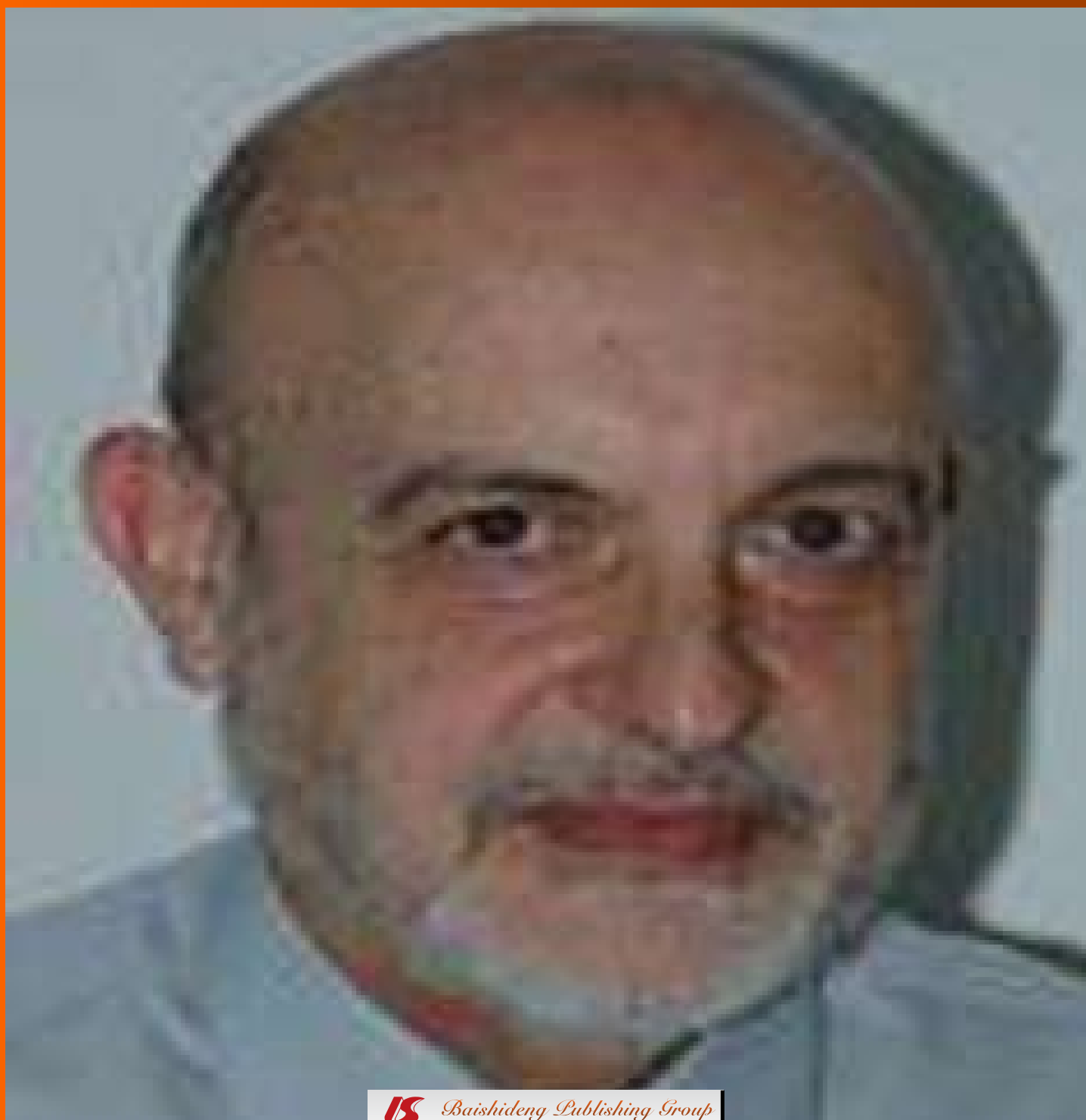


# World Journal of *Clinical Infectious Diseases*

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## Sub-acute endocarditis by *Corynebacterium straitum*: An often ignored pathogen

Vratika Agarwal, Valay Parikh, Mayur Lakhani, Chitradeep De, Apurva Motivala, Neville Mobarakai

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gens in invasive disease, mortality and morbidity can be prevented with initiation of early appropriate therapy.

