Cross-incision technique for aortic periannular abscess perforating the tricuspid annulus

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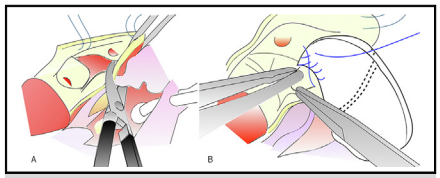


Cross-incision technique.

CENTRAL MESSAGE

The cross-incision technique allows for proper debridement, optimal visualization, and annular enlargement in cases of aortic annular abscesses with perforation extending to the tricuspid annulus.

Video clip is available online.

Surgical risk is high in cases of infective endocarditis (IE) complicated by annular abscesses. Reports exist of aortic annular abscesses perforating the left atrium, infective involvement of the intervalvular fibrous body, and annular abscesses involving the aortic and mitral valves.[1] In such cases, intervalvular fibrous body reconstruction or Commando procedures are performed, with a mortality rate of 20% to 30% reported.[2,3] When an annular abscess perforates, ensuring the best-possible visualization and reconstruction of the affected annulus is crucial. However, few reports have described aortic annular abscesses extending into the tricuspid annulus. Double-valve IE involving the aortic and tricuspid valves accounts for 1.48% of all IE cases; when accompanied by septic shock, the 30-day mortality rate is as high as 75%.[4] In such cases, the basic approach involves the reconstruction of the aortic and tricuspid annuli and subsequent replacement of the affected valves. However, thorough debridement of the fistula and exclusion of the infection site are difficult.

CASE PRESENTATION

A 42-year-old man (167 cm, 64 kg, body surface area 1.7 m^2) was referred to our hospital for the evaluation of an unknown fever that had persisted for 8 days. The patient provided informed consent for the publication of this report; institutional review board approval was not required.

Contrast-enhanced computed tomography revealed an aortic annular abscess, a pericoronary abscess around the right coronary artery, bilateral renal infarctions, and pulmonary edema. Transthoracic echocardiography revealed severe aortic regurgitation due to detachment of the right coronary cusp (RCC) and noncoronary cusp (NCC) along with vegetation around the tricuspid valve. Electrocardiography revealed an intermittent complete atrioventricular block that required temporary pacing through the right internal jugular vein.

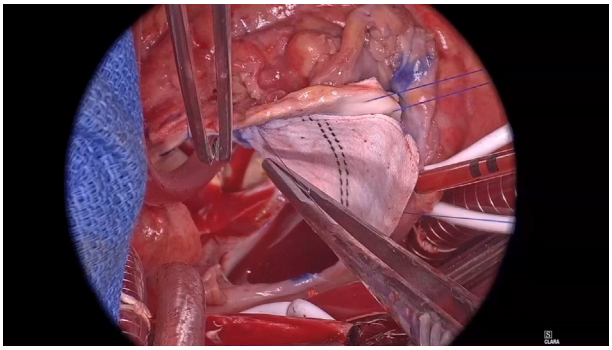
Debridement of the aortic and tricuspid valves via aortic and right atrial incisions was attempted; however, adequate visualization of the fistula was impossible. Therefore, we adopted a cross-incision technique to ensure proper visualization, enable annular reconstruction, and subsequently replace the prosthetic valves. Blood and vegetation cultures identified *Streptococcus agalactiae*, for which the patient completed an 8-week course of postoperative antibiotic therapy without complications, leading to a successful discharge.

Operative Technique

The surgical technique is demonstrated in Video 1.

Aortic Incision and Annular Debridement

Cardiopulmonary bypass was established with ascending aortic and bicaval cannulation. The aorta was obliquely incised toward the sinotubular junction, exposing the aortic valve. An aortic annular abscess involving the RCC and NCC that perforated the membranous septum was identified. The aortic valve was excised and the annulus



VIDEO 1. Clinical case portraying the cross-incision technique with preoperative case information and postoperative outcomes. Video available at: https://www.jtcvs.org/article/S2666-2507(24)00497-8/fulltext.

extensively debrided. The measurements indicated that a 19-mm SJM Regent prosthesis (St Jude Medical) was appropriate.

Right Atrium Incision and Tricuspid Annular Debridement

The right atrium was obliquely incised to expose the tricuspid valve. The anterior leaflet was detached, and a perforation was observed extending from the annulus to the right atrium and ventricle. The anterior leaflet was excised and fistular debridement was attempted from the right atrial and right ventricular sides; however, its visualization remained suboptimal.

Cross-Incision Technique

The aortic incision was extended toward the nadir of the NCC to avoid the atrial septum and moved further toward the membranous septum. A single incision was made across the aortic and right atrial walls that opened the membranous septum and provided excellent visualization (Figure 1, *A*). This enabled thorough debridement of the fistula and reconstruction of the ventricular septum using a double Hemashield patch trimmed into a boat shape. The annulus was reconstructed using 4-0 polypropylene sutures extending beyond the annular region (Figure 1, *B*).

