CASE REPORT

**Cardiobacterium hominis** endocarditis: A case report and review of the literature

Andrew Walkty MD


The present case report describes the clinical course of a patient who presented with *Cardiobacterium hominis* endocarditis. A review of the literature follows the case presentation. *C. hominis*, a fastidious Gram-negative bacillus, is a member of the HACEK group of microorganisms (*Haemophilus* species, Actinobacillus actinomycetemcomitans, *C. hominis*, Eikenella corrodens and Kingella kingae). Endocarditis caused by *C. hominis* is uncommon and generally follows a subacute course. Patients may present with constitutional symptoms, symptoms related to valvular destruction or symptoms secondary to embolic events. Diagnosis requires identification of the pathogen from blood or vegetation by either culture or molecular techniques. Blood cultures may require prolonged incubation, highlighting the importance of incubating blood cultures for at least two to three weeks in patients with suspected endocarditis. In the past, *C. hominis* was generally sensitive to penicillin. However, reports of beta-lactamase-producing *C. hominis* have appeared in the literature over the past decade. The current recommendation for first-line treatment is a third-generation cephalosporin (ceftiraxone) for four weeks (six weeks if a prosthetic valve is in place).

**Key Words:** Cardiobacterium hominis; Endocarditis

---

**CASE PRESENTATION**

A fifty-six-year-old Caucasian man with no significant past medical history was transferred to the tertiary care Health Sciences Centre (Winnipeg, Manitoba) from a peripheral hospital with new-onset congestive heart failure. The patient reported that he had been feeling ‘unwell’ for the past several weeks. He had a four-day history of flu-like symptoms, including myalgias, and a two-day history of increasing dyspnea, orthopnea, slight chest pressure and fever. He denied taking any medications. The patient’s dental history was not obtained.

Physical examination revealed a middle-aged man in moderate respiratory distress, with a blood pressure of 133/96 mmHg, a heart rate of 153 beats/min, a respiratory rate of 41 breaths/min and an oxygen saturation of 89% on a 15 L nonrebreath mask. The patient was febrile, with a temperature of 38.4°C (taken rectally). Cardiac examination demonstrated a jugular venous pressure at eight vertical centimetres above the sternal angle and a grade III/VI holosystolic murmur consistent with mitral regurgitation. Respiratory examination was significant for decreased air entry and coarse crackles bilaterally. Peripheral stigmata of endocarditis were not observed, with the exception of mild splenomegaly. The remainder of the physical examination was unremarkable.

Laboratory investigations demonstrated a white blood cell count of 29.2 × 10³/L (2.33% bands), and a normochromic, normocytic anemia (hemoglobin concentration of 107 g/L). The patient’s troponin I value was slightly increased at 0.9 µg/L (reference normal less than 0.2 µg/L). An electrocardiogram demonstrated sinus tachycardia. On chest x-ray, bilateral perihilar infiltrates, worse on the right side, were observed, consistent with asymptomatic alveolar edema and possible pneumonia. Blood cultures were sent and empirical antibiotic therapy with cefuroxime and azithromycin was initiated. The patient was transferred to the medical intensive care unit, where he was subsequently intubated for respiratory failure and treated with inotropes for cardiogenic shock.

---

L’endocardite à *Cardiobacterium hominis*: Un rapport de cas et une analyse bibliographique

Le présent rapport de cas décrit l’évolution clinique d’un patient qui a consulté en raison d’une endocardite à *Cardiobacterium hominis*. Une analyse bibliographique suit la présentation du cas. Le *C. hominis*, un bacille gram négatif pérnicieux, fait partie du groupe HACEK de microorganismes (espèces *Haemophilus*, Actinobacillus actinomycetemcomitans, *C. hominis*, Eikenella corrodens et Kingella kingae). L’endocardite causée par le *C. hominis* est peu courante et suit généralement une évolution subaiguë. Les patients peuvent souffrir de symptômes constitutionnels, liés à la destruction valvulaire ou secondaires à un événement embolique. Pour poser un diagnostic, il faut repérer le pathogène dans le sang ou les végétations au moyen d’une culture ou d’une technique moléculaire. Les analyses sanguines peuvent exiger une incubation prolongée, soulignant l’importance d’incuber les cultures sanguines pendant au moins deux à trois semaines chez les patients atteints d’une endocardite présumée. Par le passé, le *C. hominis* était généralement sensible à la pénicilline, mais des cas de *C. hominis* producteurs de bétalactamase ont été cités dans les publications depuis dix ans. Le traitement de première ligne actuellement recommandé consiste à administrer une cephélosporine de troisième génération (céftiraxone) pendant quatre semaines (six semaines en présence d’une prothèse valvulaire).
An echocardiogram performed one day after admission revealed severe mitral insufficiency. Neither papillary muscle rupture nor vegetations were seen. On the fourth hospital day, the patient was taken to the operating room for mitral valve replacement. During the surgery, extensive destruction of the anterior leaflet of the mitral valve was observed and a diagnosis of endocarditis was entertained. Two holes were observed in the aortic valve (noted to be quadricuspid), which was also replaced. The patient’s postoperative course was complicated by cardiac tamponade related to bleeding from sternal wires, necessitating a second operation, and third-degree heart block requiring placement of a pacemaker.

