

An unusual case of meningitis

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Pasteurella multocida is a rare cause of bacterial meningitis. A 56-year-old man with several pets developed a profoundly decreased level of consciousness following left tympanomastoidectomy. Lumbar puncture produced cerebrospinal fluid with the typical findings of meningitis (low glucose, high protein, high leukocytes). Cultures from the cerebrospinal fluid and a swab of the left ear revealed Gram-negative coccobacillus identified as *P multocida*. The organism was sensitive to ceftriaxone, ampicillin and penicillin, and a 14-day course of intravenous penicillin was used as definitive treatment, resulting in full recovery. Although rare, *P multocida* should be considered as a potential cause of meningitis in patients with animal exposure, particularly in the setting of recent cranial surgery.

Key Words: *Pasteurella multocida*; Meningitis; Tympanomastoidectomy; Zoonosis

Pasteurella multocida is a Gram-negative coccobacillus. It is a small, encapsulated, nonmotile facultative anaerobe, commonly found as part of the commensal oral flora in animals. Carriage rates among domestic animals, such as cats and dogs, have been shown to be as high as 70% to 90% and 55%, respectively (1,2), and it is also carried by a variety of other domestic and wild animals (3). It is, therefore, an important zoonotic organism. *P multocida* has been reported to cause a variety of infections in humans including cellulitis, subcutaneous abscesses, septic arthritis, osteomyelitis, bacteremia, endocarditis, meningitis, and various oral and respiratory tract infections; however, skin manifestations are by far the most common (3).

The present article describes a rare case of *P multocida* meningitis in a patient following tympanomastoidectomy.

CASE PRESENTATION

A 56-year-old man developed chronic otorrhea related to left tympanic membrane perforation. He was admitted for an elective left tympanomastoidectomy and removal of the incus and malleus with tympanoplasty. His medical history included hypertension, dyslipidemia, gout, polycystic kidney disease and gastroesophageal reflux disease. His surgical history was significant for previous left tympanoplasty and inguinal hernia repair. His medications at the time of admission were rosuvastatin, domperidone, esomeprazole, allopurinol, irbesartan/hydrochlorothiazide and labetalol.

On the first day postoperatively the patient experienced a sudden drop in his level of consciousness accompanied by marked agitation, and required intubation. His Glasgow Coma Scale score was 9 (eyes 3, verbal 3, motor 3). There were no focal neurological signs, his pupils were symmetrical but sluggish to react and the fundi appeared normal. His blood glucose level was 9.0 mmol/L. He was subsequently transferred to the intensive care unit. A computed tomography scan

Un cas inhabituel de méningite

Le *Pasteurella multocida* est une rare cause de méningite bactérienne. Un homme de 56 ans propriétaire de plusieurs animaux a présenté une importante diminution de son niveau de conscience après une tympanomastoidectomie gauche. Le liquide céphalorachidien prélevé par ponction lombaire présentait les caractéristiques classiques de la méningite (glycémie basse, protéine élevée, leucocytes élevés). Les cultures du liquide céphalorachidien et un écouvillon de l'oreille gauche ont révélé un coccobacille à Gram négatif, le *P multocida*. L'organisme était sensible à la ceftriaxone, à l'ampicilline et à la pénicilline. Un traitement de pénicilline administré par voie intraveineuse pendant 14 jours a favorisé un rétablissement complet. Même si c'est rare, le *P multocida* doit être envisagé comme cause de méningite chez des patients exposés à des animaux, particulièrement après avoir subi une opération crânienne.

of the patient's head showed no structural abnormalities, no masses and no hematoma. Lumbar puncture was performed and revealed cloudy cerebrospinal fluid (CSF) with an elevated protein level (5.78 g/L), low glucose level (<1.0 mmol/L) and a leukocyte count of $11,974 \times 10^6/L$, with 95% neutrophils. Based on these findings, the patient was treated empirically for bacterial meningitis with intravenous (IV) vancomycin, ceftriaxone and dexamethasone pending culture results and sensitivities. Further blood work revealed a blood leukocyte count of $13.8 \times 10^9/L$, hemoglobin level of 123 g/L and platelet count of $154 \times 10^9/L$. His serum sodium level was 146 mmol/L, potassium level 3.6 mmol/L, chloride level 106 mmol/L, urea level 12.6 mmol/L and creatinine level 190 $\mu\text{mol/L}$.

