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Bacterial Endocarditis Caused by *Abiotrophia defectiva* in a Healthy Adult: A Case Report with Literature Review

Hyunggon Je[1], Duyeal Song[2], Chulhun L. Chang[2]

Departments of [1]Thoracic Surgery and [2]Laboratory Medicine, Pusan National University Yangsan Hospital, Yangsan, Korea

Infective endocarditis caused by *Abiotrophia defectiva* is rarely encountered. A 67-year-old male transferred from a local hospital presented with severe dyspnea and pulmonary edema. Preoperative transthoracic echocardiography revealed severe mitral regurgitation with large vegetation. Blood cultures grew *A. defectiva*, a gram positive, nutritionally deficient streptococcus variant. Emergent mitral valve replacement through right thoracotomy was performed, and after completing six weeks of antibiotic combination therapy (vancomycin, ampicillin, and gentamicin), the patient recovered fully. Because of the need for prompt surgical treatment and long-term antibiotic therapy and lack of laboratory experience with the organism, physicians and laboratory workers should pay close attention to the possibility of *A. defectiva* infective endocarditis when gram positive cocci are detected in blood cultures. **(Ann Clin Microbiol 2019;22:23-27)**

Key Words: *Abiotrophia defectiva*, Infective endocarditis, Nutritionally variant streptococci

INTRODUCTION

Abiotrophia defectiva is a nutritionally variant streptococcus (NVS) and is found not infrequently in infective endocarditis patients with a negative blood culture, and thus, other methods like polymerase chain reaction are required to detect this organism [1]. *A. defectiva* was firstly identified by Frenkel and Hirsch [2] in 1961 in a case of sub-acute infectious endocarditis.

Because *A. defectiva* is primarily isolated from the oral cavity or intestinal and genitourinary tracts, it can harm normal valves in the absence of any underlying cardiac or immunosuppressive illness or previous dental manipulation. However, the bacterium affects diseased valves more frequently, by causing embolic complications and valvular destructions [3,4]. It has been reported infective endocarditis attributable to *A. defectiva* accounted for ~5% of all microbial endocarditis cases [5], but its incidence appears to be decreasing. Furthermore, the bacterium rarely involve intact valves, so physicians and laboratory workers may not familiar with this organism. Here we report a case of infective endocarditis due to *A. defectiva* in an otherwise healthy adult and provide a review of recent literature.

CASE REPORT

A 67-year old male with a complaint of aggravating dyspnea of three months duration was transferred to Pusan National University Yangsan Hospital under suspicion of infective endocarditis. He had not undergone any recent surgical or dental procedure. Physical examination revealed; body temperature 36.1°C, heart rate 86 beats/min, a hypotensive status (90/60 mmHg), and an oxygen saturation of 98% on an oxygen supply of 3 L/min via a nasal cannula. Cardiac auscultation revealed a regular rate and rhythm with a pansystolic murmur at the apex, and coarse crepitation in both lungs. No Janeway's lesions, Osler's nodes or Roth's spot were observed. Chest X-ray showed diffuse bilateral thoracic haziness with suspicion of pulmonary edema. Transesophageal echocardiography showed severe mitral regurgitation with resting pulmonary hypertension

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Correspondence: Chulhun L. Chang, Department of Laboratory Medicine, Pusan National University Yangsan Hospital, 20 Geumo-ro, Mulgum-eup, Yangsan 50612, Korea. (Tel) 82-55-360-1877, (Fax) 82-55-360-1880, (E-mail) cchl@pusan.ac.kr

and vegetation (1.0×2.6 cm sized) on anterior and posterior mitral leaflets. Blood testing revealed anemia (Hb 9.6 g/dL; reference range 13.5-17.5 g/dL) and a normal leukocyte count (8,640 cells/mm^3; reference range 6,510-13,320 cells/mm^3). Serum C-reactive protein (7.75 mg/dL; reference range 0-0.5 mg/dL) and B-type natriuretic peptide (681 pg/mL; reference range

Table 1. Summary of reported cases of *Abiotrophia defectiva* infective endocarditis

