A copybook multimodal imaging in a case of aortic root abscess – computed tomography, surgical and intraoperative echocardiography imaging

Saravana Babu¹, Dodda Brahmam¹, Sabarinath Menon¹, and Thomas Koshy¹

¹Sree Chitra Tirunal Institute for Medical Sciences and Technology

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Abstract

Aortic root abscess formation is one of the most dangerous complications of infective endocarditis. It can occur in both native and prosthetic heart valves. Treatment includes a multidisciplinary team approach focusing on antibiotic coverage and adequate surgical treatment. The surgical repair is extremely challenging in these subset of patients due to fragile tissue and involvement of adjacent cardiac structures. We report a case of aortic root abscess where the preoperative computed tomography and intraoperative transesophageal echocardiography imaging described the exact anatomical details and demarcated the extension of the abscess cavity which helped in a successful surgical repair.

Title Page

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Contributing authors

1. Dodda Brahmam¹, MD, DM, Senior Resident
2. Saravana Babu MS¹, MD, DM, FICA, FTEE, Associate Professor
3. Sabarinath Menon², MS MCh, Professor
4. Thomas Koshy¹, MBBS, DA, MD, PDCC, FRCP, Senior Professor

Department and institution:

¹Division of Cardiothoracic and vascular anesthesia, Sree Chitra Tirunal institute for medical sciences and technology, Trivandrum, India.

²Department of Cardiothoracic and vascular surgery, Sree Chitra Tirunal institute for medical sciences and technology, Trivandrum, India

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Data availability statement
The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Ethical Approval:** not available for this study

**Informed consent:** Informed consent was obtained from the patient to publish the images.

**Corresponding Author:** Dr. Saravana Babu MS, Associate Professor, Division of cardiothoracic and vascular anesthesia, Sree Chitra Tirunal Institute for medical Sciences and Technology, Trivandrum -695011, India. Phone no - +918589086898.

E-mail – saravanababu4u@gmail.com, sarvan4u@sctimst.ac.in

**Authors Contribution**

1. **Name:** Dodda Brahmam, MD, DM, Senior Resident  
**Contribution:** This author helped in Conception; drafting the work and final approval of the version

2. **Name:** Saravana Babu MS, MD, DM, FICA, FTEE, Associate Professor  
**Contribution:** This author performed transesophageal echocardiography and helped in Conception, drafting the manuscript work; final approval of the version

3. **Name:** Sabarinath Menon, MS, Mch, Professor  
**Contribution:** This author helped in Conception; maintaining accuracy and integrity of work, final approval of the version

4. **Name:** Thomas Koshy, MBBS, DA, MD, PDCC, FRCP, Senior Professor  
**Contribution:** This author helped in Conception; final approval of the article

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**Abstract**

Aortic root abscess formation is one of the most dangerous complications of infective endocarditis. It can occur in both native and prosthetic heart valves. Treatment includes a multidisciplinary team approach focusing on antibiotic coverage and adequate surgical treatment. The surgical repair is extremely challenging in these subset of patients due to fragile tissue and involvement of adjacent cardiac structures. We report a case of aortic root abscess where the preoperative computed tomography and intraoperative transesophageal echocardiography imaging described the exact anatomical details and demarcated the extension of the abscess cavity which helped in a successful surgical repair.

**Keywords:** aortic root abscess; aortic valve repair; intraoperative TEE

A 13-year-old male child who underwent aortic valve repair for severe aortic regurgitation presented with complaints of high grade fever with chills and rigor after 2 weeks of surgery. He was started on antibiotics
as his transthoracic echocardiography showed an aortic root abscess, severe aortic regurgitation, mild mitral regurgitation and preserved biventricular systolic function. Further imaging with contrast computed tomography (CT) showed a large aortic root abscess of size $3.5 \times 1.8$ cm with communication to the non-coronary sinus (Figure 1A). He was planned for Ross procedure. In the operation room, after induction of general anesthesia, the heart was examined using a transesophageal echocardiography (TEE) probe (X72t; iE33; Philips Medical, Bothell, USA). Pre-cardiopulmonary bypass (CPB) TEE showed a well-defined abscess cavity of size $3.9 \times 2.8$ cm communicating to the non-coronary sinus and distorting the aortic valve leaflets (Figure 1B, 1C; Movie S1, S2). Intraoperative TEE measurements showed a size disparity of 9 mm between the aortic annulus and pulmonary annulus. Hence the Ross procedure was abandoned and surgical plan changed to homograft replacement of aortic root. After adequate systemic heparinization, CPB was instituted and heart was arrested in diastole using blood cardioplegia. Surgical exposure confirmed the findings of CT and TEE imaging (Figure 1D). The abscess cavity was excised and the aortic root was replaced with a 23 size aortic homograft. Post-CPB TEE showed normal functioning homograft and preserved biventricular function. Postoperative period was uneventful without any complications.

Infective endocarditis can occur in both native and prosthetic heart valves and has an incidence of about 10 to 39%. Presence of aortic root abscess in the setting of infective endocarditis is associated with high operative mortality of 8.4%. The most common isolated organisms were staphylococcus, streptococcus and enterococcus. Patients usually present with septicemia, chest pain due to acute coronary syndrome, transient ischaemic attack or stroke due to systemic embolization, various degrees of heart blocks, intracardiac fistula, pseudoaneurysm formation, and heart failure. Preliminary management involves collection of sample for blood culture and initiation of antibiotics. Multimodal extensive imaging with echocardiography and radiology is needed to assess the extension of the lesion to the surrounding structures. The indication for surgical treatment depends upon the severity of the valvular lesion and development of paravalvular leak. The postoperative complications are very high in these subset of patients and include paravalvular leak, myocardial infarction, complete heart block, sepsis, stroke and acute kidney injury. TEE is an inevitable intraoperative imaging tool to guide the surgery by providing exact anatomical identification of the lesion as well as demarcation of extension to other adjacent cardiac chambers.

References

Figure Legends

**Figure 1** A. Contrast computed tomography axial section of heart showing a large crescent shaped contrast enhanced abscess cavity lying adjacent to the aortic sinuses (blue arrow). B, Pre-cardiopulmonary bypass TEE ME AV short axis view (color compare) showing large abscess cavity with shunting of blood from non-coronary sinus to abscess cavity during systole. C, Three dimensional TEE image showing the abscess cavity adjacent to the non-coronary sinus (blue arrow). D, Surgical image showing the communication between abscess cavity and aortic root (surgical forceps passed from non-coronary aortic sinus to abscess cavity). 3D = three dimensional; AS = aortic sinus; AV = aortic valve; LA = left atrium; LCC = left coronary cusp;
ME = midesophageal; NCC = non-coronary cusp; NCS = non-coronary sinus; RA = right atrium; RCC = right coronary cusp; SAX = short axis; TEE = transesophageal echocardiography;

**Supplemental Movie Legends**

**Movie S1.** Pre-cardiopulmonary bypass TEE ME AV short axis view (color compare) shows a large abscess cavity with shunting of blood from non-coronary sinus to abscess cavity. AV = aortic valve; LA = left atrium; LCC = left coronary cusp; ME = midesophageal; NCC = non-coronary cusp; RA = right atrium; RCC = right coronary cusp; SAX = short axis; TEE = transesophageal echocardiography.

**Movie S2.** Three dimensional TEE ME AV SAX view shows the presence of abscess cavity adjacent to the non-coronary sinus. AV = aortic valve; LCC = left coronary cusp; ME = midesophageal; NCC = non-coronary cusp; RA = right atrium; RCC = right coronary cusp; SAX = short axis; TEE = transesophageal echocardiography.