The blood cultures collected on admission were reported as growing Gram-negative bacilli three days after being drawn. At that time, antibiotic treatment was changed to cefotaxime. Ten days after admission, Cardiobacterium hominis was identified as the pathogen. Cultures of both valves were negative for bacteria, acid-fast bacilli and fungi. The patient was discharged home after 22 days in hospital and continued therapy with intravenous antibiotics to complete a four-week course. He was asymptomatic at a one-year follow-up visit.

<table>
<thead>
<tr>
<th>Pathogen(s) in series</th>
<th>Current review</th>
<th>Patrouel et al (41)</th>
<th>Staphylococcus aureus (30%), enterococci (5%), Actinobacillus actinomycetemcomitans</th>
<th>HACEK¹ (5%), S aureus (28.6%), HACEK¹ (8.8%), S aureus (28%), enterococci (9.6%), other (17%), other (32%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of cases of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>endocarditis in series</td>
<td>67</td>
<td>102</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Patient age (mean years)</td>
<td>48.5</td>
<td>46.8</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Symptom duration</td>
<td>145 days</td>
<td>91 days</td>
<td>29 days</td>
<td></td>
</tr>
<tr>
<td>Predisposing cardiac condition</td>
<td>76% (44 of 58)</td>
<td>76.5% (78 of 102)</td>
<td>55% (no prosthetic valve endocarditis in this series)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>72% (12% with prosthetic heart valve)</td>
<td></td>
</tr>
<tr>
<td>Symptoms/signs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constitutional symptoms</td>
<td>83% (24 of 29)</td>
<td>66.7% (30 of 45)</td>
<td>Chills 51%, arthralgias/myalgias 25%, back pain 14%</td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>81% (46 of 57)</td>
<td>97.4% (76 of 78)</td>
<td>90% as symptom, 63% as sign, 3% as sign</td>
<td></td>
</tr>
<tr>
<td>Splinter hemorrhages</td>
<td>37.5% (6 of 16)</td>
<td>ND</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Splenomegaly</td>
<td>50% (23 of 46)</td>
<td>35.6% (27 of 76)</td>
<td>19%</td>
<td></td>
</tr>
<tr>
<td>Clubbing</td>
<td>18.4% (7 of 38)</td>
<td>ND</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>Petechiae</td>
<td>32.5% (13 of 40)</td>
<td>ND</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>Murmur</td>
<td>96% (25 of 26)</td>
<td>73% (57 of 78)</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>38.5% (20 of 52)</td>
<td>27% (21 of 75)</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td>Embolic events</td>
<td>44% (12 of 27)</td>
<td>29.5% (23 of 79)</td>
<td>43%</td>
<td></td>
</tr>
<tr>
<td>Laboratory abnormalities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anemia</td>
<td>78.6% (33 of 42)</td>
<td>88% (59 of 67)</td>
<td>69%</td>
<td></td>
</tr>
<tr>
<td>Leukocytosis</td>
<td>25.6% (10 of 39)</td>
<td>45.2% (28 of 62)</td>
<td>ND</td>
<td></td>
</tr>
<tr>
<td>Elevated ESR (&gt;20)</td>
<td>69.9% (93 of 33)</td>
<td>98.4% (62 of 63)</td>
<td>88.9% (48 of 54)</td>
<td></td>
</tr>
</tbody>
</table>

Numbers in parentheses indicate the numbers of patients that could be evaluated, where no parentheses appear, percentages reflect those of the total number of cases in a series. *Data taken from references 1 to 32 and 39 to 41; †A group of microorganisms that includes Haemophilus species, A actinomycetemcomitans, C hominis, Eikenella corrodens and Kingella kingae; ‡Data are from 122 cases for constitutional symptoms and fever as a symptom; †Insufficient data to provide percentages for individual symptoms. ¹Data taken from reference 1. ESR Erythrocyte sedimentation rate; IVDU Intravenous drug user; ND No data

An echocardiogram performed one day after admission revealed severe mitral insufficiency. Neither papillary muscle rupture nor vegetations were seen. On the fourth hospital day, the patient was taken to the operating room for mitral valve replacement. During the surgery, extensive destruction of the anterior leaflet of the mitral valve was observed and a diagnosis of endocarditis was entertained. Two holes were observed in the aortic valve (noted to be quadricuspid), which was also replaced. The patient’s postoperative course was complicated by cardiac tamponade related to bleeding from sternal wires, necessitating a second operation, and third-degree heart block requiring placement of a pacemaker.

