

## Tricuspid valve endocarditis following central venous cannulation: The increasing problem of catheter related infection

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### ABSTRACT

A central venous catheter (CVC) is inserted for measurement of haemodynamic variables, delivery of nutritional supplements and drugs and access for haemodialysis and haemofiltration. Catheterization and maintenance are common practices and there is more to the technique than routine placement as evident when a procedure-related complication occurs. More than 15% of the patients who receive CVC placement have some complications and infectious endocarditis involving the tricuspid valve is a rare and serious complication with high morbidity and mortality. Overenthusiastic and deep insertion of the guide wire and forceful injection through the CVC may lead to injury of the tricuspid valve and predispose to bacterial deposition and endocarditis. We report a case of tricuspid valve endocarditis, probably secondary to injury of the anterior tricuspid leaflet by the guide wire or the CVC that required open heart surgery with vegetectomy and repair of the tricuspid valve.

**Keywords:** Central venous catheter, complications, endocarditis, infection, intensive care

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### INTRODUCTION

Burns patients are at a high risk for bacteraemia and sepsis, and antemortem diagnosis of endocarditis is made only in a minority of these patients.<sup>[1]</sup> Endocarditic valve infection in burn patients is rare and an increasing incidence of health care-associated endocarditis [7–29%] is reported to run parallel with the increasing use of central venous catheters (CVCs) for patient care.<sup>[2]</sup> Intravascular catheters are indispensable in intensive care units for the administration of drugs, volume or haemodynamic monitoring and their use also puts the patients at risk for local and systemic complications. The procedure of placing a CVC is associated with known complications such as infection, thrombus formation and catheter block and, uncommonly, air embolism, catheter migration, arteriovenous fistula, pseudoaneurysm, haemothorax and pneumothorax. Much of the data regarding catheter-related complications and sepsis is from the western literature and no such data is available from

India except for case reports like this. The experience of the operator is important for the development of complications, and is reduced to half when the procedure is performed by an experienced operator.<sup>[3]</sup> Some units employ ultrasound to optimize the success rate of CVC insertion and minimise complications, although this does not help in limiting complications during the other stages of CVC placement. The presence of systemic signs of infection in burns patients with right-sided endocarditic vegetation and a CVC would warrant a thorough investigation to rule out CVC-related blood stream infection.

### CASE REPORT

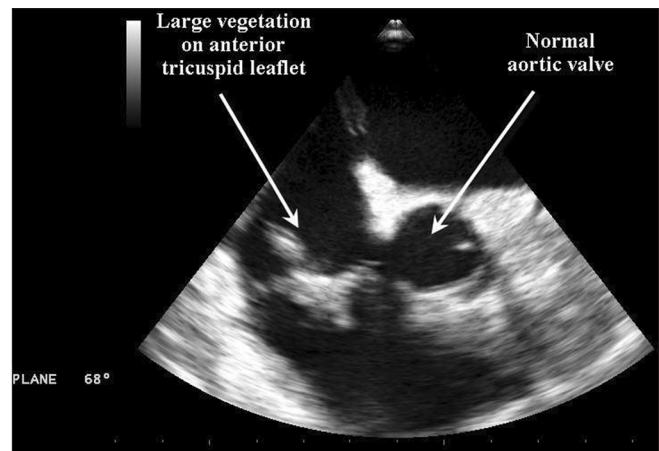
A 45-year-old female with accidental flame burns of the chest and upper limbs (approximately 30%) was referred from another hospital with high fever and breathlessness requiring Ventilatory support. She was primarily treated there for superficial burns, during which time a right internal jugular vein catheter

