Clinical significance of non-diphtheria corynebacterium in geriatric patients

Geriatrik hastalarda difteri olmayan korineform bakterilerin klinik önemi

Corynebacterium

Arzu İrvem
Umraniye Training and Research Hospital, Istanbul, Turkey

Öz

Amaç: Difteri olmayan Korinebakteriumlar; Difteroidler ve Korineformlar, genellikle kolonize yada kontamine olarak değerlendirilirler. Hastanemizin mikrobiyoloji laboratuvarında izole edilen korineform bakterileri hastanın klinik durumu ile birlikte değerlendirerek bu bakterilerin klinik önemini vurgulamayı amaçlıyoruz. Gereç ve Yöntem: Hastanemizin Tıbbi Mikrobiyoloji Laboratuvarına gönderilen çeşitli klinik örnekler Gram boyalı prepatlar ve kültür ekimi ile değerlendirildi. Gram boya mikroskopik incelemesinde polimorfonükleer nötrofiller ve Gram pozitif basiller görülmesi ile kültür plağında saf ve dominant üreme etken olarak değerlendirildi. Kan kültüründe 2 kez yada daha fazla aynı etken üremesi enfeksiyöz ajanlar olarak kabul edilirken, bu kriterlerin karşılanmadığı örnekler kontaminasyon veya kolonizasyon olarak rapor edildi. Hastaların yaş ortalaması 68.46 (47 ile 89 arasında) idi. C. jeikeium, 3 hastadan alınan kan kültürlerinden izole edildi. C. striatum, iki hastanın yara kültürlerinden, iki hastanın bronşiyal aspiratlarında ve bir hastanın kan kültürlerinden izole edildi. C. urealiticum iki hastanın idrar kültüründe (105Cfu/ml) izole edildi. C. amycolatum bir hastanın yarasında, C. minutissimum iki hastanın yarası, bir hastanın kulağı ve bir hastanın kateterinden izole edildi. Bulgular: Hızlı taksonomik değişiklikler nedeniyle Korinebakterium türlerinin belirlenmesi zor olabilir. Bu mikroorganizmaların duyarlılık testleri henüz standart değildir. Ancak giderek artan klinik önemi nedeniyle bu bakteriler hakkındaki veriler toplanmaktadır. Difteri olmayan Korinebakteriumlar özellikle geriatric hastalarda ciddi enfeksiyonlara neden olan önemli patojenler olarak ortaya çıkmıştır.

Anahtar Kelimeler

Korineform Bakteriler; Geriatrik Hastalar

Abstract

Aim: Non-diphtheria corynebacteria are referred as diphtheroid and coryneform, and can be considered as 'colonizers' and contaminants. We aim to evaluate the coryneform bacteria isolated in our hospital's microbiology laboratory together with the patient's clinical status. Material and Method: Various clinical samples sent to our hospital's Medical Microbiology Laboratory were Gram stained and cultured in agars. The strains with polymorphonuclear neutrophils and gram-positive bacilli on Gram stain, dominant or absolute growth in culture and growth in the repeated blood cultures were regarded as infectious agents while bacterial growths are not completing those criteria were reported as contamination or colonization. The mean age of the patients was 68.46 (between 47 and 89). C. jeikeium was isolated from blood cultures from 3 patients. C. striatum was isolated from wound cultures of 2 patients, in the bronchial aspirates of 2 patients and in the blood cultures of 1 patient. C. urealyticum was isolated from pre-diagnosed cystitis from 2 patients (105Cfu/ml). C. amycolatum was isolated from wound cultures of 1 patient, and C. minutissimum was isolated from 2 patient's wounds, one patient's ear and one patient's catheter and wound. Result: Identification of Corynebacterium species can be difficult because of rapid taxonomic changes. Susceptibility testing of these micro-organisms is not yet standardized. However because of their growing clinical importance, data on these bacteria are accumulating. Non-Diphtheria corynebacteria have emerged as important pathogens causing many serious infections.