The blood cultures collected on admission were reported as growing Gram-negative bacilli three days after being drawn. At that time, antibiotic treatment was changed to cefotaxime. Ten days after admission, Cardiobacterium hominis was identified as the pathogen. Cultures of both valves were negative for bacteria, acid-fast bacilli and fungi. The patient was discharged home after 22 days in hospital and continued therapy with intravenous antibiotics to complete a four-week course. He was asymptomatic at a one-year follow-up visit.

**LITERATURE REVIEW**

Previous case reports and reviews of C hominis endocarditis were obtained by performing a MEDLINE search using the search strategy ‘cardiobacterium’ AND (‘endocarditis’ OR ‘endocarditis’ [Medical Subject Headings]). The search term ‘HACEK’ was also used to obtain additional case series from...
which data on individual cases of C. hominis endocarditis could be extracted. The references cited in all of the case reports included in the present review were examined for additional cases not indexed on MEDLINE. Only those papers published in the English language were reviewed, although additional cases have been published in French, Hebrew, Spanish, German and Portuguese. The data to follow were primarily obtained from a review published in 1983 (1) and case reports that have appeared in the literature subsequent to that publication (2-32). To date, there have been 67 cases of C. hominis endocarditis reported in the English-language literature (including the present case) from which individual patient data were extractable (1-32). In many of these cases, data reporting was not complete. Hence, where percentages are calculated in subsequent parts of the present review, the denominator for the total number of cases is always less than 67.

C. hominis is an uncommon cause of endocarditis. It is a member of the HACEK group of microorganisms (Haemophilus species, Actinobacillus actinomycetemcomitans, C. hominis, Eikenella corrodens and Kingella kingae). A study published in 1990 by Steckelberg et al (33) found this group of bacteria to be responsible for approximately 3% (two of 68) of community-acquired cases of endocarditis and 6% (38 of 629) of cases in a referral population. In a series of patients diagnosed with HACEK endocarditis described by Das et al (34), C. hominis was the etiological pathogen in 27% (12 of 45) of cases.

C. hominis was first isolated from patients with endocarditis in 1962 (35). At that time, it was classified as a Pasteurella-like organism and was designated group II D (35). Slotnick and Dougherty (36) subsequently proposed the name C. hominis in 1964. C. hominis is a constituent of the normal flora (37). In one study (37), C. hominis was demonstrated to be present in the nose and throat of 68% of healthy individuals. It has also been detected in stool samples by fluorescent antibody analysis (37). Microbiologically, C. hominis has been described as a fastidious, pleomorphic Gram-negative bacillus (1,36,38). It is a facultative anaerobe and grows best in a humid atmosphere with increased CO2 tension (1,36,38). C. hominis produces indole and is oxidase-positive (1,36,38). It ferments glucose, sorbitol, mannose, sucrose and, in most cases, maltose and mannitol (1,36,38). It does not demonstrate urease, catalase, nitrate reductase, phenylalanine deaminase, beta galactosidase, lysine decarboxylase, ornithine decarboxylase or arginine dihydrolase activity (1,36). These characteristics help distinguish it from other members of the HACEK group.

There are several factors thought to predispose patients to C. hominis endocarditis. Dental work is a potential cause of bacteremia and has been cited as a risk factor leading to infection. Twelve of 27 patients (44%) reviewed by Wormser and Bottone (1) were reported to have had a dental procedure or oral infection before the onset of symptoms. Structural cardiac abnormalities also predispose to infection with C. hominis and are present in 76% (44 of 58) of case reports in the literature for which data were available (1-32). This percentage is similar to that reported in other case series of endocarditis caused by more typical pathogens (Table 1) (1-32,39-41).