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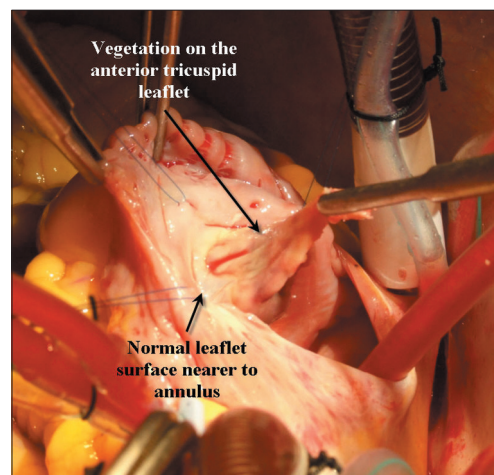
was inserted in the intensive care unit (ICU) for administration of drugs and volume. Five days after insertion of the CVC, the patient developed high fever and, over the next 7 days, breathing difficulty, this was interpreted as sepsis and supported by laboratory investigation and growth of methicillin-resistant *Staphylococcus aureus* (MRSA) in the blood sample. Appropriate antibiotics were administered and the patient showed no clinical improvement despite 3 weeks of antibiotic treatment. She persistently recorded high temperatures and was breathless even at rest. She was referred in this status to our hospital and was put on respirator for poor blood gas values. Further evaluation of sepsis with transthoracic echocardiogram showed large vegetation, measuring approximately 3 cm, on the anterior tricuspid leaflet (ATL) with no tricuspid regurgitation. Other cardiac valves were normal. Trans-oesophageal echocardiogram confirmed the findings [Figure 1]. The patient had to be ventilated for respiratory decompensation secondary to showering of the pulmonary circuit by tiny vegetations on the ATL and was taken for surgery immediately. Through a standard median sternotomy, the heart was placed on cardiopulmonary bypass and the tricuspid valve was approached through the right atrium after cardioplegic arrest. Large vegetation was seen occupying almost half of the anterior tricuspid leaflet [Figure 2], and the vegetation seemed to travel down the chordal apparatus as well. Other leaflets of the tricuspid valve and the pulmonary valve were normal. Total vegetectomy was performed with curettage of the anterior tricuspid leaflet and the remaining defect in the ATL [Figure 3] was repaired with a piece of native pericardium. Because the patient was culture positive for MRSA, a prosthetic ring was not placed and the patient weaned off cardiopulmonary bypass with minimal support. She was afebrile the next day of surgery and remained so till her discharge from the hospital. The vegetation grew MRSA.

## DISCUSSION

Endocarditic valve infection in burn patients is rare and a high degree of suspicion is required in making the diagnosis. Valvular vegetation is most often seen on the mitral and aortic valves and can develop on any of the valves and the mural endocardium. The reported incidence of endocarditis in burn patients varies from 0.4% to 2%, and up to 8.9% in those with persistent bacteraemia.<sup>[1]</sup> Infection of the burn wound and manipulation has been a major source of bacteraemia. However, current surgical technique and



**Figure 1:** Transoesophageal echocardiogram showing the large vegetation on the anterior tricuspid leaflet



**Figure 2:** Intraoperative picture showing the large vegetation on the anterior tricuspid leaflet



**Figure 3:** Intraoperative photograph showing the destroyed anterior tricuspid leaflet after vegetectomy

clinical therapy have greatly reduced the incidence of burn wound bacteraemia and its sequelae thus shifting sources of bacteraemia to foci other than the skin.<sup>[4]</sup> A review of published articles by Regules

*et al.*,<sup>[1]</sup> revealed burn-related endocarditis to occur in the absence of predisposing cardiac conditions regardless of the organism. Because most of the burn patients are young and would typically have a lower prevalence of cardiac or valvular abnormalities, it has been proposed that indwelling venous catheters may damage the endocardium and predispose these patients to the formation of valvular vegetations.<sup>[1,5,6]</sup> Endocarditic valve infection is rare in burn patient and more often involves valves on the left side of the heart.<sup>[7]</sup>

The incidence of infective endocarditis associated with central line infections is increasing, and an incidence of 7–29% is reported in the literature.<sup>[2,8]</sup> This varies considerably by type of catheter, frequency of catheter manipulation and patient-related factors (e.g., underlying disease and acuity of illness). The majority of serious catheter-related infections are associated with CVCs placed in patients in ICUs than in the operation theatre and less acute inpatients. In the ICU setting, the catheters are needed for extended periods of time and are manipulated multiple times for administration of fluids, drugs, blood and blood products, for haemodynamic measurements or to obtain samples for laboratory analysis. These make the patients prone for colonization with hospital-acquired organisms and augment the potential for contamination and clinical infection. Moreover, some catheters are inserted in urgent situations, during which optimal attention to aseptic technique might not be feasible.

