

Unusual Aetiology of *Pasteurella canis* Biovar 2 Causing Dacryocystitis in HIV Patient: A Case Report and Review of Literature

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ABSTRACT

Pasteurella species are zoonotic bacterial pathogens implicated very infrequently in various human infections following animal bites or licks usually of dogs and cats. This case report described a rare clinical presentation of dacryocystitis caused by *P. canis* in a Human Immunodeficiency Virus (HIV) positive young male patient involved in caring of cattle. It advocates the utmost need of recognizing the wide clinical manifestation spectrum of *P. canis* even without prior penetrating injury. *P. canis* associated clinical infection is more extensive than had been thought previously especially in immunocompromised patient. Early accurate identification and evidence based anti-microbial therapy may prove crucial in preventing further potential complications.

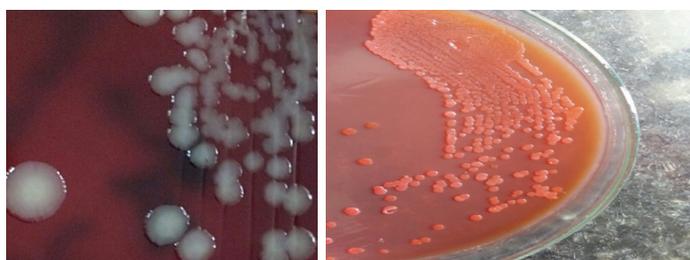
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CASE REPORT

An adult 25-year-old male truck driver presented to Outpatient Department of ENT of All India Institute of Medical Sciences (AIIMS), Raipur, Chhattisgarh with fluctuant swelling over left medial canthal region of one week duration. He also complained of left side nasal obstruction. On examination pinkish fleshy masses were seen filling the left nasal cavity along with 3 by 2 cm fluctuant abscess over the medial canthal region [Table/Fig-1,2]. The provisional diagnosis of lacrimal abscess secondary to nasal pathology was made and patient consent was obtained. He had history of chronic dacryocystitis and surgery done for some swelling in the infra-orbital region nine months back, the details of which were not available with the patient. The patient was afebrile and there were no clinical signs of systemic involvement. Various serological and radiological investigations were advised viz., complete blood examination including Complete Blood Count (CBC), Erythrocyte Sedimentation Rate (ESR), HIV, Hepatitis B, C and Venereal Disease Research Laboratory (VDRL)/ Rapid Plasma Reagin (RPR) serology, Contrast Enhanced Computed Tomography (CECT) of nose Para Nasal Sinus (PNS). Approximately, 7cc pus from the medial canthal swelling was aspirated in a sterile tube and immediately sent to the Department of Microbiology for Gram's staining, bacterial culture and anti-microbial sensitivity, Acid Fast Bacilli (AFB) staining and mycobacterial culture using Lowenstein Jensen (LJ) medium and fungal potassium hydroxide (KOH) examination and fungal culture on Sabouraud Dextrose Agar (SDA). Blood culture was not considered because patient was not febrile. Nasal mass biopsy was planned for histopathological examination after CT and blood investigations reports. The patient was started on oral amoxicillin-clavulanate 625mg TDS and was asked to come again after one week along with reports of all investigation for review. On his subsequent visit, the patient had reported that, swelling at medial canthal region was considerably reduced after aspiration. Patient had not got CECT nose paranasal sinus done due to his poor financial condition and drinking habits. CBC was found within normal limits with RBC $5.35 \times 10^6/\mu\text{l}$, HGB 15.3 g/dL, Hematocrit (HCT) 46.8 %, Mean Corpuscular Volume (MCV) 87 fL, Mean Corpuscular Hemoglobin (MCH) 28.7 pg, MCHC 32.8 g/dL, Red Cell Distribution Width (RDW) 14.2% except for lower WBC count of $5000/\mu\text{l}$ and raised ESR of 58 mm/hr. Serological test confirmed HIV positive status of the patients and found negative for HBsAg, anti-HCV antibody and VDRL/RPR. Grams' staining revealed abundant number of polymorphonuclear leucocyte with gram negative coccobacilli. Fungal KOH, AFB smear



[Table/Fig-1]: Fluctuant swelling seen over left medial canthal region of one week duration and partially seen left side nasal fleshy mass; **[Table/Fig-2]:** Pinkish fleshy mass filling the left nasal cavity.