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**Key words:** *Corynebacterium straitum*; Endocarditis; Commensals; Catheter associated infections; Iatrogenic

**Core tip:** This report highlights the pathogenicity of previously considered commensals like *Corynebacterium straitum* in severe human disease. Clinicians and microbiologists should not overlook the potential virulence of commensals in appropriate clinical situations. Furthermore, our case highlights an important point regarding the emergence of new pathogens in the etiology of infective endocarditis and also throws light on the increased incidence of endocarditis with the use of indwelling catheters and aggressive invasive medical management. As this issue is of growing concern with respect to infections that are easily avoidable.

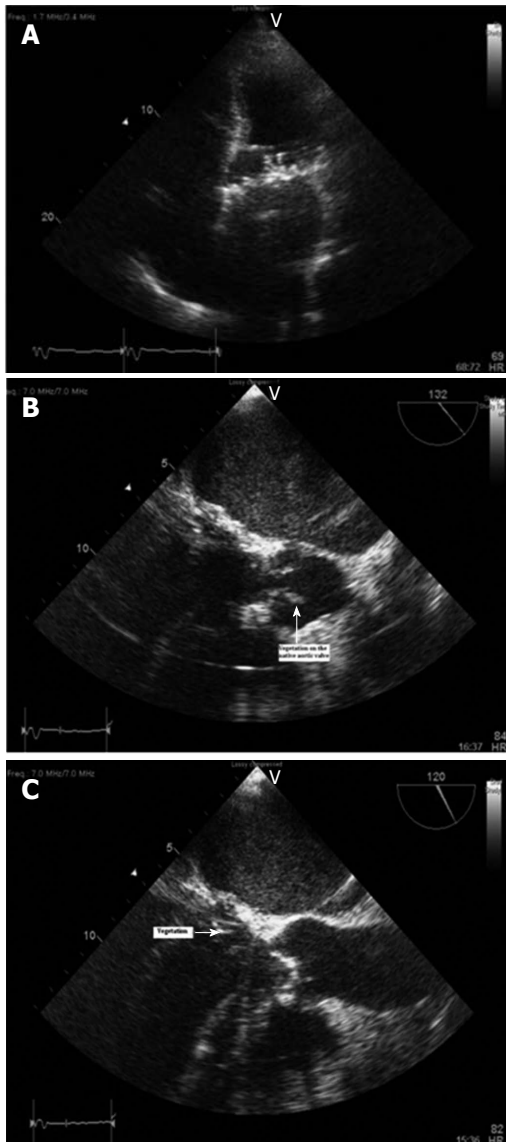
### Abstract

With the emergence of novel etiologic organisms, pan-resistance, and invasive medical care infective endocarditis continues to be evasive, requiring newer approaches and modified treatment guidelines. Presented here is the case of a 75-year-old male with history of systolic heart failure with an automatic internal cardioverter defibrillator (AICD) implantation and a prosthetic mitral valve who presented with generalized malaise and progressive shortness of breath for 6 d. He was found to have positive blood cultures for gram positive rod shaped bacteria identified as *Corynebacterium straitum*, but was not considered as the etiological pathogen initially as it a usual skin contaminant. Later this bacterium was found to be the causative agent for the patient's endocarditis. This case highlights the importance of identifying the role of this uncommon commensal in invasive disease. With the use of effective antibiotic regimen and awareness of these new patho-

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### INTRODUCTION

The epidemiological profile of infective endocarditis has changed drastically over the last several years with an estimated 10000 to 15000 new cases of IE diagnosed each year in United States. The number of cases of hospital acquired endocarditis has been on a rise with an estimated 7.5% to 29% of total cases of endocarditis in tertiary-care centre<sup>[1]</sup>. Intravenous indwelling catheters being one of the important causes of amplified risk of bacteremia.



**Figure 1** Transesophageal echocardiogram. A: Transthoracic echocardiographic image showing apical 4-chambered view showing possible vegetation on prosthetic mitral valve; B: Transesophageal echocardiogram showing sub-centimeter vegetation on the aortic valve; C: Transesophageal echocardiogram showing mobile vegetation at the prosthetic mitral valve annulus.

