

CASE REPORT

Gemella endocarditis: a case report and a review of the literature

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ABSTRACT

Infective endocarditis (IE) remains a prevalent disease with a high rate of morbidity and mortality. Recent changes have been noted in the profile of causative microorganisms. In this report, we describe a case of *Gemella*-related endocarditis and review the related literature. Our patient was an 81-year-old man who presented with dyspnea and fatigue. His initial examination revealed a new systolic murmur. Echocardiogram revealed moderate mitral regurgitation with 1-cm mass on the anterior mitral leaflet, and blood cultures grew *Gemella haemolysans*. Penicillin and gentamicin were initiated, and workup for possible source was positive for a colonic polyp with high-grade dysplasia. The patient subsequently developed cardiogenic shock and severe pulmonary edema. Comfort care measures were initiated, and he passed away thereafter. We reviewed PubMed for cases of *Gemella*-related endocarditis. We found 65 documented cases and added our patient's case to the analysis. Seventy-two percent of the cases occurred in men. The mean age was 51 years and 42% of the patients were older than 60 years. Fever was the most common presenting symptom and most of the cases presented subacutely. The mitral valve was the most affected site and 50% of the patients required surgical intervention. *G. morbillorum* was the most common subtype and a total of four cases were found to be associated with colorectal neoplasm. As a conclusion, *Gemella* species rarely cause IE. The absence of a clear source of bacteremia warrants further evaluation for a gastrointestinal source. The infection can be destructive and must be promptly treated to avoid complications.

Key words: Endocarditis, *Gemella haemolysans*, mitral, regurgitation, *morbillorum*

Key messages: *Gemella* endocarditis is a serious infection with significant morbidity and mortality. It must be promptly treated to avoid further complications.

INTRODUCTION

Infective endocarditis (IE) remains a concerning pathology given the increasing incidence and the growing rate of requiring valve replacement surgery.^[1] Furthermore, the associated rates of morbidity and mortality are high, with reported short-term mortality, that is, within 30 days from the diagnosis, of 10%–30%, making IE a great burden on global health.^[2,3]

IE is classified into acute and subacute depending on timing and severity. Acute IE usually has an aggressive course with a rapidly progressive illness, where subacute IE has usually a more indolent course and may extend over many months, which may lead to a delay in the diagnosis.^[4] The classic clinical manifestation, which combines fever, heart failure,

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new cardiac murmurs, and embolic and immunologic phenomena, is rare.^[5] Modified Duke criteria aid in making the diagnosis and include clinical, microbiological, pathological, and imaging features.^[6,7] In a previous study, it was shown that modified Duke criteria helped with 10% increase in the frequency of cases being deemed clinically as definite IE, compared with Duke criteria, with no loss of specificity.^[3,6]

Elderly patients can have atypical presentations and the diagnosis may become challenging.^[8] Treatment of IE relies on microbial eradication by antibiotics. In some cases, surgery is indicated, mainly if the infection is not well controlled (evidence of an abscess or an enlarging vegetation), if there is indication for prevention of embolic events (as in left-sided IE with a very large vegetation >30 mm, or an evidence of an embolic event despite appropriate antibiotic therapy), and in the case of heart failure.^[3,9]

The bacteriology of IE varies depending on the cohort examined; however, *Staphylococcus aureus* and *Streptococci* comprise most of the organisms involved.^[9,10] Change in the causative organisms have been noted in recent years with emerging species that are often difficult to grow.^[1,11,12]

Gemella species is present in the human oropharynx, the genitourinary system, and the gastrointestinal system. It has been implicated in several diseases primarily in adults, including meningitis and septic shock but rarely IE.^[13,14] The genus currently includes six subspecies that cause similar clinical illness: *morbillosum*, *haemolysans*, *bergeriae*, *sanguinis*, *palaticanis*, and *cuniculi*, in addition to other subspecies that are restricted to animals.^[15] *Gemella morbillosum* was initially thought to be part of the genus *Streptococcus* until 1988 when it was found to be related to *G. haemolysans* at the genus level.^[16]

The literature on *Gemella* has been scarce and based mainly on case reports as the incidence is rare. In this paper, we report a case of IE caused by *G. haemolysans* and review the related literature, aiming to gather what is known about this infection in one source.

CASE REPORT

An 81-year-old man presented with dyspnea. He had a medical history of coronary artery disease, hypertension, chronic obstructive pulmonary disease (COPD), and atrial fibrillation. He underwent a coronary artery bypass grafting (CABG) 2 months preceding presentation but was in his usual state of health until 2 weeks before presentation when he developed weakness and exertional dyspnea.

