

# Chryseobacterium Meningosepticum Meningitis in A Neurosurgical Patient

## Bir Nöroşirürji Hastasında Kriseobakterium Meningoseptikum Menenjit

### ABSTRACT

*Chryseobacterium meningosepticum* is a gram-negative bacillus that is known to cause meningitis in premature neonates, and a variety of infections in immunocompromised adults. Reports have also identified this agent as a cause of postoperative meningitis in immunocompetent adults. We present the case of a patient with head injury and cerebrospinal rhinorrhea who developed *C. meningosepticum* meningitis after external ventricular drain placement. It is important that clinicians consider *C. meningosepticum* as a cause of meningitis in any case that includes blood-brain barrier disturbance and a history of prolonged antibiotic therapy. Keeping a high index of suspicion is the key to rapid diagnosis and prompt treatment of this potentially fatal infection.

**KEY WORDS:** *Chryseobacterium meningosepticum*, meningitis, external ventricular drainage, trauma

### ÖZ

*Chryseobacterium meningosepticum* özellikle prematür yenidoğanlarda menenjitte ve bağışıklık sistemi bozuk olan erişkinlerde çeşitli enfeksiyonlara yol açan gram-negatif bir basildir. Bağışıklık sistemi normal olan erişkinlerde ameliyat-sonrası menenjitte yol açtığı da bildirilmiştir. Kafa travması ve rinoresi olan bir hastada eksternal ventriküler drenaj uygulaması sonrası gelişen bir *Chryseobacterium meningosepticum* menenjit olgusu sunmaktayız. Klinisyenlerin, kan-beyin bariyeri bozulan ve uzun süreli antibiyotik kullanım öyküsü olan menenjit olgularında etken olarak *C. meningosepticum*'u düşünmeleri önemlidir. Etkenden şüphelenilmesi potansiyel olarak öldürücü olan bu enfeksiyonun tanı ve tedavisinde kritik önem taşımaktadır.

**ANAHTAR SÖZCÜKLER:** *Chryseobacterium meningosepticum*, menenjit, eksternal ventriküler drenaj, travma

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## INTRODUCTION

*Chryseobacterium meningosepticum*, formerly known as *Flavobacterium meningosepticum*, was first described as a human pathogen by King in 1959 (1), and has been identified as the cause of many infections in newborn and infants. However, very few reports have pinpointed this bacterium as the causative organism in adult infections, and most such cases have been associated with altered immune status (2). The literature describes three cases of adult meningitis due to post-surgical infection with *C. meningosepticum*, and only one of these was a neurosurgical patient (3, 4, 5).

## CASE REPORT

A 55-year-old man who had suffered a fall and brief loss of consciousness had presented with watery discharge from his nose at another hospital. A computerized tomography (CT) scan had revealed a left frontal cerebral contusion, an anterior skull-base fracture involving the ethmoidal sinuses, and pneumocephalus. No antibiotics were given and, on the 4th day of his admission, he developed fever and neck stiffness. He was then transferred to our hospital. A lumbar puncture was performed, and cerebrospinal fluid (CSF) analysis revealed pleocytosis, a white blood cell count of 1200/mm<sup>3</sup> (40% polymorphonuclear leukocytes), a protein level of 465 mg/100 ml and a glucose level of 9 mg/100 ml. Gram staining of the CSF was negative. Ceftriaxone 1 gm i.v. every 12 h and Amikacin 500 mg i.v. every 12 h was started empirically. The CSF culture grew *Klebsiella pneumoniae*. Testing showed that this microorganism was sensitive to imipenem, and a 5-day course of treatment (500 mg i.v. every 6 h) was initiated. The patient was referred to the infectious diseases clinic when the fever persisted after 5 days of systemic antibiotics. A second CSF culture grew the same microorganism, but this round of testing showed sensitivity to vancomycin and sulbactam+cefoperazone. Imipenem was discontinued, and sulbactam+cefoperazone (2 g i.v. every 12 h) was administered for 2 weeks.

On the 17th day of hospitalization, a neurosurgical consultation was requested. The findings on the neurological examination were unremarkable apart from neck stiffness. Magnetic resonance imaging on the same day revealed an

abscess which measured 4cmx3.5cmx2.5cm in the left frontal lobe. The patient's neurological status worsened over the next 6 days and investigation with cranial CT showed slight enlargement of the abscess with increased periaabscess edema and resultant midline shift. Surgery was performed on the 23rd day of hospitalization during which the abscess was totally removed via a left frontal craniotomy and a dural tear was repaired. The patient was admitted to the intensive care unit following the surgery. A culture of the abscess contents grew *K. pneumoniae*, and testing showed sensitivity to meropenem. Treatment with this drug (2 g i.v. every 8 h) was initiated immediately.