*Corynebacterium straitum* (CS) previously considered a saprophyte on skin and mucosa is now emerging as a causative organism for various infections, not only in immunocompromised but in immunocompetent individuals as well. Positive blood cultures for CS should not be neglected. The exact infectious potential of these bacteria and their judicious antimicrobial treatment is a challenging but necessary task.

## CASE REPORT

A 75-year-old male with history of systolic heart failure with an automatic internal cardioverter defibrillator implantation and a prosthetic mitral valve presented with generalized malaise and progressive shortness of breath for 6 d. Patient also noticed worsening of lower

extremity edema. He denied chest pain, fever, cough and palpitations. Physical exam revealed a new systolic murmur, bilateral crackles and positive pitting pedal edema. Based on initial assessment a diagnosis of acute decompensated heart failure secondary to suspected prosthetic valve infective endocarditis was made. Over the next 48 h four sets of blood cultures were drawn. Transthoracic echocardiography showed dilated left atrium and possible mitral valve vegetation (Figure 1A). In addition to the symptomatic treatment of heart failure, daptomycin, gentamicin, ceftriaxone and rifampin were started empirically. Transesophageal echocardiography (TEE) revealed a subcentimeter vegetation on the aortic valve (Figure 1B) in addition to small, protruding, echogenic, mobile vegetation at the prosthetic mitral valve annulus (Figure 1C). Four sets of blood cultures drawn 24 h apart, all grew CS. Initially, was thought to be a contaminant but later confirmed as a pathogen with gram stain and microbiological characterization which included acid fast staining, chemical and antibiotic testing. Antimicrobial susceptibility of the above organism by clinical and laboratory standards institute showed sensitivity of the organism to vancomycin, ampicillin (intermediate sensitivity), daptomycin, rifampin and gentamicin. Based on antibiotic sensitivity, daptomycin was discontinued and ampicillin was added. Ceftriaxone was continued initially as the patient also has a urinary tract infection but was later discontinued after second set of cultures showed the same results and urine cultures were negative. No other bacteria were isolated from the blood cultures. Subsequent blood cultures drawn 4 d later were negative. Patient's condition improved over a period of 3 wk. Antibiotics were continued for a total of 6 wk.

One month prior to this admission, patient was admitted to a tertiary care center for diverticular bleed, which was treated with IV resuscitation via an internal jugular venous access. This was the presumed source of infection.

## Microbiology

Nondiphtherial corynebacteria also known as coryneforms, are a widely diverse collection of bacteria that are grouped together on basis of their 16S rDNA<sup>[2]</sup>. The diversity of the group is further exemplified by the wide range of guanine-plus-cytosine content of the nucleotides. Although frequently considered as colonizers or contaminants they have been associated with invasive disease, particularly in immunocompromised patients. These organisms have been specifically implicated in bacteremia associated with catheterizations, shunts, pacemakers causing meningitis, osteomyelitis, prosthetic heart valve endocarditis and peritonitis, often seen in patients undergoing dialysis or have associated empyema, pneumonia and skin infections<sup>[3,4]</sup>. Patients infected with nondiphtherial organisms usually have significant medical co-morbidity or immunosuppression.

CS is one of the less known nondiphtherial species belonging to the genus corynebacteria. Frequently



distinguished from other coryneform bacteria by being non acid fast, nitrate reducing, utilizing glucose and sucrose and having colonies that are white grey or yellowish green in color. This species is non-motile. Microscopically they are larger when compared to the other coryneform bacteria and on gram stain have a typical striated appearance. Therefore named *Corynebacterium striatum*. CS is found in the anterior nares and on the skin, face and upper torso of normal individuals. There is a growing concern for its role as a pathogen in various disease entities, as noted in few case studies<sup>[5-7]</sup>.