Initial Gram stain of the CSF using the cytospin technique revealed abundant polymorphonuclear leukocytes and no organisms. Preliminary reports revealed growth of Gram-negative coccobacilli, and at this point metronidazole was also added to the treatment regime until an anaerobic cause was ruled out. Ultimately, the organism was identified from aerobic cultures as *P multocida* using the Vitek 2 identification system (bioMérieux, USA). Anaerobic cultures were negative. The isolate was sensitive to ceftriaxone, ampicillin and penicillin. Interestingly, a swab of the left ear performed on postoperative day 2 grew the same organism as that cultured from the CSF (growth on chocolate and blood agar; no growth on MacConkey's or inhibitory mold agar). The empirical antibiotics and dexamethasone were discontinued, and the patient was started on a 14-day course of IV penicillin G at a dose of 2,000,000 units every 4 h. The patient made a rapid recovery from his meningitis, and he was discharged on postoperative day 10 to continue treatment as an outpatient. On further questioning, it was revealed that the patient was the primary caregiver of several pet cats and a dog, although he reported no history of bites. The pets were allowed on the furniture, including his bed, and would occasionally lick his face.

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TABLE 1

A list of cases of *Pasteurella multocida* meningitis published in the English literature after 1999

Author (reference), year	Age, years (sex)	Predisposing factors	Animal exposure	Clinical findings	Treatment (duration)	Outcome
Brossier et al (13), 2010	46 (F)	Transethmoidal pituitary adenectomy	Contact with cats	Headache; fever; nuchal rigidity; epistaxis	Cefotaxime and ofloxacin (1 week)	Recovered
López et al (14), 2013	37 (M)	Chronic sinusitis; defect in lamina cribosa	Pig bite	Headache; vomiting; fever	Ceftriaxone	Recovered
Kawashima et al (15), 2010	44 (F)	None	Kissing her dog	Headache; fever; nausea; neck stiffness	Meropenem (1 week)	Recovered
Per et al (16), 2010	15 (M)	Kerion celci on head	Pet rabbit	Headache; weakness; confusion; lethargy; neck stiffness	Cefotaxime, cefazolin, penicillin	Recovered
Tjen et al (17), 2007	44 (F)	Otitis media	Face licked by pet dog	Headache; vomiting; fever; drowsy; neck stiffness; right-sided paralysis	Chloramphenicol	Recovered
Tattevin et al (18), 2005	60 (F)	Chronic mastoiditis	Cat bite	Fever; chills; rigors; nuchal rigidity; agitation; decreased responsiveness	Benzylpenicillin (2 weeks)	Recovered
Jordan et al (19), 2007	66 (M)	Otitis, alcoholism	Dog exposure	Not reported	Iv levofloxacin; aztreonam (1 week); oral levofloxacin (18 days)	Recovered
O'Neill et al (20), 2005	72 (F)	None	Pet cat	Fever; jaundice; decreased level of consciousness; neck stiffness	Cefotaxime cefotaxime (14 days), penicillin (27 days)	Obstructive hydrocephalus requiring shunt and eventual recovery
Proulx et al (21), 2003	33 (F)	None	Dog scratch	Headache; neck pain; photophobia; fever; tachycardia	Penicillin (14 days)	Recovered
Armstrong et al (22), 2000	52 (M)	None	Pet dog, animal feces indoors	Found dead at home	–	Death

F Female; M Male

DISCUSSION

Meningitis is an uncommon outcome of *P multocida* infection (3), making *P multocida* a rare cause of adult bacterial meningitis. Two reviews spanning 1950 to 1999 report only 29 cases published in the English literature during that time period (4,5). Animal contact was a major risk factor, present in 89% of cases, and a history of a bite was much less common, occurring only 15% of the time (4). Previous cranial/facial surgery or skull fracture has been reported as a cause of *P multocida* meningitis (5-13). Table 1 summarizes adult cases of *P multocida* meningitis published in the English literature after 1999 (13-22). Animal contact was present in all cases, while only two (20%) reported a history of a bite. One patient had a history of cranial surgery (13).

The current report presents one of only a handful of cases of *P multocida* meningitis ever documented in the literature from a Canadian site (5,6,9,21,23). The patient developed a severely decreased level of consciousness after tympanomastoidectomy. The patient had the typical CSF findings of bacterial meningitis (low glucose, high protein, high leukocytes). Penicillin is the most commonly used antibiotic to treat *P multocida* meningitis (4,15), and our patient recovered fully with a course of IV penicillin G. Many of the more recent cases describe treating with third generation cephalosporins (Table 1).

P multocida meningitis has been reported following mastoidectomy (11,12), and the pathogenesis of infection is hypothesized to involve contiguous spread of the organism from a colonized ear canal. Supporting this theory, a swab of our patient's ear canal grew *P multocida*. Our patient had experienced chronic otorrhea. Local spread from an adjacent infected site has been proposed as an etiology (4) because chronic otitis media and otorrhea have been found in association with *P multocida* meningitis (4,19,24-27). Our patient showed no signs of clinical meningitis preoperatively; therefore, extension to the surgical site is the likely mechanism in this case. A preoperative ear swab has been proposed for patients having a mastoidectomy that have a history of exposure to animals (12), and may be supported by the present case.

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