The patient's neurological examination was normal; however, a control CT at 2 days after surgery revealed ventricular dilatation. A communicating hydrocephalus was suspected and an external ventricular drain was inserted through a right frontal burr hole. The opening pressure of the CSF was 27 cm H<sub>2</sub>O. CSF samples were collected daily for biochemical and microbiological testing. Seven days after the ventriculostomy, the CSF was sterile and the patient remained stable with normal level of consciousness, but his temperature rose to 40 °C on the 9th day. The patient was still on meropenem at this point and was scheduled for another week of this therapy. That day's CSF analysis revealed a white blood cell count of 1720/mm<sup>3</sup> (80% polymorphonuclear leukocytes), a protein level of 495 mg/100 ml, and a glucose level of 3 mg/100 ml. Two days later, on the 41st day of hospitalization, the microbiology laboratory reported that the organism isolated from this sample was a *Chryseobacterium species*. The diagnosis was based on the API 20 NE test which is a rapid diagnostic test used for the identification of bacteria. The organism produced 2mm-wide, hemolytic, yellowish-white colonies on blood and EMB media. Gram staining showed long and tiny Gram negative bacilli. The microorganism was oxidase-positive. Blood cultures inoculated the same day the CSF sample was collected grew the same organism. Testing showed sensitivity to ofloxacin and sulbactam+cefoperazone. The catheter was removed, and a culture of material from its tip also grew *C. meningosepticum*. A left frontal ventriculostomy was performed, a new catheter was inserted to control hydrocephalus, and the patient was started on a 10-day course of a two-drug regimen of ofloxacin (200 mg i.v. every 12 h) and

sulbactam+cefoperazone (2 g i.v. every 12 h). Despite all attempts at treatment, the patient's condition continued to deteriorate. He died on the 47th day of hospitalization, 11 days after the most recent antibiotic protocol had been initiated.

## DISCUSSION

As mentioned, King (1) was the first researcher to identify *C. meningosepticum* as a human pathogen. This organism is a non-motile, oxidase-positive, gram-negative bacillus found in soil and water (7). It rarely causes infection in adults, and in such cases it usually accompanies a disease that alters immune status (2). Most meningitis cases linked to this organism have been in neonates and premature infants, and the associated rates of mortality and morbidity are high (8). Prior to our case with skull-base trauma, three adult cases of *C. meningosepticum* meningitis after skull-base surgery had been reported (3, 4, 5).

All three of these previous cases had undergone surgery on the skull base, and two of them involved subsequent CSF leakage. One of the patients had undergone craniofacial surgery for treatment of squamous cell carcinoma of the left preauricular area, and another was operated on for squamous cell carcinoma of the paranasal sinuses (3, 4). The third case was a neurosurgical patient who developed meningitis after transsphenoidal hypophysectomy (5). Both individuals with squamous cell carcinoma received local radiotherapy after surgery. The CSF leak originated at the operative site in the patient with carcinoma of the paranasal sinuses and the hypophysectomy patient (4, 5). No postoperative CSF leakage was observed in the patient that underwent surgery on the preauricular region but the authors did describe reconstructing the skull base (3). This may have helped the organism penetrate the meninges and cause infection as late as nine months after the operation.

In our case, blunt head injury and anterior skull base fracture causing cerebrospinal rhinorrhea were the initial problems. *K. pneumoniae* was the first agent isolated after meningitis developed. *C. meningosepticum* was identified only after the external ventricular drainage (EVD) catheter was inserted; however, this does not eliminate the possibility that the agent may have penetrated the meninges through the ethmoidal sinuses after the

first insult or during hospitalization. Neither of these routes can be ruled out. *C. meningosepticum* is not found in healthy adults, but occurs naturally in soil, water, plants, foodstuffs, and in water systems and on wet surfaces in the hospital environment (8). Other identified risk factors for the development of infection after EVD catheter placement are head injury, elevated intracranial pressure, and ventriculostomy performed in the intensive care unit (9). It appears that all these may have played a role in our patient's infection.

The three previously reported cases were successfully treated with antibiotic therapy (3, 4, 5). The individual who underwent craniofacial exenteration for squamous carcinoma of the left preauricular area responded to ampicillin and gentamycin. The patient who underwent the same type of surgery for carcinoma of the paranasal sinuses was treated with amikacin and erythromycin. The patient who developed cerebrospinal rhinorrhea after transsphenoidal hypophysectomy received combination therapy including rifampicin, cefoperazone, and chloramphenicol. We believe that the fatal outcome in our case may have been due to ventriculitis as well as meningitis. The ventriculostomy catheter might have facilitated colonization of bacteria and thus complicated therapy. This is a possibility although we monitored the CSF closely, and removed the first EVD catheter to replace it with a new one in a different location immediately after *C. meningosepticum* was detected.