Prosthetic Valve Replacement

The aortic valve was positioned supra-annularly using a 21-mm SJM Regent prosthesis with 2-0 polyester sutures in an antianatomical orientation, with the pivot located at the commissure between the RCC and LCC. The tricuspid valve was replaced in an intra-annular position using a 27-mm SJM Masters prosthesis in an antianatomical orientation with 2-0 polyester sutures, with the pivot located at the center of the septal leaflet.

Reconstruction of the Aorta and Right Atrium

The double Hemashield patches were separated, and the aortic and right atrial walls were reconstructed using 4-0 polypropylene sutures. The patient was weaned off of cardiopulmonary bypass without difficulty; however, a complete atrioventricular block was observed postoperatively, which led to the placement of an epicardial lead. The patient reverted to sinus rhythm on postoperative day 2, at which point temporary pacemaker support was no longer required.

DISCUSSION

Here, we describe an optimal incision approach for communication between the aortic and tricuspid annuli. Adequate visualization and debridement of the fistular interior cannot be achieved using aortic and right atrial incisions alone. This technique was inspired by the

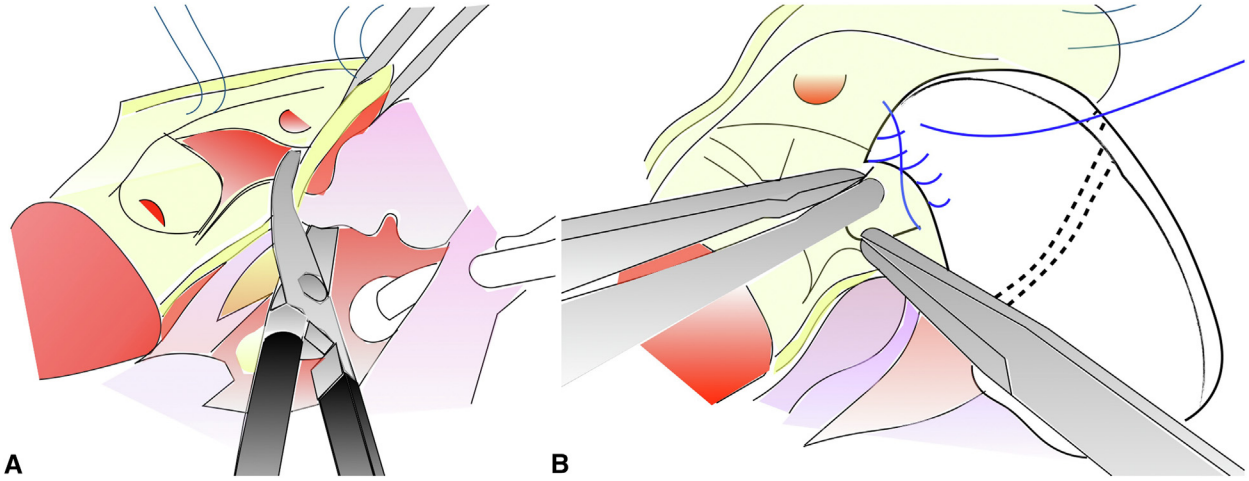


FIGURE 1. A, The aorta and right atrial wall incised as a single block in a cross-shaped manner (cross-incision technique) across the noncoronary cusp annulus at the right coronary cusp side toward the membranous septum; B, A double Hemashield patch continuously sutured from the lower edge of the membranous septum.

Commando procedure in which incisions are extended into the annulus to open both chambers, thereby providing excellent visualization. The cross-incision was named for its X-shaped incision line that extends from the nadir of the NCC toward the RCC-NCC commissure and membranous septum. This technique is facilitated through fistular debridement, annular enlargement, and reconstruction and allows for exclusion of the infected area via opening of the abscess cavity into the pericardium.

This approach enables annular enlargement even in patients with a small annulus. Conventional annular reconstruction typically requires downsizing of the prosthesis by one size, which increases the risk of patient-prosthesis mismatch. In this case, the preincision annular size was 19 mm, but the annular reconstruction involved the patch-enabled placement of a 21-mm SJM Regent prosthesis. Considering the patient's body surface area, the risk of prosthesis-patient mismatch with the 19-mm SJM Regent valve was considered low. We used Hemashield patches for the ventricular septum and annular reconstruction.

PITFALLS

The initial aortic and right atrial incisions must be planned considering potential extension to ensure proper incision direction. The lower margin of the membranous septum houses the His bundle, and mattress sutures may introduce the risk of conduction disturbances. Continuous sutures may be safer for patch implantation because they avoid conduction pathway injury. Although pericardial patch reconstruction offers easy handling, its long-term durability remains concerning. Here, we used Hemashield patches for reconstruction and chose mechanical valves due to reoperation complexity during the remote period.

CONCLUSIONS

This case demonstrates that the cross-incision technique effectively treats aortic annular abscesses perforating the tricuspid annulus. This technique enables sufficient debridement and annular enlargement and facilitates annular reconstruction in the treatment of IE.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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