He denied any fever, rigors, or chest pain. On physical examination, he was afebrile and edentulous. On cardiac auscultation, he had an irregular heart rhythm with a 4/6 soft blowing systolic murmur in the left lower sternal border radiating to the axilla along with bilateral lung wheezing. His skin exam did not reveal any Osler nodes or Janeway lesions, and no Roth spots were noted in the eye examination.

Initial laboratory work showed a white cell count of 15,400/mm³, a hemoglobin of 8.7 g/dL, a creatinine level of 1.74 mg/dL, a pro-brain natriuretic peptide of 11,341 pg/mL, and a procalcitonin level of 28.66 ng/mL (with normal value of below 0.15 ng/mL in healthy adults without kidney injury). A transthoracic echocardiogram was obtained to assess for a possible cardiac etiology for the patient's symptoms, and that revealed a normal ejection fraction; however, a new moderate mitral regurgitation with a 1 cm × 1 cm uniform, round and immobile mass on the atrial surface of the anterior mitral leaflet [Figure 1]. Figure 2 is included for comparison, and it shows a transthoracic echocardiogram that was obtained couple months before the current presentation, when he underwent CABG.

Because of concerns for endocarditis, the patient was started on vancomycin and ceftriaxone after blood cultures were obtained. Transesophageal echocardiogram showed an anterior leaflet mass measuring 1.3 cm × 0.8 cm, consistent

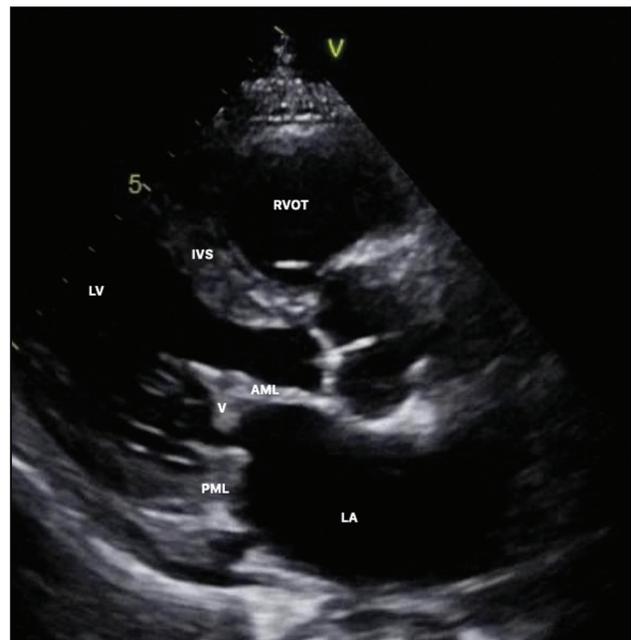


Figure 1: Transthoracic echocardiogram, parasternal long access view showing the vegetation on the anterior mitral leaflet. AML = anterior mitral leaflet, IVS = interventricular septum, LA = left atrium, LV = left ventricle, PML = posterior mitral leaflet, PW = posterior wall, RVOT = right ventricle outflow tract, V = vegetation

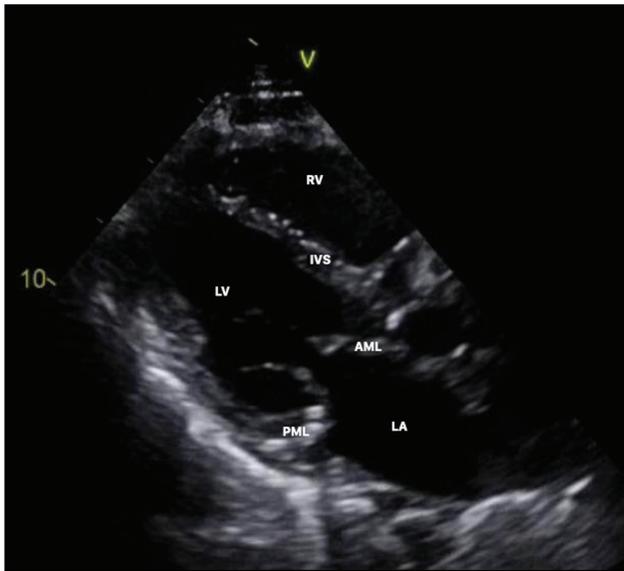


Figure 2: Transthoracic echocardiogram, parasternal long access view obtained couple months before current presentation. AML = anterior mitral leaflet, IVS = interventricular septum, LA = left atrium, LV = left ventricle, PML = posterior mitral leaflet, RV = right ventricle, V = vegetation

with vegetation on the atrial aspect with moderate mitral regurgitation.