[Table/Fig-3]: Non haemolytic, smooth, grayish white colonies with pungent odour of *P. canis* on blood agar; **[Table/Fig-4]:** Nonlactose fermenting colonies of *P. canis* on mac-conkey agar.

examination and their culture were found negative. He was sent for registration at the government designated Integrated Counselling and Testing Centre (ICTC) for anti-retroviral therapy and asked to follow-up with CT scan for nasal mass biopsy and incision and drainage of the medial canthal region with continuing the amoxicillin-clavulanate for one more week. Unfortunately the patient did not return for follow-up.

The pus was inoculated on both Blood agar and Mac-Conkey agar (BA and MA) and incubated at 37°C for 24 hours. Next day cultural examination revealed a moderate growth of non-haemolytic, large, grayish white, smooth colonies on BA, whereas on MA agar, non-lactose fermenting, moist colonies were obtained [Table/Fig-3,4]. Smear examination from both MA and BA showed gram-negative Coccobacilli. The isolate was catalase and oxidase test positive. Considering it as presumptive non-fermenter, following battery of test was put up for identification [Table/Fig-5]. The biochemical identification confirmed this isolate as *P. canis* biovar 2 on the basis of Indole test which comes positive for biovar 1 and negative for biovar 2. Since, it's a rare pathogen of abscess isolated from left medial canthal region, we referred the isolate for

automated identification by Vitek 2 microbial identification system, Biomerieux, USA using GN card which also confirmed *P. canis* with excellent identification confidence level of 98% after eight hours of incubation. Fungal and tuberculosis investigation were found negative. Antibiotic susceptibility testing was done by Kirby-Bauer disk diffusion test following the CLSI guidelines, 2014 [1]. The organism was found sensitive to ampicillin, gentamycin, cefuroxime, cefotaxime, ciprofloxacin, amoxicillin-clavulanic acid, piperacillin and tetracycline.

Since, *P. canis* has been reported mostly following animal bite history, patient was enquired for any animal contact history on which he stated being involved in caring of cattle at his village farm. Literature

S. No.	Test Name	Result
1.	Oxidase	Positive
2.	Catalase	Positive
3.	Motility	Non-motile
4.	Indole	Negative
5.	Methyl Red	Negative
6.	Voges-Proskauer	Negative
7.	Citrate	Negative
8.	Urease	Negative
9.	Bile esculin	Negative
10.	Lysine, Arginine, Ornithine	Negative, Negative, Positive
11.	Phosphatase	Positive
12.	Nitrate reduction test	Positive
13.	ONPG	Negative
14.	Glucose	Fermented
15.	Sucrose	Fermented
16.	Maltose	Not fermented
17.	Lactose	Not fermented
17.	Mannitol	Not fermented
18.	Fructose	Fermented
19.	Mannose	Fermented

[Table/Fig-5]: List of biochemical tests put up for identification of the culture isolate and their results.