Previous valve replacement, previous rheumatic heart disease, previous endocarditis, known ventricular septal defect, known bicuspid aortic valve, congenital aortic valve disease (type not specified), mitral valve prolapse with murmur (type not specified) and dilated cardiomyopathy have all been described as potential predisposing cardiac lesions in cases of C. hominis endocarditis (2-32). The present patient had a quadricuspid aortic valve, and this may have placed him at risk for this infection. There has been one case report in the literature of bacteremia due to upper gastrointestinal endoscopy as the potential cause of C. hominis endocarditis (2). Neither intravenous drug use nor infection at another site in the body have been described as risk factors for C. hominis endocarditis, in contrast with endocarditis caused by other pathogens (eg, Staphylococcus aureus) (1-32,39).

Endocarditis caused by C. hominis has been reported in both men and women (1-32). Case reports have described patients between the ages of 17 and 82 years (mean patient age 48.5 years) (1-32). Most case reports in the literature have described aortic and/or mitral valve involvement (1-32). However, pulmonary valve involvement has been documented (42).

The clinical manifestations of C. hominis endocarditis are presented in Table 1 and contrasted with those of endocarditis caused by A. actinomycetemcomitans (another HACEK microorganism) and other more typical bacteria (1-32,39-41).

C. hominis is a pathogen of relatively low virulence (1); as such, patients typically present with a picture of subacute endocarditis, often feeling unwell for a period ranging from weeks to months before a diagnosis is reached (1-32). The patient described in the present report was unwell for several weeks before seeking medical attention. The mean duration of symptoms before diagnosis is 145 days, but the range is extremely variable (from less than one week to more than 11 months) (1-32). This is prolonged relative to endocarditis caused by staphylococci and streptococci (Table 1) (1-32,39-40).

Patients will often report constitutional symptoms, including fatigue, lethargy, sweats, chills, myalgias, arthralgias, anorexia and weight loss (1-32). Eighty-three per cent (24 of 29) of cases in the literature have described at least one of these symptoms (2-32). Orthopnea and dyspnea may be a part of the presentation if the valvular lesion has progressed to the point where it is causing heart failure (3,38,43). This was the case with the patient described in the present report. Symptoms of heart failure may develop or progress despite appropriate antibiotic therapy depending on the extent of valvular damage before diagnosis (43).

Physical findings that have been documented in case reports include splinter hemorrhages in 37.5% (six of 16) of cases, clubbing in 18.4% (seven of 38) of cases, splenomegaly in 50% (23 of 46) of cases, petechiae in 32.5% (15 of 40) of cases and signs of congestive heart failure in 38.5% (20 of 52) of cases (1-32). Roth spots have been rarely reported (43). Fever as either a sign or a symptom has been described in 81% (46 of 57) of cases (1-32). A heart murmur has been auscultated at the time of diagnosis in 96% (25 of 26) of patients described in the literature (1-32). None of these physical findings clearly differentiates C. hominis endocarditis from other more common causes of endocarditis (Table 1) (1-32,39,40).

Laboratory features of C. hominis endocarditis include mild-to-moderate anemia, reported in 78.6% (33 of 42) of cases (mean hemoglobin level 101 g/L, range 82 g/L to 114 g/L [1-32]), and an elevated erythrocyte sedimentation rate, reported in 93.9% (31 of 33) of cases (mean 73.3 mm/h, range of 25 mm/h to 133 mm/h [1-32]). The frequency of anemia and elevated erythrocyte sedimentation rate observed with C. hominis endocarditis are again comparable with endocarditis caused by other bacteria (Table 1) (1-32,39-41). Tests for rheumatoid factor and C-reactive protein may also be elevated (1,4-9). An
increased white blood cell count, typically to less than 15×10^9/L, has been documented in 25.6% (10 of 39) of case reports (1-32). A more profound degree of leukocytosis has been infrequently described in cases where the patient was acutely ill on presentation (2). With respect to the present patient, the leukocytosis observed was likely related in part to the stress response associated with acute valve failure. Significant thrombocytopenia (platelet count of 17×10^9/L) has been described in one case report (10), which is thought to be due in part to the production of platelet autoantibodies. Glomerulonephritis has been described in the literature in association with C hominis endocarditis (4,42). Hematuria and a rising creatinine level may suggest the development of this complication (42).

