Calcified Patent Ductus Arteriosus

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SUMMARY

A case of calcified patent ductus arteriosus was reported. The ductus was successfully divided under normothermic occlusion of the descending aorta utilizing cerebrospinal fluid drainage.

When calcification of the ductus is suspected radiologically, surgical manipulation should be performed with stand-by of cardiopulmonary bypass.

Additional Indexing Words:
Cerebrospinal fluid drainage

Operative treatments of uncomplicated patent ductus arteriosus are now well established, and the ductus can be safely and effectively divided in vast majority of children and young adults.

In certain older patients, however, calcification of the ductus and the adjacent segments of aorta and pulmonary artery offers some technical difficulties.

Under this circumstance, division of the ductus is unusually hazardous, because the diseased vessels often fracture or tear when clamps are applied or when sutures are placed in them.

In a patient recently studied in our Department, a large calcified ductus was divided. As calcification in this case was located at the aortic end of the ductus and the adjacent aortic wall, the ductus was divided under normothermic occlusion of the descending aorta utilizing cerebrospinal fluid drainage.

Case Report

M.O. was a 24-year-old housewife, who complained of exertional dyspnea and short breath. Her family history was noncontributory.

She was detected to have a cardiac murmur in the physical examination of her school at 13 years of age. At that time she was asymptomatic. At age 24, her symptoms deteriorated and she visited the Department of Internal Medicine of our

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University Hospital. Her illness was diagnosed as patent ductus arteriosus after cardiac catheterization.

She was admitted to our Department for operation of patent ductus on February 24, 1967. On admission the pulse was 96 per min. regular. The blood pressure was 152/56 in the right arm and 146/66 in the left arm. The heart was grossly enlarged and a Grade 4/6 continuous murmur was present at the base of the heart.

Chest roentgenograms, reproduced in Fig. 1 and 2, demonstrated gross cardiac enlargement with increased pulmonary vascularity. Calcification in the area of the ductus was readily apparent.

Fig. 1. Chest X-ray film (dorsoventral). Fig. 2. Chest X-ray film (lateral).

Fig. 3. Electrocardiogram.
At fluoroscopy the calcification appeared moving synchronously with the aortic pulsation.

The electrocardiogram revealed left ventricular hypertrophy, as shown in Fig. 3.

At cardiac catheterization a patent ductus was traversed by the catheter and the pulmonary arterial pressure was 48/26. Calculated left-to-right shunt was 73 per cent of the pulmonary blood flow (Table I).

Large left-to-right shunt was also detected on dye dilution curve.

Operation was performed on March 3, 1967 with stand-by of cardiopulmonary bypass. A fine polyethylene catheter was cannulated intrathecally by lumbar puncture in preparation for cerebrospinal fluid drainage.

Left pleural cavity was entered through the 4th intercostal space by a postero-

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<thead>
<tr>
<th>Table I. Results of Cardiac Catheterization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Pressure (mm. Hg)</td>
</tr>
<tr>
<td>R.P.A.</td>
</tr>
<tr>
<td>L.P.A.</td>
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<tr>
<td>Ao. Abdominalis</td>
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<tr>
<td>R.V. Outflow</td>
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<tr>
<td>R.V. Inflow</td>
</tr>
<tr>
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<tr>
<td>O₂ Consumption</td>
</tr>
<tr>
<td>O₂ Capacity</td>
</tr>
<tr>
<td>O₂ Saturation</td>
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<tr>
<td>Systemic Blood Flow</td>
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<tr>
<td>Pulmonary Blood Flow</td>
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<tr>
<td>Left-to-right Shunt</td>
</tr>
</tbody>
</table>

Fig. 4. Photograph of sutured aortic end of the divided ductus and adjacent descending aorta, showing extensive calcification.
lateral incision and the ductus and distal aortic arch were dissected. The ductus was 0.7 cm. in diameter.

