A guide to the radiographic identification of prosthetic heart valves: an addendum

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ABSTRACT Several years ago "A Guide to the Radiographic Identification of Prosthetic Heart Valves" (Circulation 57: 613, 1978) described the radiographic silhouettes of 40 different cardiac prostheses in clinical use. Since that time a number of prostheses have been developed and introduced to clinical practice. Ten of these newer prostheses manufactured by six domestic companies were photographed and radiographed as they would be expected to appear in standard chest radiographs. The radiographic silhouettes are described and distinguishing features are discussed.


SEVERAL years ago "A Guide to the Radiographic Identification of Prosthetic Heart Valves" was prepared to enable the clinician to identify unknown cardiac prostheses on the basis of their radiographic appearances. Since that time a number of new prostheses have been developed and thus additional radiographic silhouettes require recognition. This addendum is designed to fill that need.

As described previously, prostheses were obtained from domestic manufacturers, mounted to simulate appropriate surgical placement, photographed, and radiographed (table 1). Radiographs were taken at appropriate angles to simulate the radiographic silhouettes that would be seen on routine posteroanterior (PA) and left lateral (LL) chest radiographs. The valves pictured here (figures 1 to 10) are likely to be used in any annular position. For display purposes they are oriented to simulate mitral or aortic implantation. If the radiographic silhouette is similar to that of another valve type, distinguishing features (if any) are discussed. Some of the prostheses included are investigational devices.

TABLE 1
Heart valve prostheses studied

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<thead>
<tr>
<th>Manufacturer</th>
<th>Valve</th>
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<tr>
<td>American Edwards Laboratories, American Hospital</td>
<td>Carpenter-Edwards supraAnnular (SAV) Bio-prosthesis</td>
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<tr>
<td>Ana, CA</td>
<td>Carpenter-Edwards Pericardial Valve Prosthesis</td>
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</tr>
<tr>
<td>Hancock Extracorporeal, King of Prussia, PA,</td>
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<tr>
<td>Extracorporeal Medical Specialties, Inc., Anaheim,</td>
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<td>Minneapolis, MN</td>
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<td>St. Jude Medical, Inc., St. Paul, MN</td>
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<td>Shiley Incorporated, Irvine, CA</td>
<td>Bjork-Shiley Cardiac Valve Prosthesis with Convexo-Concave Disc</td>
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This article updates information published previously in the Journal, which the editors and reviewers felt would be of interest and use to the readers of Circulation. — Philip A. Ludbrook, M.B., B.S., F.R.A.C.P., for the editors.
FIGURE 1. Carpentier-Edwards SupraAnnular (SAV) Bioprosthesis (aortic position: A, PA radiograph; B and C, LL radiograph and photograph). One continuous narrow wireform outlines each of the three stents and that portion of the base ring between stents. Although superficially similar to the radiographic silhouettes of the Carpentier-Edwards Bioprosthesis, in the SupraAnnular model the change of shape of the wireform as it shifts from base ring to stent is more gradual, giving the wire a gently curving appearance rather than a right-angle appearance.

FIGURE 2. Carpentier-Edwards Pericardial Valve Prosthesis (mitral position: A, PA radiograph; B and C, LL radiograph and photograph). The base ring is marked by a flattened circular ring with three holes. The flattened ring does not extend into the stents as is seen in the Ionescu-Shiley xenograft. In addition, a narrow wireform outlines each of the three stents and the base ring between the stents. The wire curves gently between stent and base ring, similar to the Carpentier-Edwards SupraAnnular Bioprosthesis.

FIGURE 3. Hancock Pericardial Heart Valve (mitral position: A, PA radiograph; B and C, LL radiograph and photograph). The base ring is narrow, circular, wirelike form. The remainder of the valve is radiolucent. The radiographic silhouette is similar to that of the Hancock porcine xenograft.

FIGURE 4. Hancock II Porcine Xenograft (mitral position: A, PA radiograph; B and C, LL radiograph and photograph). The base ring and stents are radiolucent. Three tiny circular rings mark the distal external aspects of the three stents.
FIGURE 5. Omniscience Prosthetic Heart Valve (mitral position: A, PA radiograph; B and C, LL radiograph and photograph; D, oblique radiograph demonstrating disc on edge). Emerging from the wide base ring are two low profile struts that are fastened to the base ring along their length. Although reminiscent of the silhouette of the Lillehei-Kaster prosthesis, the struts are shorter and form a much lower profile. On routine chest radiographs the disc is likely to be radiolucent. The disc of the Omniscience prosthesis (unlike the Lillehei-Kaster) is radiopaque when viewed on edge.

FIGURE 6. Medtronic Hall (formerly called Hall-Kaster) Prosthetic Heart Valve (mitral position: A, PA radiograph; B and C, LL radiograph and photograph; D, oblique radiograph demonstrating disc on edge). Four projections emerge from the base ring toward the center of the ring. Two short straight projections of equal size are on opposing sides of the base ring. A longer straight projection is perpendicular to the short projections. A large hooklike projection is opposite the long straight projection. On routine chest radiographs the disc is likely to be radiolucent. When viewed on edge, the disc is radiopaque.

FIGURE 7. St. Jude Medical Cardiac Valve (mitral position: A, oblique radiograph demonstrating both discs on edge in the open position; B, oblique radiograph demonstrating both discs on edge in the closed position; C, LL photograph). On routine chest radiographs the St. Jude Medical Valve is likely to be radiolucent. When viewed on edge, the discs are radiopaque. The base ring is radiolucent.

FIGURE 8. Bjork-Shiley Cardiac Valve Prosthesis with Convexo-Concave Disc (mitral position: A, PA radiograph; B and C, LL radiograph and photograph). The radiographic silhouette is essentially the same as the Bjork-Shiley prosthesis with straight disc and incorporated disc marker. The flattened base ring is encircled by a groove. Emerging from the base ring toward its center are two eccentrically located U-shaped structures of unequal size. The radiolucent disc contains a narrow circular radiopaque disc marker that is seen from any projection.
FIGURE 9. Bjork-Shiley Integral Monostent Cardiac Valve Prosthesis (mitral position: A, PA radiograph; B and C, LL radiograph and photograph). The radiographic silhouette is similar to that of the Bjork-Shiley Convexo-Concave and Straight disc valves. The flattened base ring is encircled by a groove. Emerging from the base ring toward its center is a wide U-shaped structure. Perpendicular to the flattened portion of the U is a short straight projection with a very small hook or bulge on its end. The radiolucent disc contains a narrow circular radiopaque disc marker which is seen from any projection.

FIGURE 10. Ionescu-Shiley Low Profile Pericardial Xenograft (mitral position: A, PA radiograph; B and C, LL radiograph and photograph). The base ring consists of three narrow wireform arcs, each length approximately one-third the circumference of the base ring. Adjoining arcs are separated by small radiolucent areas. The stents are radiolucent.

For providing prosthetic valves for study, I thank James Baker, Jr., Bruce D. Bentzen, Nancy L. Kinley, Nancy More, and Patti Pearson. Michael Foreman assisted in the radiographic photography of the prostheses.

References
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