Embolism phenomena associated with C hominis endocarditis have been reported often (1,5,9,11-14,42,44,45). Forty-four per cent (12 of 27) of patients in the review by Wormser and Bottone (1) had at least one embolic event. Embolism has been responsible for atypical presentations of C hominis endocarditis. Wong and Chan (11) described a 28-year-old man who presented with neurological signs and symptoms, including transient vertiginous attacks, intermittent vertical diplopia, slurring of speech, left-sided weakness (face, arm) and left incomplete homonymous hemianopia. Embolization from a valvular vegetation was the presumed cause of these symptoms (11). Francioli et al (12) described a 30-year-old man with C hominis endocarditis who presented with bacterial meningitis, thought to be secondary to septic embolization. Mueller et al (9) published a case report of a patient with C hominis endocarditis who presented with sudden onset of sharp right calf pain and had a pulseless right foot on examination due to embolic occlusion of the right popliteal artery. Pulmonary embolism has been infrequently reported as a consequence of right-sided valvular infection (42). Myotic aneurysm formation (cerebral, femoral and visceral) has also been described (1,15,16,44,45). In general, embolic phenomena are no more common with C hominis endocarditis than with other types of bacterial endocarditis (Table 1) (1-32,39-41).

Diagnosing endocarditis caused by C hominis requires demonstration of this pathogen in blood or vegetation. Blood cultures for C hominis may need a prolonged period of incubation. Positive cultures have generally been reported after an incubation time ranging from two to 14 days (1,3,7,8,10,12-14,17-28); however, it should be noted that in case reports published since January 2002 (including the case described presently), cultures have been positive in less than five days (10,19). Two case reports have recently described the identification of C hominis using molecular techniques (9,29). Mueller et al (9) diagnosed C hominis endocarditis by broad-range polymerase chain reaction (PCR) amplification of 16s ribosomal RNA in embolic material, followed by single-strand sequencing. Similarly, Nikkari et al (29) used broad-range PCR amplification of 16s ribosomal RNA followed by sequencing of the PCR product to demonstrate the presence of C hominis in an aortic valve tissue sample.

Once a diagnosis is made, treatment rests with antibiotic therapy. The majority of C hominis isolates previously reported in the literature were sensitive to penicillin (1,2,5-9,11-14,18,19,21,22,24,25,28,30). Over the past decade, however, there have been two case reports describing endocarditis caused by beta-lactamase-producing C hominis (3,20). The isolate described in the first of these two cases (20) was reported to be resistant to cefotaxime in addition to penicillin, although the criteria used to determine resistance were unclear. Treatment of the patient described in this case consisted of vancomycin and rifampin for four weeks, followed by amoxicillin/clavulanate for two weeks (20). The isolate described in the second case report (3) had an elevated minimal inhibitory concentration for both ceftriaxone (1 µg/mL) and vancomycin (8 µg/mL), in addition to penicillin (minimal inhibitory concentration higher than 256 µg/mL) (3). In this case, the patient was treated successfully with ciprofloxacin (3). The current recommendation for first-line treatment of C hominis endocarditis is a third-generation cephalosporin such as intravenous ceftriaxone 2 g daily for four weeks (six weeks in the case of prosthetic valve infection) (46). The combination of ampicillin and gentamicin can be considered as an alternative (46). However, as illustrated by the aforementioned two reports (3,20), there is the need to develop consensus guidelines describing appropriate susceptibility testing (media/growth conditions) and interpretive breakpoints to further guide antibiotic selection for individual patients (47). At present, such guidelines do not exist (47). Valve replacement and/or repair may be necessary in the treatment of C hominis endocarditis depending on the extent of valvular destruction and the patient’s symptoms (1-25,28-31). Surgery has been required in 40% of cases (23 of 57) reported in the literature (1-32). The present patient underwent replacement of both his mitral and aortic valve because of severe symptoms of congestive heart failure. A good clinical outcome has been reported in 90% (55 of 61) of cases reviewed here; however, this may be the result of publication bias (1-32).

CONCLUSION

C hominis is an infrequent cause of endocarditis. Clinically, C hominis endocarditis presents similar to other causes of endocarditis, although it generally follows a more prolonged course, with symptoms present for weeks or months before a diagnosis is made. Diagnosis in the past has often required prolonged incubation of blood cultures. While more recent reports have described positive cultures with incubation times of less than five days, the paucity of data regarding time to positive culture would still argue in favour of ensuring that blood cultures are incubated for at least two to three weeks in suspected cases of endocarditis (46). Molecular methods of diagnosing this pathogen have recently been reported and may provide an alternative method of diagnosis in the future. Most isolates of C hominis reported in the literature have been sensitive to penicillin. However, there are published cases that exist describing beta-lactamase-producing C hominis. Currently, third-generation cephalosporins (such as ceftriaxone) are recommended as first-line therapy.

ACKNOWLEDGEMENT: The author wishes to thank Dr F Aoki for his review of the manuscript.

REFERENCES


