosebumps" or "sandpaper-like". The rash first appears on the distal extremities and then spreads over 2-3 days covering the neck, chest, and back, sparing the soles, palms, and face (11). The cause of the rash in *A. haemolyticum* infections is not understood. Rarely are complications reported in clinical case series or case reports in the pediatric young adult population, such as peritonsillar abscess (2), Lemierre's syndrome, septicemia (3), orbital necrotizing fasciitis, and osteomyelitis (4).

*Arcanobacterium haemolyticum* is a  $\beta$ -hemolytic pathogen that can have poor hemolytic activity in sheep blood

agar and requires the use of human or rabbit blood agar media in 5% CO<sub>2</sub> (1). However, it has been shown, that trypticase soy agar with 5% horse blood in 5% CO<sub>2</sub> is the most optimal media (17). Most clinical laboratories use sheep blood agar, where *A. haemolyticum* colonies average 0.1 mm in diameter at 24 h with hardly noticeable hemolysis and only 0.5 mm at 48 h with a narrow rim of hemolysis (18). Consequently, plates are often discarded and colonies may be easily missed (4). The reverse CAMP test and rapid alpha-mannosidase test can also aid in diagnosis, both of which are positive for this bacterium. These tests combined with the Gram stain and catalase test are highly beneficial for the rapid identification of *A. haemolyticum* (19). Moreover, with the appropriate laboratory equipment matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS) allows for the swift and effective identification of bacteria at the species level in less than 10 minutes (20). There are 2 types of colonies: the rough-type, which is more frequently associated with respiratory system infections, and the smooth-type which is linked to infections of the skin and soft tissues (21).

Treatment of *A. haemolyticum* infections should be considered on a case-by-case basis based on the clinical condition, site of infection, and microbiological tests, including the antimicrobial susceptibility profile of individual strains (22). According to in vitro studies, *A. haemolyticum* is particularly sensitive to penicillin, as well as to macrolides, cephalosporins, clindamycin, ciprofloxacin, and vancomycin but resistant to trimethoprim-sulfamethoxazole (18). According to Sayad's review article, penicillin was the most common antibiotic of choice in monotherapy, proving effective in most cases. The second most common and effective drug of choice was erythromycin (9). However, many clinical

and microbiological failures have been reported after penicillin therapy (6, 16) despite full sensitivity to penicillin in in vitro tests (23). There are fewer failures after erythromycin treatment than after penicillin treatment possibly due to intracellular invasion of *A. haemolyticum* (24).

In most cases, treatment for 7-10 days was sufficient (6). Sayad et al. proposed an algorithm for the management of pharyngitis in children and young adults if symptoms suggest Group A *Streptococcus pyogenes* (GAS) or *A. haemolyticum* infection and the rapid GAS test is negative, empirical treatment with amoxicillin should be initiated. If the culture confirms *A. haemolyticum* infection, consider narrowing the treatment to oral penicillin or erythromycin (if penicillin allergy is present), to complete a 10-day course (9).

## CONCLUSIONS

We have presented a case of a patient with recurrent pharyngitis complicated by peritonsillar abscesses, which illustrates the variety of symptoms caused by *A. haemolyticum* infection. An antibiogram should be used to guide antibiotic therapy. Penicillins are typically the first-line treatment, but they may not always be effective even if *A. haemolyticum* shows sensitivity in vitro. In such cases, treatment with macrolides should be considered. When diagnosing *A. haemolyticum* infection, it's important to consider if the sheep blood agar culture and the Group A *Streptococcus pyogenes* rapid test results are negative. In cases of recurrent infections of this nature, culture on suitable media for the diagnosis of *A. haemolyticum* should be considered. Deciding to stop antibiotic therapy based on a negative result from a rapid GAS test or culture for patients infected with *A. haemolyticum* would mean leaving them without appropriate treatment.