## DISCUSSION

There has been a steep rise in the number of reported cases of health care acquired infective endocarditis over the last decade. This is most likely due to the vast use of invasive procedures in people with or without pre-existing valvular disease<sup>[8]</sup>. Effective antibiotic regimen has managed to curb the traditional etiological organisms, but there is growing concern for identification of newer unrecognized pathogens. CS generally considered a commensal, has now been implicated as a causative organism in various infections. Although nontoxigenic, this organism has been associated with invasive infections in patients with implanted cardiac device and prosthetic valves<sup>[9]</sup>, usually in an immunocompromised setting. There have been reports of CS bacteremia attributed to indwelling venous catheters<sup>[10]</sup>. CS infection along with *C. jeikeium* has been shown to be associated with nosocomial risk factors in some studies<sup>[11]</sup>. Most of the reported CS isolates have been susceptible to a wide spectrum of antibiotics. There have been few reported cases of multi drug resistant CS<sup>[12]</sup>. In general they are resistant to penicillin's but have been reported to be susceptible to B-lactams and vancomycin. There are no established guidelines for the management of corynebacteria yet. But in the light of impending multidrug resistance and nosocomial infections, there is need for appropriate guidelines to be established. Positive blood cultures for *Corynebacterium striatum* should not be neglected as a contaminant because of lack of data involving its role as a pathogen, especially in a hospital environment. Recognition and classification of diphtherial organisms continues to be a challenge for various laboratories as there is discrepancy in diagnosis of contamination in opposition to causative pathogen<sup>[13]</sup>. Delay in treatment increases morbidity and mortality.

This report highlights the pathogenicity of previously considered commensals like *Corynebacterium striatum* in severe human disease. Clinicians and microbiologists should not overlook the potential virulence of commensals in appropriate clinical situations.

## COMMENTS

### Case characteristics

Acute decompensated heart failure with fluid overload. Found to be febrile with

positive blood cultures.

### Clinical diagnosis

Sub-acute endocarditis due to *Corynebacterium striatum* (CS).

### Differential diagnosis

Most Coryneform bacteria are commensals on human skin and are ubiquitous in our environment. Initially positive blood cultures for this organism was thought to be a contaminant, but was later found to be the etiological agent of endocarditis.

### Laboratory diagnosis

Organisms isolated from blood culture underwent staining with Gram's method and acid fast staining. Microbiological characterization was also performed.

### Imaging diagnosis

Presence of vegetation was identified using transthoracic and transesophageal echocardiography.

### Pathological diagnosis

Sub-acute endocarditis due to invasive CS infection.

### Treatment

Antibiotic therapy with Rifampin, ampicillin, and gentamycin. There is lack of data with regards to treatment of endocarditis due to CS.

### Term explanation

Cardioverter defibrillator: An implantable cardioverter defibrillator is a small device that's placed in the chest or abdomen. Used to treat arrhythmias; Vegetation: Endocarditis is characterized by a prototypic lesion, the vegetation, which is a mass of platelets, fibrin, microcolonies of microorganisms, and scant inflammatory cells.

### Experiences and lessons

Clinicians and microbiologists should not overlook the potential virulence of commensals like CS in appropriate clinical situations.

### Peer review

This is just a single case report describing a human endocarditis caused by CS. The case report is interesting and the manuscript is well written.

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#### Journals

English journal article (list all authors and include the PMID where applicable)

- 1 **Jung EM**, Clevert DA, Schreyer AG, Schmitt S, Rennert J, Kubale R, Feuerbach S, Jung F. Evaluation of quantitative contrast harmonic imaging to assess malignancy of liver tumors: A prospective controlled two-center study. *World J Gastroenterol* 2007; **13**: 6356-6364 [PMID: 18081224 DOI: 10.3748/wjg.13.6356]

Chinese journal article (list all authors and include the PMID where applicable)

- 2 **Lin GZ**, Wang XZ, Wang P, Lin J, Yang FD. Immunologic effect of Jianpi Yishen decoction in treatment of Pixu-diarhoea. *Shijie Huaren Xiaobua Zazhi* 1999; **7**: 285-287

In press

- 3 **Tian D**, Araki H, Stahl E, Bergelson J, Kreitman M. Signature of balancing selection in Arabidopsis. *Proc Natl Acad Sci USA* 2006; In press

Organization as author

- 4 **Diabetes Prevention Program Research Group**. Hypertension, insulin, and proinsulin in participants with impaired glucose tolerance. *Hypertension* 2002; **40**: 679-686 [PMID: 12411462 PMCID:2516377 DOI:10.1161/01.HYP.0000035706.28494.09]