Study [Reference No.]	Case detail	Diagnosis	Transmission route	Underlying disease	Treatment	Outcome
Casallas-Rivera M et al., [7]	56 Yr, Female	Hemorrhagic septicaemia with secondary pleural empyema	Unknown (No animal contact)	Hypertension and hypothyroidism	Piperacillin-Tazobactam	Recovered
Bhat S et al., [5]	70 Yr, Male	Lower respiratory tract infection	Exposure to domestic cats	COPD and ischaemic heart disease	Doxycycline	Recovered
Gundluru R et al., [11]	16 Yr, Female	Peritonitis	Patting of peritoneal catheter by cat	Peritoneal dialysis for end stage renal disease	Cefepime	Recovered
Castellano I et al., [8]	65 Yr, Male	Peritonitis	Dog contact	Continuous cycling peritoneal dialysis	Vancomycin and Gentamycin	Recovered
Hazelton BJ et al., [2]	14 Month, female	Osteomyelitis and synovitis of Left ankle joint	Dog licking on face	None	Amoxicillin- Clavulanate	Recovered
	19 Month, Female	Septic arthritis of right elbow	Dog licking on face	None	Amoxicillin- Clavulanate	Recovered
Kaftandzieva A et al., [9]	55 Yr, Female	Right leg wound	Dog bite	None	Amoxicillin- Clavulanate	Recovered
Yimaz MB et al., [13] ^a	14 children with median age 3 month	Conjunctivitis	NA	NA	Vancomycin and Gentamycin	Recovered
Rashid NK et al., [4]	3 Yr, Male	Superonasal conjunctival laceration and scleral perforation	Left eye trauma with coconut skewer broom stick contaminated by cat	None	Ciprofloxacin	Recovered
Akhane T et al., [3]	25 Yr, Female	Dog bite wound	Dog bite	None	Cefazolin/Cefcapene pivoxil	Recovered
Yefet E et al., [6] ^a	21 Month,	Bacteraemia	Rabbit secretion	None	NA (in Hebrew)	Recovered
Albert TJ and Steven DL [10]	74Yr, male	Bacteraemia	Dog lick to open leg wound	Alcoholic cirrhosis	Amoxicillin- Clavulanate	Recovered
Hara H et al., [12] ^a	NA	Osteomyelitis and cutaneous abscess	Dog bite	None	NA	Recovered
Mondon D et al., [14] ^a	NA	Total knee arthroplasty infection	NA	NA	NA	NA

[Table/Fig-6]: Comparative study of the various case reports of *P. canis* infection in indexed Journal of Pubmed.

^a and NA = Not fully accessed due as not available freely online except abstract.

search of *P. canis* in PUBMED retrieved 72 reports. Fifty three (53) studies restricted to animals and six (06) with characterisation of *P. canis* were excluded. Only 13 case studies were found relevant for review [2-14].

DISCUSSION

More than 80% of HIV infected patients present with otorhinolaryngological and ocular manifestations at some point during the course of their disease [15,16]. ENT and ocular manifestations in HIV patients are however varied. People infected with HIV are prone to develop various infections by typical as well as atypical organisms.

P. canis, a gram negative non-motile coccobacillus or short rods belonging to Pasteurellaceae family is found as a part of normal oropharyngeal flora of many animals including healthy dogs and cats. *P. canis* although rarely affects humans and cause systemic zoonotic infection albeit its infection can be broadly classified into three categories on the basis of its mode of transmission [4,17]. The first category includes infection occurring after animal bite predominantly of dog and cat with dog bite reported more commonly and infrequently by licking and scratches. The second category describes infection occurring after other animal exposure while third category included infection with no known animal contact history [4,17]. *P. canis* have been infrequently implicated in wound infection, cellulitis, bacteraemia, peritonitis, conjunctivitis, empyema, osteoarticular and lower respiratory tract infection mainly during two extremities of age but never been reported in HIV patients [2-9]. In fact, *P. bettaye* has exclusively been reported in HIV patients [18]. No literature was found for *P. canis* infection in HIV patients supporting our claim of this case report as one of the rarest finding.