Keywords

Corynebacterium; Geriatric Patients

DOI: 10.4328/JCAM.5132 Received: 05.06.2017 Accepted: 26.06.2017 Printed: 01.12.2017 J Clin Anal Med 2017;8(suppl 4): 381-4
Corresponding Author: Arzu İrvem, Umraniye Training and Research Hospital. Istanbul. Turkey.
GSM: +905323025705 E-Mail: arzuirvem93@gmail.com

Introduction

Corynebacterium species, or "diphtheroids", are aerobic, non-spore forming, pleomorphic, Gram-positive bacilli. Non-diphtheria corynebacteria are referred to as diphteroids and coryneforms and can be considered as 'colonizers' and contaminants [1,2]. Nevertheless, the ability of these bacteria to cause life-threatening disease is well established, and over the last decade, there have been increasing reports of their pathogenic potential in numerous clinical scenarios. Including bacteremia and endocarditis [1]. Several species such as ***C. xerosis, C. amycolatum, C. striatum, C. minutissimum, C. pseudodiphtheriticum, C. matruchotii, C. aquaticum, C. genitalium***, and ***C. pseudogenitalium*** have been related to human infections. Coryneform bacteria exist commensally in the soil, water, human, and animal mucosa and on the skin. Coryneform bacteria other than Corynebacterium diphtheria are often isolated from clinical samples and regarded as contamination. However, after they began to be identified, it has been realized that they are an agent of important infection of geriatric patients and hospital infections. This study aims to emphasize the clinical significance of coryneform bacteria and to draw attention to the problems arising in microbiological diagnosis because coryneform bacteria mostly are not considered as contamination and ruled out. It is quite difficult to determine whether this bacterium is an agent or contaminant; We aim to evaluate the coryneform bacteria isolated in our hospital's microbiology laboratory together with the patient's clinical status.

Material and Method

Various clinical samples sent to our hospital's Medical Microbiology Laboratory were Gram stained, and cultured in agars. The strains with polymorphonuclear neutrophils and Gram-positive bacilli on Gram stain, dominant or absolute growth in culture and growth in the repeated blood cultures were regarded as infectious agents while bacterial growths are not completing those criteria were reported as contamination or colonization. Isolates of Corynebacterium obtained from catheters (≤15 CFU by the rollingplate method), urine culture (>105 CFU/mL) and predominant culture from wound exudates and bronchial aspirates were considered potentially significant. Identification of the agents at stain level was performed with Vitek MS (bioMerieux, France) system.

Results

The mean age of the patients was 68.46 (between 47 and 89). ***C. jeikeium*** was isolated from blood cultures from 3 patients. ***C. striatum*** was isolated from wound cultures of 2 patients, in the bronchial aspirates of 2 patients and in the blood cultures of 1 patient. ***C. urealyticum*** was isolated from pre-diagnosed cystitis from 2 patients. ***C. amycolatum*** was isolated wound cultures of 1 patient, and ***C. minutissimum*** was isolated from 2 patient's wounds, 1 patient's ear and 1 patient's catheter and wound (Table 1).

Discussion

After much discussion and confusion about their clinical significance, coryneforms have emerged as important pathogens [3]. It is quite difficult to determine whether this bacterium is an agent or contaminant; It must be taken into consideration that coryneform bacteria, which are generally regarded as contamination and as diphtheroids in gram staining, can be an opportunistic pathogen in patients with risk factors such as a compromised immune system and staying in the intensive care unit in addition to a long-term antibiotic treatment history. That the same coryneform bacterium grew in more than one clinical sample and that dense granular leukocyte or intensive shaped leukocyte and coryneform bacteria were seen in Gram staining is an indication that this situation can be clinically significant.