Both personal authors and an organization as author

- 5 **Vallancien G**, Emberton M, Harving N, van Moorselaar RJ; Alf-One Study Group. Sexual dysfunction in 1, 274 European men suffering from lower urinary tract symptoms. *J Urol* 2003; **169**: 2257-2261 [PMID: 12771764 DOI:10.1097/01.ju.0000067940.76090.73]

No author given

- 6 21st century heart solution may have a sting in the tail. *BMJ* 2002; **325**: 184 [PMID: 12142303 DOI:10.1136/bmj.325.7357.184]

Volume with supplement

- 7 **Geraud G**, Spierings EL, Keywood C. Tolerability and safety of frovatriptan with short- and long-term use for treatment of migraine and in comparison with sumatriptan. *Headache* 2002; **42** Suppl 2: S93-99 [PMID: 12028325 DOI:10.1046/j.1526-4610.42.s2.7.x]

Issue with no volume

- 8 **Banit DM**, Kaufer H, Hartford JM. Intraoperative frozen section analysis in revision total joint arthroplasty. *Clin Orthop Relat Res* 2002; (**401**): 230-238 [PMID: 12151900 DOI:10.1097/00003086-200208000-00026]

No volume or issue

- 9 Outreach: Bringing HIV-positive individuals into care. *HRS-A Careaction* 2002; 1-6 [PMID: 12154804]

### Books

Personal author(s)

- 10 **Sherlock S**, Dooley J. Diseases of the liver and biliary system. 9th ed. Oxford: Blackwell Sci Pub, 1993: 258-296

Chapter in a book (list all authors)

- 11 **Lam SK**. Academic investigator's perspectives of medical treatment for peptic ulcer. In: Swabb EA, Azabo S. Ulcer disease: investigation and basis for therapy. New York: Marcel



Dekker, 1991: 431-450

#### Author(s) and editor(s)

- 12 **Breedlove GK**, Schorffheide AM. Adolescent pregnancy. 2nd ed. Wicczorek RR, editor. White Plains (NY): March of Dimes Education Services, 2001: 20-34

#### Conference proceedings

- 13 **Harnden P**, Joffe JK, Jones WG, editors. Germ cell tumours V. Proceedings of the 5th Germ cell tumours Conference; 2001 Sep 13-15; Leeds, UK. New York: Springer, 2002: 30-56

#### Conference paper

- 14 **Christensen S**, Oppacher F. An analysis of Koza's computational effort statistic for genetic programming. In: Foster JA, Lutton E, Miller J, Ryan C, Tettamanzi AG, editors. Genetic programming. EuroGP 2002: Proceedings of the 5th European Conference on Genetic Programming; 2002 Apr 3-5; Kinsdale, Ireland. Berlin: Springer, 2002: 182-191

#### Electronic journal (list all authors)

- 15 Morse SS. Factors in the emergence of infectious diseases. Emerg Infect Dis serial online, 1995-01-03, cited 1996-06-05; 1(1): 24 screens. Available from: URL: <http://www.cdc.gov/ncidod/eid/index.htm>

#### Patent (list all authors)

- 16 **Pagedas AC**, inventor; Ancel Surgical R&D Inc., assignee. Flexible endoscopic grasping and cutting device and positioning tool assembly. United States patent US 20020103498. 2002 Aug 1

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Write as mean  $\pm$  SD or mean  $\pm$  SE.

#### Statistical expression

Express *t* test as *t* (in italics), *F* test as *F* (in italics), chi square test as  $\chi^2$  (in Greek), related coefficient as *r* (in italics), degree of freedom as *v* (in Greek), sample number as *n* (in italics), and probability as *P* (in italics).

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Use SI units. For example: body mass, *m* (B) = 78 kg; blood pressure, *p* (B) = 16.2/12.3 kPa; incubation time, *t* (incubation) = 96 h; blood glucose concentration, *c* (glucose)  $6.4 \pm 2.1$  mmol/L; blood CEA mass concentration, *p* (CEA) =  $8.6 \pm 24.5$   $\mu$ g/L; CO<sub>2</sub> volume fraction, 50 mL/L CO<sub>2</sub>, not 5% CO<sub>2</sub>; likewise for 40 g/L formaldehyde, not 10% formalin; and mass fraction, 8 ng/g, etc. Arabic numerals such as 23, 243, 641 should be read 23 243 641.

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