Pt. no.	Age (yr)	Sex	Pre-existing heart diseases	Other predisposing medical conditions	Identification methods of bacterium	Involved valves & surgery	Valve type	Antibiotics	Publication yr	References
1	67	M	No	No	MALDI-ToF/MS	MVR	Mechanical	VCM+AMP+GM		The current case
2	60	M	Hypertrophic obstructive cardiomyopathy, hypertension	No	ND	Mitral valve/no surgery	-	CRO+GM	2018	9
3	31	M	No	Intravenous drug abuser	ND	MVR	Mechanical	AMP+GM	2017	10
4	59	F	Ventricular septal defect	No	ND	PVR, AVR, MVP, TAP	Bioprosthesis	CRO+AMP	2017	11
5	18	M	No	No	ND	AVR, MVR, Heart transplantation	Bioprosthesis	CRO+VCM	2017	12
6	41	M	Ventricular septal defect	ND	ND	PVR, AVR, MVR	Bioprosthesis	PG+GM	2017	13
7	26	F	No	Pregnancy (postpartum), fixed teeth brace	Vitek 2 Compact Analyzer	MVR	Mechanical	Broad spectrum antibiotics	2017	14
8	52	M	Mitral valve prolapse	Arterial hypertension	Polymerase chain reaction	MVR	Mechanical	AMP+GM	2016	1
9	42	F	Rheumatic heart disease	No	ND	AVR, MVR	ND	AMP/SB+GM	2016	15
10	65	M	Systolic/diastolic heart failure with intracardiac device (ICD)	No	MALDI-ToF/MS	Removal of ICD leads was impossible	-	PG+CM	2016	16
11	50	M	Myxomatous mitral valve/mitral insufficiency	Tooth extraction	Vitek 2, 16S rRNA sequencing	MVR	Bioprosthesis	VAN+GM	2016	17
12	25	F	Mitral valve prolapse/mitral insufficiency	Tooth extraction	Vitek 2, 16S rRNA sequencing	MVP	-	CRO+RIF+GM	2016	17
13	62	F	Rheumatic mitral stenosis/mitral valve regurgitation	Tooth extraction	MALDI-ToF/MS	MVR	Mechanical	VCM+GM	2016	18
14	78	M	Mitral regurgitation/ischemic heart disease	COPD, hypertension, hypercholesterolemia	ND	Mitral valve/no surgery	-	PG+GM	2016	19
15	39	F	No	Pregnancy (14th gestation week)	ND	MVR	Mechanical	AMP+GM	2016	20
16	74	M	No	No	ND	AVR, MVR	Mechanical	AMP	2015	4
17	35	M	Ventricular septal defect	ND	Culture negative, metagenomic analysis	PVR, AVR, MVR	ND	AMP/SB+GM	2015	21

Abbreviations: ND, not described; MALDI-ToF/MS, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry; COPD, chronic obstructive pulmonary disease; AVR, aortic valve replacement; MVR, mitral valve replacement; MVP, mitral valve plasty; PVR, pulmonic valve replacement; TAP, tricuspid annuloplasty; AMP, ampicillin; CRO, ceftriaxone; CM, chloramphenicol; GM, gentamicin; PG, penicillin G; RIF, rifampin; SB, sulbactam; VCM, vancomycin.

0-100 pg/mL) were elevated. In the absence of any neurological symptom, preoperative brain MRI (magnetic resonance imaging) showed multiple diffuse restriction foci in both cerebral hemispheres and left cerebellum, and subarachnoid hemorrhage (SAH) along both parietal and right occipital sulci. Blood cultures were requested and ceftriaxone and vancomycin were started empirically. To prevent further embolism by the cardiac vegetation, emergent mitral valve replacement was conducted through right mini-thoracotomy. Intraoperative findings showed massive destruction of anterior and posterior mitral valve leaflets with huge vegetation, which extended to posterior medial annulus of the mitral valve and to posterior left atrial endocardium. After massive debridement of all infected tissues, the mitral valve was replaced with a Carpentier-Edwards Perimount Magna mitral valve bioprosthesis (Edwards Lifesciences, Irvine, CA, USA). The preoperative blood culture revealed Gram positive cocci in three sets of culture bottles. The organism was identified as *A. defectiva* by MALDI-ToF/MS (matrix-assisted laser desorption/ionization time-of-flight mass spectrometry; bioMérieux, Marcy-l'Étoile, France), and E-testing showed susceptibility to penicillin and vancomycin (bioMérieux, Durham, NC, USA). Accordingly, vancomycin, ampicillin and gentamicin antibiotic treatment was continued for 6 weeks. His postoperative recovery course was uncomplicated and resulted in complete disease resolution. At the time of writing the patient had been followed uneventfully for 4 months.