C. striatum survives as a saprophyte on the skin and mucous membranes of asymptomatic individuals. Corynebacterium striatum is an agent of endocarditis and pneumonia and infects surgical wounds. Many hospital-acquired epidemics and osteomyelitis are caused by C. striatum [4]. In addition, meningitis [5], shunt infection [6], endocarditis [7] and peritonitis [8], keratitis [9] cases have been reported [10,11,12]. In a study by Renom et al., ***C. striatum*** was isolated from the sputum samples of 21 patients with a chronic obstructive respiratory disease, and it was reported hat this isolate can colonize the respiratory tracts of chronic obstructive respiratory disease patients and causes hospital-acquired infections by spreading from person to person [12]. Similarly, Tarr et al. detected ***C. striatum*** growth in the bronchoalveolar lavage (BAL) and sputum cultures of a 58-year-old male patient diagnosed with bilateral pneumonia three months after undergoing a heart transplantation; they showed that the pneumonia was reduced after four weeks of vancomycin treatment. While ***C. striatum*** growth is mostly regarded as contamination, one study indicated that it can be considered a pathogen in immunocompromised patients with a prolonged hospitalization history undergoing long-term antibiotic treatment [13]. In general, cell renewal decelerates in geriatric patients, and they tend to be open to various infections. Reunes et al. found the Corynebacterium spp. isolation rate to be 0.6% (1/155) in a study conducted on geriatric patients with bloodstream infections [14]. The agent must be identified at type level in case bacterial growth occurs in blood cultures taken in at least two different periods. That these bacteria were isolated from the respiratory tract and blood samples simultaneously and that the same agent was detected in repeated blood samples for analyzing the bacteremia accompanying the pneumonia observed in one patient made us think that ***C. striatum*** is highly likely to be the agent. Proven infections have been found most commonly in the setting of immunocompromised patients with respiratory infections, recurrent or continuous instrumentation, chronic ulcers or surgery [11,15]. The nosocomial person-to-person spread has been documented twice [16]. Septic arthritis has been reported in the setting of joint replacement surgery and after accidental scalpel laceration [17]. In the case reported here, several factors enhanced the patient's risk of infection with ***C. striatum***, including an immune system compromised by age and failing health, prolonged institutionalization, the presence of chronic ulcers, the occurrence of pneumonia, a reported blunt trauma to the knee when he fell, and osteoarthritis in the involved knee [2,11,15,18]. In this case, the infecting organism is most likely to have gained access to the patient's circulation either through the respiratory tract, perhaps during his pneumonia, or through his persistent and

Table 1. Clinical distribution of patients

Case	Gender	Age	Patient's diagnosis	Clinic	Culture material	Bacterial growth	The number of sets where growing occurred
1	F	64	Lower respiratory tract infection	Intensive Care Unit	Tracheal aspirate 100.000 cfu/ml	C. striatum (Leukocytes and gram-positive bacilli)	
2	M	78	Lower respiratory tract infection	Intensive Care Unit	Tracheal aspirate 100.000 cfu/ml	C. striatum (Leukocytes and gram-positive bacilli)	
3	F	74	Lower respiratory tract infection	Intensive Care Unit	sputum	C. striatum (Leukocytes and gram-positive bacilli)	
4	M	82	DM + soft tissue infection	Infectious Diseases	Wound	C. striatum (agent) (Abundant leukocytes, gram-positive bacilli)	
5	M	62	Acute lymphadenitis	General Surgery	Wound	C. striatum (agent) (Abundant leukocytes, gram-positive bacilli)	
6	F	88	Bowel bypass anastomosis	Surgery site infection	Blood	C. striatum (agent)	2
7	M	47	Lung malignancy	Pulmonology	Blood	C. jeikeium(agent?)	1
8	F	67	DM+ diabetic foot	Internal Diseases	Blood	C. jeikeium (agent?)	1
9	F	89	Pneumonia	Pulmonology	Blood	C. jeikeium (agent?)	1
10	F	66	Cystitis	Urology	Urine	C. urealyticum (agent) 10^5 cfu/ml growth	
11	M	49	Soft tissue infection	Urology	Wound	C. amycolatum (agent) (Abundant leukocytes, gram-positive bacilli)	
12	M	68	DM + osteomyelitis	Infectious Diseases	Wound Culture	C. minutissimum (agent)	
13	F	55	Otitis media	Ear Nose and Throat (ENT)	Ear	C. minutissimum (agent) (Rare leukocytes, epithelial cells, gram-positive bacilli)	
14	F	63	DM + diabetic foot	Infectious Diseases	Wound	C. minutissimum (agent) (Abundant leukocytes, gram-positive bacilli)	
15	F	75	Coronary failure, soft tissue infection	Internal Diseases	Catheter + Wound	C. minutissimum (agent) (Leukocytes and gram-positive bacilli)	

open venostasis ulcers. This case highlights both the growing importance of C. striatum as a nosocomial pathogen, and the difficulty microbiology laboratories may encounter when trying to identify this species. It is likely that the number and range of clinically important infections with this organism have been underestimated. The first recognized spontaneous infection of a natural joint with ***C. striatum*** is reported here, in our study, was isolated from three patients with pulmonary infections, tracheal aspirates were identified as causative pathogen. One patient was isolated from the Diabetic foot wounds. It was isolated from a patient with acute lymphadenitis. Also, a patient has also caused a surgical site infection (Table 1).

