

Sudden death due to infective endocarditis caused by *Streptococcus constellatus*: A case report

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Abstract. Infective endocarditis (IE) is a relatively uncommon disease, but has been challenging to diagnose over the years. With the increasing incidence, variety of causative agents and the resistance of microorganisms towards antibiotics, there is still an occurrence of sudden death due to undiagnosed IE. The most common microorganism causing IE is *Staphylococcus aureus*. However, there is increasing prevalence of other microorganisms causing IE. This case report highlights a case of sudden death due to IE caused by a rare pathogen, *Streptococcus constellatus* which belongs to the *Streptococcus anginosus* group (Milleri group). A study noted the crude incidence of IE in 6 world regions ranged between 1.5 and 11.6 cases per 100,000 people. To date, there has been no previous report on sudden death due to IE caused by *Streptococcus constellatus* in Malaysia, neither in the forensic nor clinical setting. This case report underlined the characteristics and pathological features of this microorganism. The increasing incidence and variety of causative organisms in IE are important public health issues. It is vital for future studies to examine the risk factors of IE related to *Streptococcus constellatus*, to enhance better understanding, insight and awareness regarding the course of this disease. This in turn may facilitate preventive measures to avoid morbidity and mortality from this condition.

INTRODUCTION

Infective endocarditis (IE) is a serious infection occurring on the endothelial surfaces of the heart, especially at the valves. Oral commensal bacteria are the important causative agents in this disease. Common dental procedures, even non-surgical ones can often cause bacteremia of oral commensals. IE is an uncommon but potentially lethal disease with a high mortality rate. The estimated annual incidence ranges from 2 to 7.9 per 100,000 individuals per year (Hoen *et al.*, 2002; Que *et al.*, 2011) with a short-term mortality of 10% to 30% (Hasbun *et al.*, 2003). The microorganisms causing this disease are variable due to their different ports of entry

and characteristics (Kasper *et al.*, 2016). The nature and characteristics of IE have evolved from the past with the discovery of increasing number of new species of the causative microorganisms. The course of this disease is often acute in nature and there have been challenges in diagnosing IE (Murdoch *et al.*, 2009). Delayed diagnosis and presence of its complications may lead to poor outcome for the patients. A group of expert did a systematic review of the literature regarding IE in 6 world regions involving 10 countries and noted the crude incidence of IE ranged between 1.5 and 11.6 cases per 100,000 people (Bin Abdulhak *et al.*, 2014). In this case report, we highlighted a rare cause of IE among the *Streptococcus* species, which is *Streptococcus constellatus*. To date, in

Malaysia, there is no case reported regarding the mortality of IE cause by *Streptococcus constellatus*.

CASE REPORT

History

A 44 years old Chinese male was found dead and brought to mortuary for autopsy. History available revealed that the deceased was a vagabond with poor social support. There was no history of known medical illness and absence of information from family members.

Autopsy Findings

The autopsy external examination revealed facial and upper chest congestion. Intraorally, the body presented with natural teeth with no evidence of dental prostheses. The maxillary arch exhibited anterior edentulousness with a retained root of right maxillary canine and second molar teeth. Left maxillary second molar root was also noted. Root stumps were noted in all regions of the mandibular arch, (Figure 1). Intraosseous radiolucency mesial to right mandibular second molar indicated a periapical lesion as a result from the odontogenic inflammation (Figure 2). The gingiva and canal roots showed signs of general odontogenic inflammation and the oral hygiene was unkempt. There were no needle marks noted over all limbs.

The heart weighed 590 grams, was globular in shape and dusky in appearance. Epicardial surface was smooth. The left ventricle and right ventricle were both

dilated and have thin wall measuring 11 mm and 2 mm respectively. The left atrial wall showed localized, reddish, vegetative growth (Figure 3A) measuring 4.0 x 4.0 cm. The mitral valve showed the presence of vegetation (Figure 3B) measuring 2.0 x 2.5 cm. The liver weighed 2,160 gram and cut



Figure 1. Root stumps noted in the anterior region of the mandible.



Figure 2. Post-mortem CT image shows radiolucency indicated periapical lesion mesial to right mandibular second molar.