DISCUSSION

A. defectiva endocarditis cases have been continuously reported since the bacterium was first identified as a cause of sub-acute infectious endocarditis in 1961 [2]. Roberts et al. [5] reported *A. defectiva*, which was originally called *Streptococcus mitior* or vitamin B6-dependent streptococcus, accounted for 5-6% of all microbial endocarditis cases during the periods 1944 to 1955 and 1970 to 1978. Subsequently the incidence of *A. defectiva* associated infective endocarditis seemed to decrease. For example, Brouqui and Raoult [6] reported in 2001 that 4.3% of cases of streptococcal endocarditis, that is, not all cases of microbial endocarditis, were caused by *Abiotrophia* spp., and Raoult et al. [7] reported in 2005 that only 2 of 348 microbiologically confirmed endocarditis were caused by *A. defectiva*. Recently, Doig et al. [8] reported *Abiotrophia* spp. was the etiology in 4 of 112 (3.6%) cases of infective endocarditis.

Since 2015, 17 cases (including our case) of *A. defectiva* endocarditis have been reported in the English literature (Table 1) [1,4,9-21], and these cases show a male predominance (11:6) and a mean age of 48.5±18.1 years. Approximately 2/3 had a pre-existing heart disease and of 15 with other medical conditions, eight had a history of some specific event like tooth extraction or pregnancy. Thus, only one case, two including the current case, did not have a pre-existing heart problem or medical condition. Among the 17 cases, the mitral valve was most frequently involved. Fortunately, all cases were successfully treated with appropriate antibiotics and/or surgery, although cardiac transplantation was needed in one case [12].

The microbiological aspects of this organism are of concern. *A. defectiva* requires specific growth factors, including vitamin B6, and is rarely isolated from clinical specimens, as is demonstrated by the literature [5-8]. Accordingly, because it is only rarely detected laboratory workers are likely to be unfamiliar with the microorganism. However, modern automated blood culture and MALDI-ToF/MS made it easier to cultivate and identify this bacterium. Actually, our literature review showed three of six cases, in which identification methods were specified, were identified by MALDI-ToF/MS (Table 1). Antimicrobial susceptibility data for *A. defectiva* is also limited. Generally speaking, *A. defectiva* associated infective endocarditis is less susceptible to penicillin, synergistically responds to beta-lactams or vancomycin with aminoglycosides and requires long-term combination therapy (4 to 6 weeks) [22]. As noted in Table 1, a combination of beta-lactams or vancomycin and aminoglycosides were administered to 12 of 15 cases, in which treatment regimens were specified.

In conclusion, *A. defectiva* infective endocarditis is rarely encountered. Because of the needs for urgent surgery and long-term antibiotic therapy and likely lack of laboratory experience of the organism, physicians and laboratory workers should pay close attention to possible cases with a Gram positive cocci blood culture result.

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REFERENCES

1. Giannakopoulos K, Zompolou C, Behnes M, Elmas E, Borggrefe M, Akin I. Infective endocarditis-a word of caution on non-typical bacteria. Eur Rev Med Pharmacol Sci 2016;20:4782-5.