Preliminary report showed gram-positive cocci that turned out to be *G. haemolysans* by mass spectrometry (MS)-based molecular identification (Microflex, matrix-assisted laser desorption ionization time-of-flight [MALDI-TOF]), which was later confirmed by the Michigan State Laboratory. Follow-up antimicrobial susceptibility results showed the isolate to be highly sensitive to penicillin (≤ 0.03 mg/mL), ceftriaxone (≤ 0.06 mg/mL), meropenem (≤ 0.06 mg/mL), and vancomycin (≤ 0.5 mg/mL). The treatment was then changed to penicillin and gentamicin.

As a part of the workup to find a source for the bacteremia, and as the patient was edentulous, he underwent a colonoscopy, which showed a tubular villous adenoma that measured 9 cm with a focus of high-grade dysplasia.

The patient did not have any embolic phenomena. He was advised to undergo a surgical replacement of the mitral valve; however, he opted to pursue conservative management and was discharged to complete a 6-weeks course of ceftriaxone and 2 weeks of gentamicin. He returned to the hospital 3 days following discharge complaining of increasing dyspnea and was hypotensive. He was started on vasopressors. A repeat transesophageal echocardiogram showed a rupture in the mitral leaflet with increased mitral regurgitation and multiple regurgitation jets [Figure 3].

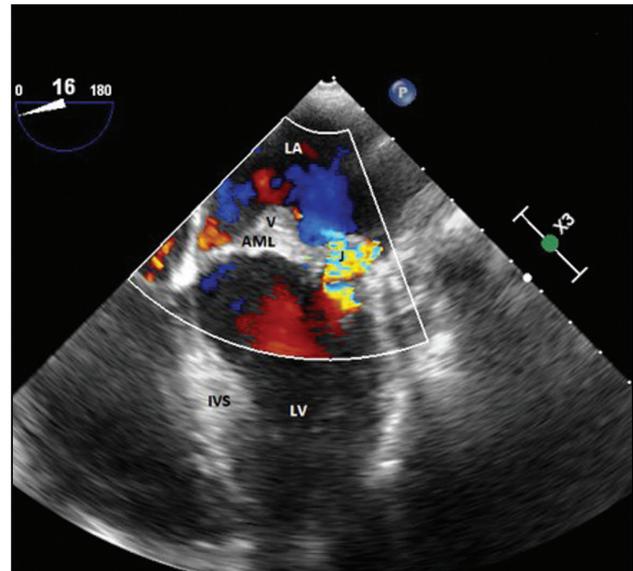


Figure 3: Four chamber view of transesophageal view showing mitral regurgitation jet and vegetation. AML = anterior mitral leaflet, IVS = interventricular septum, J = mitral regurgitation jet, LA = left atrium, LV = left ventricle, V = vegetation

The patient subsequently developed cardiogenic shock and was enrolled in hospice and passed away couple of days later.

REVIEW OF THE LITERATURE

We reviewed PubMed for cases of *Gemella*-associated endocarditis using appropriate key words. The articles in languages other than English and those that do not include case reports were excluded. The articles were reviewed to gather information about patients' demographics, symptoms, microbiology, echocardiographic findings, and treatment options.

RESULTS

We found a total of 75 articles that included our key words in their titles, of these, 62 were included, depicting 65 cases, after adding our case, we analyzed a total of 66 cases. The characteristics of these cases are shown in Tables 1 and 2. The mean age was 50.5 years (range, 4–84 years) with the majority being men (46, 72%).

Onset of illness was subacute in majority of cases (37, 63%), and fever was the most common chief complaint in 40 (61%) patients. The mitral valve was the most affected valve (24 cases, 39%), followed by the aortic valve in 15 cases (24%).

The source of infection was described in 30 cases of which dental source (22, 73%) was the most common source.