There was extensive calcification in the posterior wall of the ductus on its aortic end and adjacent aorta. However, the pulmonary arterial end of the ductus was so soft and pliable that a Potts’ ductus clamp could be safely applied and that extracorporeal circulation was unnecessary in this case.

The descending aorta was occluded at both proximal and distal to the ductus under drainage of cerebrospinal fluid.

A Potts’ ductus clamp was placed on the pulmonary artery including the take off of the ductus. Thereafter the ductus was divided and sutures were placed in its aortic stump which was lined with calcified plaques, as shown in Fig. 4. After removal of aortic clamps, which had been applied for 11 min. the pulmonary end of the divided ductus was sutured.

Postoperative course was uneventful and she was discharged on April 9, 1967.

COMMENT

Calcification in the patent ductus has been presumed to be atheromatous calcification in etiology. Such calcification has been reported in other vascular anomalies, e.g., in the aorta of coarctation.1) Some authors maintain that calcification in a patent ductus occurs more frequently as a sequelae of quiescent infective endocarditis.1)

Keys and Shapiro2) collected from the literature 60 cases of uncomplicated patent ductus in adults. Calcification was found in 6, and atheromatous degeneration was shown in 5 cases. Ages of the calcified cases ranged from 33 to 58 years.

In 4 cases reported by Ruskin and his colleagues,1) ages were scattered between 29 and 42 years. Thus it seems certain that calcification in the patent ductus occurs in the older patient.

As far as the site of calcification is concerned, the most favorite site is the aortic end of the ductus.

In Keys’ series2) the aortic end was involved in 4, the pulmonary artery in 1, and the aorta and pulmonary artery with the ductus itself in 1 case. In a surgical case of Ruskin1) and this case, the calcification lay in the aorta at the site of attachment of the ductus.

Weiss3) suggested that in cases of suspected patent ductus such calcification might be looked upon as a confirmatory sign. Without typical feature of the patent ductus, however, it is necessary to differentiate it from a group of conditions which may rise to calcification in the left upper mediastinum and which were enumerated in Ruskin’s paper.1)

In the calcified ductus, the diseased vessels are so friable that application
of clamps is quite hazardous and their sutures are difficult.

In Ruskin’s case,\textsuperscript{1} ligation was performed, instead of division, because of the shortness of the calcified ductus.

Recently Morrow and Clark\textsuperscript{4} reported 2 cases, operated by a new method utilizing cardiopulmonary bypass. The descending aorta and main pulmonary artery were isolated from the remainder of the circulation, and, after the origin of the ductus has been exposed through an incision in the lateral wall of the aorta, it was closed with a patch of prosthetic fabric. One patient made an uneventful recovery, though another died of right heart failure 1 week after surgery.

In the first case of Morrow and Clark\textsuperscript{4} the pulmonary artery was so heavily calcified that it was necessary to occlude the main pulmonary artery under cardiopulmonary bypass. In our case, however, there was no need for extracorporeal circulation, because a ductus clamp could be applied safely to pliable pulmonary arterial end of the divided ductus.

Division of the window-type ductus under normothermic occlusion of the descending aorta was proposed by Crafoord.\textsuperscript{5} It has been maintained, however, that the occlusion time should be limited within 20 min.

Jones\textsuperscript{6} reported a case of patent ductus whose descending aorta was occluded over 25 min. because of tear of the ductus, and in whom paraplegia occurred postoperatively.

Miyamoto and Kimoto\textsuperscript{7} found that drainage of cerebrospinal fluid could prolong the allowed time for occlusion of the descending aorta as far as about 40 min. Utilizing this method the descending aorta in this case was occluded for 11 min. without complication.

In almost all cases of calcified patent ductus, its division will be safely performed within 40 min. utilizing cerebrospinal fluid drainage, because, as described above, the calcified site is limited to the aortic end of the ductus in most majority of such cases.

Since the exact site of involvement cannot be diagnosed preoperatively, however, surgical manipulation should be performed with pump stand-by, providing for cases involved the pulmonary arterial end as well as the aortic end.

**References**