C. jeikeium colonizes especially the skin floras of the inguinal, axillar and rectal areas of hospitalized patients. It is evaluated as contamination, but it also plays a role as a slightly pathogenic agent. Various infections caused by ***C. jeikeium*** are septicemia, meningitis, peritonitis, foreign body infections, osteomyelitis, pneumonitis, and endocarditis. ***C. jeikeium*** causes hematologic and catheter infections. Infections are mostly observed in patients with nosocomial infections, those with malignity and neutropenia and in patients who are hospitalized for a prolonged duration [19,20,21,22]. Since it has become possible to identify these isolates, there has been an increase in the occurrence rates of these bacteria [2].

In our study, two geriatric and immunosuppressed patients who had a pulmonary infection had growth on their blood culture. It has also been isolated from diabetic foot wounds (Table 1).

C. amycolatum causes endocarditis, pneumonia, and skin, soft tissue, and catheter infections. It also causes urinary tract infection and the development of kidney stones because of the strong activity of its urease enzyme. In our study, one patient was isolated from the wound tissue of a patient with soft tissue infection (Table 1).

C. urealyticum is a urinary system pathogen and causes the occurrence of kidney stones by producing strong urease. In our study, urinary tract infection was seen as affecting (Table 1).

C. minutissimum causes erythrasma infection in healthy people by colonizing the skin. Although this infection is most frequently formed by ***C. minutissimum***, it can also be caused by other Corynebacterium species. ***C.minutissimum*** can also be an agent of endocarditis, catheter infection, and peritonitis in peritoneal dialysis patients. Invasive ***C. minutissimum*** infection usually occurs in immunocompromised patients and/or patients with skin disruption due to surgery or indwelling devices, such as a central venous catheter or a peritoneal dialysis catheter [23,24]. Although the source of infection was unknown, skin disruption by surgery and a drainage catheter might have contributed to the development of invasive ***C. minutissimum*** infection in this patient. In conclusion, given an increasing number of cases with ***non-diphtheria Corynebacterium*** as an agent of serious opportunistic infection in immunocompromised patients and the more common use of indwelling devices causing a breach in the skin barrier [24,25]. Clinicians would be wise to keep this organism in mind as a rare cause of post-surgical abdominal infection. In our study, it was isolated as an osteomyelitis-affecting effect in a diabetic patient. It was also isolated from a diabetic

foot wound. It was isolated in a wound and catheter culture of a patient with coronary artery insufficiency. Otitis media was also seen as effective (Table 1).

Identification of ***Corynebacterium*** species can be difficult because of rapid taxonomic changes. Susceptibility testing of these micro-organisms is not yet standardized. However because of their growing clinical importance, data on these bacteria are accumulating. After decades of confusion on their clinical significance, non-diphtheria corynebacteria have emerged as important pathogens causing many serious infections.

Conflict of Interest

No conflict of interest was declared by the authors.

Financial Disclosure

The authors declared that this study had received no financial support.