2. Frenkel A and Hirsch W. Spontaneous development of L forms of streptococci requiring secretions of other bacteria or sulphydryl compounds for normal growth. Nature 1961;191:728-30.
3. Lainscak M, Lejko-Zupanc T, Strumbelj I, Gasparac I, Mueller-Premru M, Pirs M. Infective endocarditis due to *Abiotrophia defectiva*: a report of two cases. J Heart Valve Dis 2005;14:33-6.
4. Carleo MA, Del Giudice A, Viglietti R, Rosario P, Esposito V. Aortic valve endocarditis caused by *Abiotrophia defectiva*: case report and literature overview. In Vivo 2015;29:515-8.
5. Roberts RB, Krieger AG, Schiller NL, Gross KC. Viridans streptococcal endocarditis: the role of various species, including pyridoxal-dependent streptococci. Rev Infect Dis 1979;1:955-66.
6. Brouqui P and Raoult D. Endocarditis due to rare and fastidious bacteria. Clin Microbiol Rev 2001;14:177-207.
7. Raoult D, Casalta JP, Richet H, Khan M, Bernit E, Rovery C, et al. Contribution of systematic serological testing in diagnosis of infective endocarditis. J Clin Microbiol 2005;43:5238-42.
8. Doig F, Loewenthal M, Lai K, Mejia R, Iyengar A. Infective endocarditis: a Hunter New England perspective. Intern Med J 2018;48:1109-16.
9. Chowdhury S and German ML. Rare but not infrequent: infective endocarditis caused by *Abiotrophia defectiva*. Case Rep Infect Dis 2018;2018:5186520.
10. Rudrappa M and Kokatnur L. Infective endocarditis due to *Abiotrophia defectiva* and its feared complications in an immunocompetent person: rare, but real. J Glob Infect Dis 2017;9:79-81.
11. Planinc M, Kutlesa M, Barsic B, Rudez I. Quadruple-valve infective endocarditis caused by *Abiotrophia defectiva*. Interact Cardiovasc Thorac Surg 2017;25:998-9.
12. Escarcega E, Trovato C, Idahosa O, Gillard J, Stankewicz H. *Abiotrophia defectiva* endocarditis: an easy miss. Clin Pract Cases Emerg Med 2017;1:229-31.
13. Bhattacharya P, Mohammed A, Mizrahi E. Aorto-right ventricular fistula: a rare complication of Abiotrophia endocarditis. Oxf Med Case Reports 2017;2017:omx035.
14. Birlutiu V and Birlutiu RM. Endocarditis due to *Abiotrophia defectiva*, a biofilm-related infection associated with the presence of fixed braces: a case report. Medicine (Baltimore) 2017;96: e8756.
15. Bozkurt I, Coksevim M, Cerik IB, Gulel O, Tanyel E, Leblebicioglu H. Infective endocarditis with atypical clinical feature and relapse by *Abiotrophia defectiva*. J Saudi Heart Assoc 2017;29:136-8.
16. van Roeden S, Hartog H, Bongers V, Thijsen S, Sankatsing S. (18)F-FDG-PET scanning confirmed infected intracardiac device-leads with *Abiotrophia defectiva*. Case Rep Cardiol 2016;2016: 6283581.
17. Rhodes HM, Hirigoyen D, Shabnam L, Williams DN, Hansen GT. Infective endocarditis due to *Abiotrophia defectiva* and Granulicatella spp. complicated by infectious intracranial cerebral aneurysms: a report of three cases and review of the literature. J Med Microbiol 2016;65:493-9.
18. Park S, Ann HW, Ahn JY, Ku NS, Han SH, Hong GR, et al. A case of infective endocarditis caused by *Abiotrophia defectiva* in Korea. Infect Chemother 2016;48:229-33.
19. Mouyis K, Metaxa S, Missouris C. *Abiotrophia defectiva* endocarditis complicated by ventricular tachycardia. J Heart Valve Dis 2016;25:114-5.
20. Botta L, Merati R, Vignati G, Orcese CA, De Chiara B, Cannata A, et al. Mitral valve endocarditis due to *Abiotrophia defectiva* in a 14th week pregnant woman. Interact Cardiovasc Thorac Surg 2016;22:112-4.
21. Fukui Y, Aoki K, Okuma S, Sato T, Ishii Y, Tateda K. Metagenomic analysis for detecting pathogens in culture-negative infective endocarditis. J Infect Chemother 2015;21:882-4.
22. Sinner SW and Tunkel AR. Viridans Streptococci, Nutritionally Variant Streptococci, Groups C and G Streptococci, and Other Related Organisms. In: Bennet JE, Dolin R, Blaser MJ, eds. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. 8th ed. Philadelphia, PA: Elsevier Saunders, 2015:2349-61.

=국문초록=

건강 성인에서의 *Abiotrophia defectiva*에 의한 심내막염과 문헌고찰

양산부산대학교병원 [1]흉부외과, [2]진단검사의학과

제형곤[1], 송두열[2], 장철훈[2]

Abiotrophia defectiva 심내막염은 매우 드물다. 심한 호흡곤란과 폐부종을 호소하는 67세 남자가 지역 병원에서 전원되어 왔다. 술 전에 시행한 경흉벽 심에코검사에서 심한 승모판 역류와 큰 증식증을 보였다. 혈액배양에서 그람양성 영양요구성 사슬알균인 *A. defectiva*가 자랐다. 환자는 응급으로 승모판 치환술을 받고 6주간의 복합 항균제(vancomycin, ampicillin, and gentamicin) 치료로 완전히 회복되었다. 이와 같은 환자는 응급 수술과 장기간의 항균제 치료가 필요하지만 임상 의사와 검사실 근무자가 이 세균에 대한 경험이 적으므로, 혈액배양에서 그람양성 세균이 나오면 이 세균일 가능성을 주의 깊게 검토해야 한다. [Ann Clin Microbiol 2019;22:23-27]

교신저자 : 장철훈, 50612, 경남 양산시 물금읍 금오로 20
양산부산대학교병원 진단검사의학과
Tel: 055-360-1877, Fax: 055-360-1880
E-mail: cchl@pusan.ac.kr