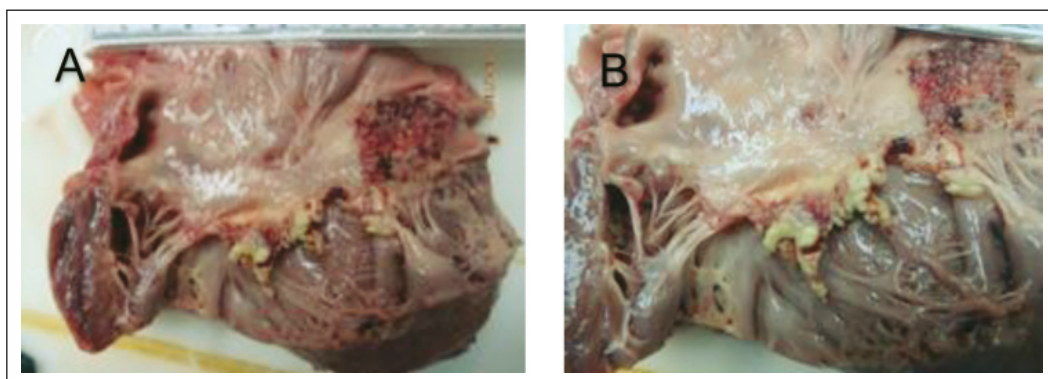


Figure 3. (A) The gross appearance of the left atrial wall showed localised vegetation. (B) Presence of vegetation over the left mitral valve.

sections showed chronic passive venous congestion. There were no other significant findings found in all other organs.

Histopathology Examination of The Heart

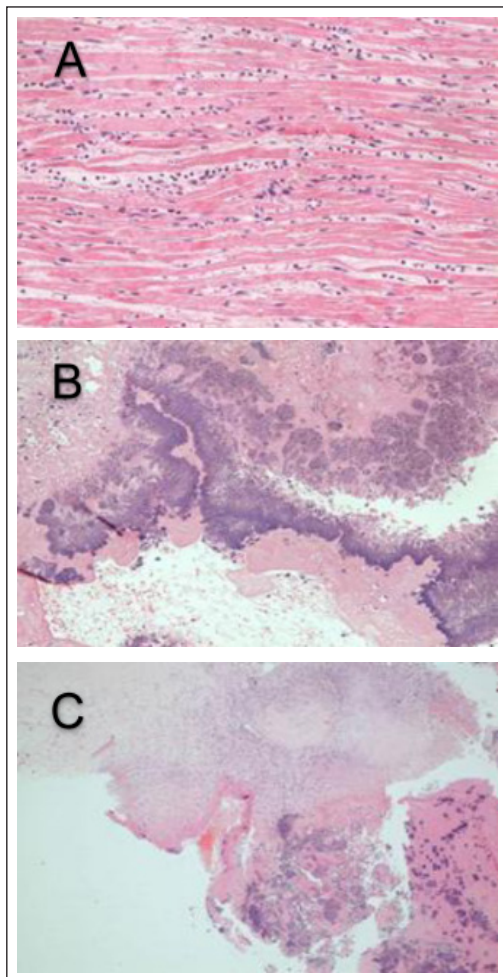


Figure 4. (A) Sections of the heart showed areas with acute inflammatory cell infiltration. (B) Vegetation at left atrial wall (yellow arrow) and (C) vegetation at mitral valve (yellow arrow).

Investigations

Blood culture and sensitivity showed *Streptococcus constellatus* spp. *pharyngis*.

DISCUSSION

There have been a lack of data on the incidence of IE in Southeast Asia, but in the

United States of America, the incidence of IE has increased from 11 per 100,000 population to 15 per 100,000 population (Whiley *et al.*, 1992; da Silva *et al.*, 2004). A population-based observational study in France was carried out and reported 33.8 cases of IE annually (Yoshino *et al.*, 2013). The incidence was highest in men aged 75 to 79 years and the majority of patients had no known prior heart disease. Healthcare associated IE accounted for 27 percent all cases (Yoshino *et al.*, 2013).

In another study in USA, there was a comparison study of the trend of IE in high income countries and low-income countries. The number of cases related to degenerative valvulopathy, prosthetic valves, and cardiovascular implantable device, had increased compared to cases related to prior rheumatic heart disease in the high income countries (Byramji *et al.*, 2011). Infections in non-valvular IE are commonly caused by *Streptococcus* species, mostly *S. viridans*, associated with dental procedure (Wilson *et al.*, 2007).