Research indicates that *C. meningosepticum* is resistant to many antibiotics. This organism exhibits intrinsic resistance to multiple antibiotics, and has been reported to acquire resistance during treatment (2). The literature describes significant differences in antimicrobial sensitivity patterns, and there is no consensus on empirical therapy for this agent. However, Chang et al reported effective antimicrobial activity against *C. meningosepticum* with piperacillin, ceftazidime, or ciprofloxacin (10). Kirby et al, in their recently published article, describe the newer quinolones garenoxacin, gatifloxacin and levofloxacin as effective with an MIC 90 value of 1 microg/ml and 98% susceptibility. They found rifampin to be effective, with a MIC 90 value of 2 micro g/ml with 87.5 % susceptibility. Vancomycin showed poor potency (6). Nevertheless,

repeat sensitivity testing should be performed to assess acquired resistance during treatment for *C. meningosepticum* infection, and CSF drug levels should be closely monitored to achieve the appropriate dosage (2). In our case, the disk diffusion method revealed that the organism was sensitive only to ofloxacin and sulbactam+cefoperazone. Although, this technique complies with the NCCSL standarts, it is considered unreliable and measurement of minimal inhibitory concentration (MIC) is recommended (10, 11). We did not monitor for acquired resistance, which may have contributed to therapy failure in our patient.

*C. meningosepticum* is an unusual pathogen and should be considered in any patient with meningitis and/or ventriculitis, especially in immunocompromised individuals. In particular, one should suspect this organism when meningitis develops in a neurosurgical patient, in any case of cranial sinus surgery or trauma with associated rhinorrhea, and in any individual with an EVD catheter. Meningeal infections that are resistant to antibiotic therapy, particularly those that involve a break in the meningeal barrier, should alert the clinician to *C. meningosepticum* as a possible cause. If this type of infection is not rapidly diagnosed and appropriately treated, the outcome can be fatal.

#### REFERENCES

1. Bagley DH Jr, Alexander JC Jr, Gill VJ, Dolin R, Ketcham AS: Late *Flavobacterium* species meningitis after craniofacial exenteration. *Arch Intern Med* 136; 229-231, 1976
2. Bloch KC, Nadarajah R, Jacobs R: *Chryseobacterium meningosepticum*: an emerging pathogen among immunocompromised adults. Report of 6 cases and literature review. *Medicine (Baltimore)* 76; 30-41, 1997
3. Chan KH, Chau PY, Wang RYC, Huang CY: Meningitis caused by *Flavobacterium meningosepticum* after transsphenoidal hypophysectomy with recovery. *Surg Neurol* 20; 294-296, 1983
4. Chang JC, Hsueh PR, Wu JJ, Ho SW, Hsieh WC, Luh KT: Antimicrobial susceptibility of *Flavobacteria* as determined by agar dilution and disk diffusion methods. *Antimicrob Agents Chemother* 41; 1301-1306, 1997
5. Fraser SL, Jorgensen JH: Reappraisal of the antimicrobial susceptibilities of *Chryseobacterium* and *Flavobacterium* species and methods for reliable susceptibility testing. *Antimicrob Agents Chemother* 41; 2738- 2741, 1997
6. Gruber WC: Miscellaneous bacterial infections. *Flavobacterium*. In: Feigin RD, Cherry JD, editors. *Textbook of Pediatric Infectious Diseases*. Philadelphia: W.B. Saunders 1987: 1392-1395
7. Harrington SP, Perlino CA: *Flavobacterium meningosepticum* sepsis: disease due to bacteria with unusual antibiotic susceptibility. *South Med J* 74; 764-766, 1981
8. King EO: Studies on a group of previously unclassified bacteria associated with meningitis in infants. *Am J Clin Pathol* 31; 241-247, 1959
9. Kirby JJ, Sader HS, Walsh TR, Jones RN: Antimicrobial susceptibility and epidemiology of worldwide collection of *chryseobacterium* spp: report from the SENTRY Antimicrobial Surveillance Program. (1997-2001) *J Clin Microbiol* 42 (1): 445-448, 2004
10. Koneman EW, Allen SD, Janda WM, Schreckenberger PC, Winn WC Jr: *Color Atlas and Textbook of Diagnostic Microbiology*. Philadelphia, New York: Lippincott Raven Publishers 1997: 280-283
11. Mayhall GC, Archer NH, Lamb VA, Spadora AC, Baggett JW, Ward JD, Narayan RK: Ventriculostomy-related infections: a prospective epidemiologic study. *N Engl J Med* 310; 553-559, 1984