Human Rights Statement

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Animal Rights Statement

Nonapplicable.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

References

1. Mandell GL, Bennet JE, Dolin R (eds): Principles and Practice of Infectious Diseases, 5th ed. Philadelphia: Churchill Livingstone 2000; 2198 – 208.
2. Funke G, Von Graevenitz A, Clarridge JE, III, Bernard KA. Clinical microbiology of coryneform bacteria. Clin Microbiol Rev 1997; 10: 125-59.
3. Bayram A, Eksi F, Balci I. Resistance problem of Coryneform bacteria isolated from intensive care unit samples. Research J Microbiol 2006; 1: 136-41.
4. Cone LA, Curry N, Wuestoff MA, O'Connell SJ, Feller JF. Septic synovitis and arthritis due to ***Corynebacterium striatum*** following an accidental scalpel injury. Clin Infect Dis 1998; 27: 1532-3.
5. Weiss K, Labbe AC, Laverdie M. ***Corynebacterium striatum*** meningitis: case report and review of an increasingly important Corynebacterium species. Clin Infect Dis1996; 23: 1246-8.
6.Hoy CM, Kerr K, Livingston JH. Cerebrospinal fluid shunt infection due to Corynebacterium striatum. Clin Infect Dis 1997; 25: 1486-7.
7. Melero-Bascones M, Munoz P, Rodriguez-Creixems M, Bouza E. ***Corynebacterium striatum***: An undescribed agent of pacemaker related endocarditis. Clin Infect Dis 1996; 22: 576-7.
8. Bhandari S, Meigh JA, Sellars L. CAPD peritonitis due to ***Corynebacterium striatum***. Perit Dial Int 1995; 15: 88-9.
9. Rubinfeld RS, Cohen EJ, Arentsen JJ, Laibson PR. Diphtheroids as ocular pathogens. Am J Ophthalmol 1989; 108: 251-4.
10. Creagh RJM, Saavedra FJ, Rodriguez P, Merino D. Pneumonia caused by ***Corynebacterium striatum*** in a patient with AIDS. Enferm Infecc Microbiol Clin 2000; 18: 297-8.
11. Otsuka Y, Ohkusu K, Kawamura Y, Baba S, Ezaki T, Kimura S. Emergence of multidrug-resistant ***Corynebacterium striatum*** as a nosocomial pathogen in long-term hospitalized patients with underlying diseases. Diagn Microbiol Infect Dis 2006; 54: 109-14.
12. Renom F, Garau M, Rubí M, Ramis F, Galmés A, Soriano JB. Nosocomial outbreak of ***Corynebacterium striatum*** infection in patients with chronic obstructive pulmonary disease. J Clin Microbiol 2007; 45: 2064-7.
13. Tarr PE, Stock F, Cooke RH, Fedorko DP, Lucey DR. Multidrug resistant ***Corynebacterium striatum*** pneumonia in a heart transplant recipient. Transplant. Infect. Dis. 200; 5: 53-8.
14. Reunes S, Rombaut V, Vogelaers D, Brusselaers N, Lizy C, Cankurtaran M et al. Risk factors and mortality for nosocomial bloodstream infections in elderly patients. Eur J Intern Med 2011; 22: 39-44.
15. Martı´n MC, Melon O, Celada MM, Alvarez J, Mendez FJ, and Vazquez F. Septicaemia due to ***Corynebacterium striatum***: molecular confirmation of entry via the skin. J Med Microbiol 2003; 52: 599-602.
16. Brandenburg AH, Van Belkum A, Van Pelt C, Bruining HA, Mouton JW, Verbrugh HA. Patient-to-patient spread of a single strain of ***Corynebacterium striatum*** causing infections in a surgical intensive care unit. J Clin Microbiol 1996; 34: 2089-94.
17. Roux V, Drancourt M, Stein A, Riegel P, Raoult D, La Scola B. Corynebacterium species isolated from bone and joint infections identified by 16S rRNA gene sequence analysis. J Clin Microbiol 2004; 2231-3.
18. Esterhai JR, Gelb I. Adult septic arthritis. Orthop Clin N Am 1991; 22:503-14.
19.Soriano F, Rodriguez-Tudela JL, Fernandez- Roblas R, Aguado JM, Santamaria M. Skin colonization by Corynebacterium groups D-2 and JK in hospitalized patients. J Clin Microbiol 1988; 26: 1878-80.
20. Boc SF, Martone JD. Osteomyelitis caused by ***Corynebacterium jeikeium.*** J Am Podiatr Med Assoc 1995; 85: 338-9.
21.Wang CC, Mattson D, Waid A. ***Corynebacterium jeikeium*** bacteremia in bone marrow transplant patients with Hickman catheters. Bone Marrow Transplant 2001; 27: 445-9.
22.Van Bosterhaut B, Cuvelier R, Serruys E, Pouthier F, Wausters G. Three cases of opportunistic infection caused by propionic acid producing ***Corynebacterium minutissimum***. Eur J Clin Microbiol Infect 1992; 11: 628-31.
23. Bandera A, Gori A, Rossi MC, Degli Esposti A, Ferrario G, Marchetti G, Tocalli L, Franzetti F. A case of costochondral abscess due to ***Corynebacterium minutissimum*** in an HIV-infected patient. J Infect 2000; 41: 103-5.
24. Dalal A, Likhi R. ***Corynebacterium minutissimum*** bacteremia and meningitis: a case report and review of litera. J Infect 2008; 56: 77-9.25. Eshwara VK, Munim F, Shetty A, Gupta A, Nitin J, Mukhopadhyay C. ***Corynebacterium minutissimum*** infecting pseudomeningocele: a rare case. J Microbiol Immunol Infect 2014; 47: 149-51.

How to cite this article:
İrvem A. Clinical Significance of Non-Diphtheria Corynebacterium in Geriatric Patients. J Clin Anal Med 2017;8(suppl 4): 381-4.