The number of cases related to nosocomial and non-nosocomial infection have also risen as that caused by Staphylococci. However, rheumatic heart disease remained as the main risk factor for IE in and Streptococci as the frequent causative organism in low income country (Byramji *et al.*, 2011). The scenario of IE in the Southeast Asia region has been poorly studied.

IE may be subclassified into acute and subacute forms. Acute endocarditis is characterized by high grade fever associated with rapid cardiac damage and metastatic infection with extracardiac sites via the circulatory system. Without proper treatment, death can occur within weeks. Subacute endocarditis is more slowly progressive unless complications such as a mycotic aneurysm arise (Slipczuk *et al.*, 2013). One of the difficulties in IE treatment lies in the complete eradicating of septic loci, as responsible organisms may lie deep within vegetations and antibiotic resistance is increasing (Strom *et al.*, 2000). The clinical characteristics of infective endocarditis have changed significantly, with increased

age at onset and some recent studies reporting that the most common etiological agent is *S. aureus* (Strom *et al.*, 2000).

The risk factors of IE can be classified into host- or procedure-related. Cardiac valvular abnormalities are well recognized as host-related risk factors. Other previously cited host-related risk factors include chronic alcoholism, meningitis, and diseases with accompanying disorders of immunity, such as systemic lupus erythematosus, diabetes, and inflammatory bowel disease. There is increased risk among dentulous cases infected with dental flora and reduced risk among those who floss daily, which suggests beneficial effects from hygienic oral practices, especially for those at high risk for IE (Strom *et al.*, 2000).

This case report highlighted the pathological feature of the disease from the autopsy and the risk factor of the deceased that caused IE. With that, we hope we can learn more about the course of this disease and the micro-organism. In this case, the deceased came from low socioeconomic background since the deceased being homeless. There was limitation in obtaining detailed past medical history of the deceased, since we were unable to trace his next of kin and/or friends.

The clinical symptoms of IE caused by *Streptococcus constellatus* are non-specific, including fever and other symptom such as cough and malaise. Cardiac complications of IE including heart failure and perivalvular abscess are the most common in IE caused by *Streptococcus constellatus*, reported from other previously documented cases. This suggests that this pathogen is highly invasive towards the heart tissues (Strom *et al.*, 2000).

From the post mortem examination, we noted that the general hygiene of the deceased was poor. Further oral examination revealed that the dentition was unkempt, with obvious inflammation of the gingiva and root canal. The vegetations seen at the mitral valve and atrial wall were classical appearance of that for IE. There were no other pathological findings from the post mortem examination, nor was there any evidence for another source of infection. The source of the infection for

the deceased is most likely from the oral mucosa. However, there was limitation in determining the duration of the infection as there was no information available on the deceased past medical or dental record. If we know the medical history of the deceased and his condition was diagnosed and treated early, he may have higher survival chance as there was good prognosis for infective endocarditis caused by this same micro-organism if intervention was done early (Concistrè *et al.*, 2012). Complication of this disease affects the prognosis significantly and the mortality rate of overall causative organism is 14.5% (Slipczuk *et al.*, 2013). However, there was no previous reports on overall mortality of infective endocarditis caused by *Streptococcus constellatus*.

CONCLUSION

The increasing incidence and variety of causative organisms in IE are important public health issues. Given that more recently, many micro-organisms have developed resistance towards existing antibiotics, it is now becoming more challenging for the healthcare providers to effectively treat IE. It is vital for future studies to examine the risk factors of IE related to *Streptococcus constellatus*, to enhance better understanding, insight and awareness regarding the course of this disease. This in turn may facilitate preventive measures to avoid morbidity and mortality from this condition.

REFERENCES

- Bin Abdulhak, A.A., Baddour, L.M., Erwin, P.J., Hoen, B., Chu, V.H., Mensah, G.A. & Tleyjeh, I.M. (2014). Global and Regional Burden of Infective Endocarditis, 1990–2010. *Global Heart* **9**: 131-143.
- Byramji, A., Gilbert, J.D. & Byard, R.W. (2011). Sudden Death as a Complication of Bacterial Endocarditis. *The American Journal of Forensic Medicine and Pathology* **32**: 140-142.