To the best of our knowledge, this is probably the first report of isolation of *P. canis* from abscess in the left nasolacrimal sac region from a HIV positive patient of chronic dacryocystitis without any dog or cat bite history. How this *P. canis* has colonized canthal region and caused abscess was really interesting to explore. The most probable reason could be initial nasopharyngeal colonization via

inhalation after close contact with cattle. Bhat S et al., have also reported the inhalation route of transmission of *P. canis* [5]. Once colonized, probably the leukotoxin production had stimulated cytokine release in exaggerated manner leading to inflammation and abscess formation amid impaired cellular response due to HIV infection. Since, the patient did not return for follow-up, we could not get the histopathological examination of the pink fleshy nasal masses done leaving the speculation wide open whether *P. canis* isolated of abscess from left medial canthal region could also be the reason of pinkish fleshy mass in the left nasal cavity or *vice-versa*. Although lack of histopathological examination is a major limitation of this study, the mainstay of this case report of novel finding of *P. canis* from left medial canthal region prompted us to share this unusual extended spectrum of infective capacity of *P. canis*.

Literature search of various human infection by *P. canis* in PUBMED retrieved 13 case reports [Table/Fig-6] [2-14]. On comparison, we found that infrequent reports of *P. canis* infection due to animal exposure other than dog and cat bite have been reported to support our hypothesis of transmission of *P. canis* after close contact with other animals. Yefet E et al., reported *P. canis* associated bacteraemia in a child after exposure to rabbit secretions [6]. Castellano et al., reported, *P. canis* associated peritonitis in a peritoneal dialysis patient without animal bite history [8]. Hazelton BJ et al., reported *P. canis* associated osteomyelitis and septic arthritis in 14 and 19 month old girl respectively without any history of penetrating dog bite [2]. Casallas-Rivera N et al., reported haemorrhagic sepsis and empyema in a 56-year-old female patient without epidemiological background [7]. All the reported cases led to the important finding that *P. canis* is an opportunistic pathogen which cause multi-varied infection in humans after exposure to animal bite, scratches, licking or close contact and even in cases without animal contacts. Majority of these cases were from extreme of the ages either children or old age people and predominantly suffering with some underlying disease, although not always true. All the cases showed sufficient sensitivity of *P. canis* to various anti-microbial with complete recovery of their patients and amoxicillin-clavulanate was the drug of choice in majority of the reported cases [2-14].

P. canis is divided into two biotypes: biotype 1 is found in the oral cavity of dogs, whereas, biotype 2 has been received from calves [5]. As our isolate was negative for indole test which is the criteria of distinguishing biotype 2 (indole negative) from Biotype 1 (Indole positive), we designated it as *P. canis* biotype 2 correlating well with the clinical history of the patient involvement in care of cattles.

We found the susceptibility of the isolate to ampicillin, gentamycin, cefuroxime, cefotaxime, ciprofloxacin, amoxicillin-clavulanic acid, piperacillin and tetracycline supporting the notion that *Pasteurella* spp are not great resistance exhibiting organism [3-9]. Several decades of clinical experiences with *Pasteurella* and numerous in vitro studies including ours suggested, penicillin as the best anti-microbial agent for the treatment of virtually all forms of infection [17]. Aminopenicillin, oral (cefuroxime and cefixime) and parenteral cephalosporin (ceftriaxone and cefoperazone) have been reported as excellent invitro activity [17]. Among non- β -lactam antibiotics, trimethoprim-sulfamethoxazole, fluoroquinolones and tetracycline showed good invitro activity [17]. However, occasional clinical failures have been documented to *P. multocida* against various

anti-microbials including oral macrolides (e.g., erythromycin), semi-synthetic penicillins (e.g., oxacillin, dicloxacillin), first generation cephalosporins (e.g., cephalothin, cephalexin, cefadroxil) and clindamycin [3-9].

Pasteurella infections although considered often amid history of dog or cat bite, our and some published studies strongly advocated that, it also should not be ignored even in absence of animal bite history. Timely and accurate identification proved pivotal in giving rarest insight spectrum of infective capacity of *P. canis* and evidence based anti-microbial treatment to prevent any further complications.

CONCLUSION

The potential spectrum of clinical manifestation caused by *P. canis* even without prior penetrating injury is more extensive than had been thought previously especially in immunocompromised patients where in early accurate identification and evidence based antimicrobial therapy may prevent any further complication.

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