Surgical intervention was pursued in 31 (50%) of the reported cases, of these 13 patients (42%) underwent aortic

Characteristics	Participants (N = 66)
Age group (years; N = 64)	50.5 ± 23
0–10	3 (5%)
11–20	5 (8%)
21–30	6 (9%)
31–40	7 (11%)
41–50	8 (13%)
≥51	35 (55%)
Gender (N = 64)	
Male	46 (72%)
Female	18 (28%)
Source (N = 30)	
Dental/oral	22 (73%)
Intravenous drug abuse	4 (13%)
Colonic	4 (13%)
Presentation	
Fever	40 (61%)
Fatigue	7 (11%)
Dyspnea	6 (9%)
Miscellaneous	13 (19%)
Gemella species (N = 63)	
<i>G. morbillorum</i>	34 (54%)
<i>G. haemolysans</i>	17 (26%)
<i>G. sanguinis</i>	6 (10%)
<i>G. bergeriae</i>	5 (8%)
<i>G. taiwanensis</i>	1 (2%)

valve replacement and 13 patients (42%) underwent mitral valve replacement, whereas 5 patients (32%) underwent both aortic and mitral valve replacement. Outcomes were available in 57 patients with a mortality rate of 18%. The mortality rate was similar with no significant difference between the group that proceeded with surgical intervention (45%) and the group that received conservative approach (43%).

G. morbillorum was the most common subtype in the 63 cases that reported the subtype (34, 54%), followed by *G. haemolysans* (17, 26%).

DISCUSSION

Gemella species is a gram-positive, facultative anaerobic bacterium that was first reported in 1917.^[17] It was initially thought to be a part of the Neisseriaceae family^[18,19] until 1961, when it was found to be sufficiently distinctive to form a different genus.^[20] The virulence factors are not well studied; however, the production of exopolysaccharide may contribute to its capability of causing endocarditis.^[21]

The demographic findings in our results may represent those of IE as a whole, recent data have shown a shift toward older patients and more males being affected with IE.^[22] This can also be attributed to the higher frequency of predisposing conditions such as dental disease and colon cancer in older individuals.^[23,24] The high number of cases

Characteristics	Participants (N = 66)
Valve affected (N = 62)	
Mitral valve	24 (39.1%)
Aortic valve	15 (24%)
Prosthetic mitral valve	9 (14%)
Others	14 (23%)
Surgery	
No	31 (50%)
Yes	31 (50%)
Aortic valve	13 (42%)
Mitral valve	13 (42%)
Mitral and aortic valve	5 (16%)
Others	7 (23%)
Outcomes (N = 57)	
Survived	47 (82%)
Died	10 (18%)
Outcomes based on treatment type (N = 53)	
Required surgery and died	24 (45%)
Conservative approach and died	23 (43%)
Required surgery and survived	5 (9%)
Conservative approach and survived	1 (2%)

caused by *G. morbillorum* may be due to the fact that it was the first subtype to be discovered, this finding may change over time with more cases reported.

Gemella isolates have shown to be susceptible to β -lactams and vancomycin, with less response to other antibiotics such as macrolides, levofloxacin, and clindamycin.^[25-27] As it is impossible to clinically differentiate *Gemella* from other causes of IE, antibiotic therapy is empiric in acutely ill patients, with vancomycin being the best choice after obtaining sufficient blood cultures.^[28] Once *Gemella* is isolated, choice of antibiotics and length of treatment depend on minimal inhibitory concentration of penicillin on susceptibility testing.^[29] *Gemella* species is generally sensitive to penicillin G, and a combination of penicillin G and gentamicin is the current treatment of choice for these infections, whereas vancomycin can be used in patients with penicillin allergy. In our patient, the isolate was highly sensitive to penicillin, ceftriaxone, and vancomycin and the decision was made to discharge him on ceftriaxone and gentamicin given the ease of administration.

The source of bacteremia should be sought in all cases of *Gemella* IE, and potential risk factors include dental procedures, poor dentition, colorectal disease and procedures, bypass surgery, as well as immunocompromised status.^[30] *Gemella* has been found to be more abundant in the stool of patients with colorectal cancer compared with healthy individuals,^[31] and more abundant in the cancerous tissue specifically.^[32] Some studies defend that the lesioned mucosa, that is undergoing chronic inflammation, is propitious to translocation of organisms including *Gemella*, leading to bacteremia and subsequently endocarditis.^[33]

The organism can be difficult to be identified with standard techniques, and the 16S rRNA identification method seems to be the most accurate mean of diagnosis.^[34] We detected the organism by MALDI-TOF MS, which shows strong potential as a new method for species identification of many bacteria in clinical microbiological laboratories.

CONCLUSION

Gemella spp. is a rare cause of IE, but it should be identified and treated properly as it can otherwise result in a significant morbidity and mortality. The main source of *Gemella* IE is dental; however, colonic etiologies should also be suspected in patients without apparent source. The infection can be destructive and must be promptly treated to avoid complications. In addition, optimal therapy should include valve repair or replacement in patients with clinical progression, despite appropriate antimicrobial therapy.

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Conflicts of interest

There are no conflicts of interest.

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