## CONFLICT OF INTEREST KONFLIKT INTERESÓW

None  
Brak konfliktu interesów

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## REFERENCES/PIŚMIENNICTWO

1. Collins MD, Jones D, Schofield GM: Reclassification of 'Corynebacterium haemolyticum' (MacLean, Liebow & Rosenberg) in the genus *Arcanobacterium* gen.nov. as *Arcanobacterium haemolyticum* nom.rev., comb.nov. J Gen Microbiol 1982; 128(6): 1279-1281.
2. Miller RA, Brancato F: Peritonsillar abscess associated with *Corynebacterium haemolyticum*. West J Med 1984; 140: 449-451.
3. Fernandez-Suarez A, Aguilar Benitez JM, Lopez Vidal AM, Diaz Iglesias JM: Lemierre's syndrome and septicaemia caused solely by *Arcanobacterium haemolyticum* in a young immunocompetent patient. J Med Microbiol 2009; 58: 1645-1648.
4. Stone LA, Harshbarger RJ 3<sup>rd</sup>: Orbital necrotizing fasciitis and osteomyelitis caused by *Arcanobacterium haemolyticum*: a case report. Ophthalmic Plast Reconstr Surg 2015; 31(2): e31-33.
5. Maclean PD, Liebow AA, Rosenberg AA: A hemolytic corynebacterium resembling *Corynebacterium ovis* and *Corynebacterium pyogenes* in man. J Infect Dis 1946; 79(1): 69-90.
6. Banck G, Nyman M: Tonsillitis and rash associated with *Corynebacterium haemolyticum*. J Infect Dis 1986; 154: 1037-1040.
7. Locksley RM: The lowly diphtheroid: non-diphtheria corynebacterial infections in humans: Medical Staff Conference. West J Med 1982; 137: 45-52.

8. Fell HWK, Nagington J, Naylor GRE, Old RJ: Infections of man with *Corynebacterium haemolyticum* [Abstract]. J Med Microbiol 1973; 6: Pvii.
9. Linder R: *Rhodococcus equi* and *Arcanobacterium haemolyticum*: two “coryneform” bacteria increasingly recognized as agents of human infection. Emerg Infect Dis 1997; 3(2): 145-153.
10. Mackenzie A, Fuite LA, Chan FT et al.: Incidence and pathogenicity of *Arcanobacterium haemolyticum* during a 2-year study in Ottawa. Clin Infect Dis 1995; 21(1): 177-181.
11. Therriault BL, Daniels LM, Carter YL, Raasch RH: Severe sepsis caused by *Arcanobacterium haemolyticum*: a case report and review of the literature. Ann Pharmacother 2008; 42(11): 1697-1702.
12. Tan TY, Ng SY, Thomas H, Chan BK: *Arcanobacterium haemolyticum* bacteraemia and soft-tissue infections: case report and review of the literature. J Infect 2006; 53(2): e69-74.
13. Cambier M, Janssens M, Wauters G: Isolation of *Arcanobacterium haemolyticum* from patients with pharyngitis in Belgium. Acta Clin Belg 1992; 47: 303-307.
14. Sayad E, Zeid CA, Hajjar RE et al.: The burden of *Arcanobacterium haemolyticum* pharyngitis: A systematic review and management algorithm. Int J Pediatr Otorhinolaryngol 2021; 146: 110759.
15. Miller RA, Brancato F, Holmes KK: *Corynebacterium haemolyticum* as a cause of pharyngitis and scarlatiniform rash in young adults. Ann Intern Med 1986; 105(6): 867-872.
16. Miller RA, Brancato F, Holmes KK: *Corynebacterium haemolyticum* as a cause of pharyngitis and scarlatiniform rash in young adults. Ann Intern Med 1986; 105(6): 867-872.
17. García-de-la-Fuente C, Campo-Esquisabel AB, Unda F et al.: Comparison of different culture media and growth conditions for recognition of *Arcanobacterium haemolyticum*. Diagn Microbiol Infect Dis 2008; 61(2): 232-234.
18. Cummings LA, Wu W, Larson AM et al.: Effects of media, atmosphere, and incubation time on colonial morphology of *Arcanobacterium haemolyticum*. J Clin Microbiol 1993; 31: 3223-3226.
19. Carlson P, Kontiainen S: Alpha-mannosidase: a rapid test for identification of *Arcanobacterium haemolyticum*. J Clin Microbiol 1994; 32(3): 854-855.
20. Vila J, Juiz P, Salas C et al.: Identification of clinically relevant *Corynebacterium* spp., *Arcanobacterium haemolyticum*, and *Rhodococcus equi* by matrix-assisted laser desorption ionization-time of flight mass spectrometry. J Clin Microbiol 2012; 50(5): 1745-1747.
21. Carlson P, Lounatmaa K, Kontiainen S: Biotypes of *Arcanobacterium haemolyticum*. J Clin Microbiol 1994; 32(7): 1654-1657.
22. Carlson P, Korpela J, Walder M, Nyman M: Antimicrobial susceptibilities and biotypes of *Arcanobacterium haemolyticum* blood isolates. Eur J Clin Microbiol Infect Dis 1999; 18(12): 915-917.
23. Carlson P, Kontiainen S, Renkonen OV: Antimicrobial susceptibility of *Arcanobacterium haemolyticum*. Antimicrob Agents Chemother 1994; 38(1): 142-143.
24. Osterlund A: Are penicillin treatment failures in *Arcanobacterium haemolyticum* pharyngotonsillitis caused by intracellularly residing bacteria? Scand J Infect Dis 1995; 27(2): 131-134.

submitted/nadesłano:

5.02.2024

accepted/zaakceptowano do druku:

26.02.2024