- Concistrè, G., Chiaramonti, F., Miceli, A. & Glauber, M. (2012). Mitral and aortic valve endocarditis caused by a rare pathogen: *Streptococcus constellatus*. *Interactive Cardiovascular and Thoracic Surgery* **14**: 889-890.
- da Silva, R.M., Caugant, D.A., Josefsen, R., Tronstad, L. & Olsen, I. (2004). Characterization of *Streptococcus constellatus* Strains Recovered From a Brain Abscess and Periodontal Pockets in an Immuno-compromised Patient. *Journal of Periodontology* **75**: 1720-1723.
- Hasbun, R., Vikram, H.R., Barakat, L.A., Buenconsejo, J. & Quagliarello, V.J. (2003). Complicated Left-Sided Native Valve Endocarditis in Adults. *JAMA* **289**: 1933.
- Hoen, B., Alla, F., Selton-Suty, C., Béguinot, I., Bouvet, A., Briançon, S., Casalta, J.-P., Danchin, N., Delahaye, F., Etienne, J., Moing, V.L., Lepout, C., Mainardi, J.-L., Ruimy, R., Vandenesch, F., Group for the Association pour l'Etude et la Prévention de l'Endocardite Study, Infectieuse (AEPEI) Study. (2002). Changing Profile of Infective Endocarditis: Results of a 1-Year Survey in France. *JAMA* **288**: 75.
- Kasper, D.L., Fauci, A.S., Hauser, S.L., Longo, D.L., Jameson, J.L. & Loscalzo, J. (Eds.). (2016). *Harrison Manual of Medicine* (19th ed.). United States of America: McGraw-Hill Education.
- Murdoch, D.R., Corey, G.R., Hoen, B., Miró, J.M., Fowler, V.G., Bayer, A.S., Karchmer, A.W., Olaison, L.P., Pappas, P.A., Moreillon, P., Chambers, S.T., Chu, V.H., Falcó, V., Holland, D.J., Jones, P., Klein, J.L., Raymond, N.J., Read, K.M., Tripodi, M.F., Utili, R., Wang, A., Woods, C.W., Cabell, C.H., International Collaboration on Endocarditis-Pro prospective Cohort Study (ICE-PCS) Investigators. (2009). Clinical Presentation, Etiology, and Outcome of Infective Endocarditis in the 21st Century. *Archives of Internal Medicine* **169**: 463.
- Que, Y.-A. & Moreillon, P. (2011). Infective endocarditis. *Nature Reviews Cardiology* **8**: 322-336.
- Slipczuk, L., Codolosa, J.N., Davila, C.D., Romero-Corral, A., Yun, J., Pressman, G.S. & Figueredo, V.M. (2013). Infective Endocarditis Epidemiology Over Five Decades: A Systematic Review. *PLoS One* **8**: e82665.
- Strom, B.L., Abrutyn, E., Berlin, J.A., Kinman, J.L., Feldman, R.S., Stolley, P.D., Levison, M.E., Korzeniowski, O.M. & Kaye, D. (2000). Risk factors for infective endocarditis: oral hygiene and nondental exposures. *Circulation* **102**: 2842-2848.
- Whiley, R.A., Beighton, D., Winstanley, T.G., Fraser, H.Y. & Hardie, J.M. (1992). *Streptococcus intermedius*, *Streptococcus constellatus*, and *Streptococcus anginosus* (the *Streptococcus milleri* group): association with different body sites and clinical infections. *Journal of Clinical Microbiology* **30**: 243-244.
- Wilson, W., Taubert, K.A., Gewitz, M., Lockhart, P.B., Baddour, L.M., Levison, M., Bolger, A., Cabell, C.H., Takahashi, M., Baltimore, R.S., Newburger, J.W., Strom, B.L., Tani, L.Y., Gerber, M., Bonow, R.O., Pallasch, T., Shulman, S.T., Rowley, A.H., Burns, J.C., Ferrieri, P., Gardner, T., Goff, D. & Durack, D.T. (2007). Prevention of Infective Endocarditis. *Circulation* **116**: 1736-1754.
- Yoshino, Y., Kimura, Y., Sakai, T., Kanzaki, T., Seo, K., Koga, I., Kitazawa, T. & Ota, Y. (2013). Infective endocarditis due to a rare pathogen, *Streptococcus constellatus*, in a patient with gingivitis: A case report and review of the literature. *Open Medicine* **8**: 489-492.