Central Venous Catheterization has traditionally been achieved blindly by the “landmark method”, although ultrasound guidance has recently helped achieve safe venous puncture at the first stage of central venous catheterization. Complications still occur at other stages of the procedure, including the guide wire, the dilator or the catheter insertion. Atrial and ventricular arrhythmias may occur when advancing the guide wire and, although catheter looping and knotting are well recognized complications, there are only a few reports of guide wire-related complications including complete heart block and sudden death.<sup>[9,10]</sup> Most of the guide wire-related complications include entrapment of guide wire in the sternocleidomastoid muscle and inferior venacava filters<sup>[9,11]</sup> and some are due to insertion of inappropriately excessive length. There is no consensus about the safe length of guide wire required to secure vascular access, although Andrew *et al.*<sup>[12]</sup> concluded an upper limit of 18 cm to be safe in most adult patients from right internal jugular venous

entry point to cavoatrial junction. This guideline may reduce or eliminate the risk of entrapment and valve injury, and has not been practiced widely as evident from our case report. Some central venous catheterization packs do not have distance markings on the guide wires and other packs have a huge catheter to wire length discrepancy with excessively long guide wires that promote “more than required” threading and increase the likelihood of reaching into or below the atrium and tricuspid valve. The optimal position of the CVC tip remains the subject of debate,<sup>[13]</sup> and the right tracheobronchial angle and carina are considered common markers radiologically for insertion depth, which can be reflected practically to the sternal angle as a surface marker while cannulating the right internal jugular vein. This avoids entering the right ventricle and injury to the tricuspid valve, is practical and easy to follow and is relatively safe.

Fully inserted CVCs, although placed uneventfully, tend to lie close to the tricuspid leaflets and can cause abrasive injury of the leaflets and endocardium secondary to forceful and rapid injection of volume or drugs. This, along with guide wire injury, especially when the firm straight end is used by the operator instead of the “J” tip, may contribute to endocarditis of the tricuspid leaflet in patients with adequate substrates and we believe, apart from others,<sup>[2]</sup> this to be the mechanism in our patient. Tricuspid valve injury associated with central venous catheterization is rarely reported<sup>[10]</sup> and poses significant clinical and diagnostic challenge because of a normal structural heart and no predisposing conditions. According to current estimates from large series, only 5–10% of right-sided infective endocarditis appears in non-addicted patients.<sup>[14]</sup> Our case was operated in lieu of the large vegetation and the resistant nature of MRSA to respond to appropriate antibiotics for more than 3 weeks. At surgery, the vegetectomy eliminated the bacterial load and provided local treatment with radicality and reconstruction. If not operated in time, the patient would have suffered right ventricular dilatation and recurrent pulmonary embolus or intractable right ventricular failure.

## CONCLUSION

Guide wire complications during CVC placement can be reduced or avoided by introducing only the amount of wire necessary for safe placement of catheter. Overenthusiastic passage of the guide wire into the right ventricle may injure the tricuspid

leaflets directly or indirectly after entangling with the chordal apparatus. This injury acts as a nidus for bacterial deposition and endocarditis, more magnified in patients with depressed immunity and sub-clinical sepsis, like in our case of burns. This important part of the procedure has to be highlighted and practiced so as to pass on to the newer trainees and cannot be overstated than in this case.

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## Announcement

### CALENDAR OF EVENTS OF ISA - 2013

Certain important dates regarding awards of ISA are mentioned here for the members. All the applications should be sent by registered post (with Acknowledgement Due)

Date	Name of the Award/Post	Application has to be sent to
30 <sup>th</sup> June 2013	Bhopal Award for Academic Excellence	Hony. Secretary, ISA
31 <sup>st</sup> July 2013	KPR Young Anaesthesiologist Award State Chapter	Secretary, Kerala State
15 <sup>th</sup> August 2013	Prof. A. P. Singhal Life Time Achievement Award	Hony. Secretary, ISA
31 <sup>st</sup> October 2013	Dr (Mrs.) Rukmini Pandit Award - Publication format along with Conference Presentation Certificater	Hony. Secretary, ISA
31 <sup>st</sup> October 2013	Y. G. Bhoj Raj Award - Best Review Article in IJA	Hony. Secretary, ISA
31 <sup>st</sup> October 2013	Dr. Kop's Award	Chairman Scientific committee of ISACON with a copy to Hony Secretary ISA
27 <sup>th</sup> November 2013	Dr. TN Jha Memorial & Dr. KP Chansoriya Travel grant	Hony. Secretary, ISA
27 <sup>th</sup> November 2013	Late Dr. Venkata Rao Memorial Oration	Hony. Secretary, ISA
27 <sup>th</sup> November 2013	Ish Narani Best Poster Award	Chairman Scientific Committee ISACON
28 <sup>th</sup> November 2013	ISA GOLDCON QUIZ Competition	Chairman Scientific Committee ISACON
28 <sup>th</sup> November 2013	Awards for 1. Best City Branch 2. Best State Branch 3. Best Metro Branch 4. Public Awareness Individual 5. Public Awareness City 6. Public Awareness State 7. Ether Day - City / State 8. Individual Drive 9. Highest Membership Drive	Hony. Secretary, ISA

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