Corrected Transposition of the Great Arteries

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**Introduction**

Congenitally corrected transposition is a rare condition, characterized by atrio-ventricular and ventricular–arterial discordance. The clinical presentation and indication for surgery generally depends on the associated cardiac lesions such as ventricular septal defect, obstruction of the outflow tract from the morphologically left ventricle, abnormalities of the morphologically tricuspid valve, and problems with the conduction system.

Operations for congenitally corrected transposition fall into four categories:

1. Temporary palliative procedures (arterial–pulmonary shunt, stenting of the patent ductus arteriosus, or pulmonary artery banding)
2. “Physiological correction,” preserving the right ventricle as a systemic ventricle and correcting only the associated lesions
3. “Anatomic correction,” utilizing the left ventricle as the systemic pumping chamber and the mitral valve as the systemic atrioventricular valve
4. Single-ventricle pathway that leaves both ventricles connected to the systemic circuit, providing systemic venous to the pulmonary arterial circuit by modified Fontan procedure

The long-term outcomes of patients after physiological correction have clearly demonstrated that the tricuspid valve and right ventricular function is the Achilles heel of the physiology of congenitally corrected transposition. Anatomic
Correction has therefore been proposed in the hope that it might serve patients better in the long run. At present, the midterm outcomes after anatomical correction are encouraging. However, long-term outcomes show that anatomical correction has only a slight advantage over other types of surgical treatment. The long-term survival and functional benefits after anatomic correction have been demonstrated, particularly in patients with preoperative tricuspid valve regurgitation.

Anatomical correction represents a group of procedures in which the atrioventricular discordance is “corrected” by an atrial switch (Senning or Mustard), and ventricular–arterial discordance is “corrected” either by an arterial switch operation, by the Rastelli procedure, or by translocation of the aortic root (Bex–Nikaidoh operation), depending on the underlying anatomy of the left ventricular outflow tract and/or morphology of the ventricular septal defect. Three different types of anatomical correction are therefore recognized: (1) double switch – Senning plus arterial switch operation (S-ASO), (2) Senning and Rastelli (S-R), and (3) Senning and Bex–Nikaidoh (S-BN) (Fig. 2.1).

**Anatomy**

1-Looping of the cardiac tube during embryonic development leads to an abnormal connection between the atrial, ventricular, and arterial segments of the developing heart. In congenitally corrected transposition, the systemic venous atrium (right atrium) is connected to the morphologically left ventricle, and the pulmonary venous atrium (left atrium) is connected to the morphologically right ventricle. The connection of the great arteries is also abnormal, i.e., there is a right ventricular origin of the aorta and a left ventricular origin of the
The ventricles carry their usual inlet valve to their inverted location, and coronary artery distribution is also abnormal.

The malformation can occur in a situs solitus arrangement {SLL}, or in situs inversus {IDD}.

In congenitally corrected transposition situs solitus {SLL}, the outflow tracts of the ventricles are most often in a parallel position, although other relationships do exist (crisscross or inferosuperior position). The entire ventricular mass is frequently abnormally located within the thorax, the location ranging from levocardia to meso- or dextrocardia. The right-sided, morphologically left ventricle gives rise to the pulmonary trunk, and there is usually fibrous continuity between the leaflets of the pulmonary and mitral valves. The subpulmonary outflow tract (the left ventricular outflow tract) is wedged between the mitral valve and the interventricular septum. A hemodynamically significant obstruction of the outflow tract of the morphologically left ventricle is a common finding, occurring in about 40% of patients, particularly in the presence of a ventricular septal defect.

Apart from pulmonary atresia, the mechanism of obstruction is multifactorial, the factors including valvar stenosis, annular hypoplasia, and a variety of subpulmonary obstructions (muscular tunnel-like obstruction, membranous stenosis, an aneurysmal dilation of the fibrous tissue derived from the interventricular component of the membranous septum, or accessory tissue from atrioventricular valves, etc). The right-sided morphological mitral valve is supported by posteromedial and anterolateral papillary muscles. Overriding and/or straddling of the mitral valve can be seen in combination with a double outlet from the right ventricle.

The left-sided morphologically right ventricle empties into the aorta, which is supported by a complete infundibulum. The aorta is typically located anteriorly and to the left, relative to the pulmonary trunk. The left-sided morphologically tricuspid valve is frequently dysplastic. This abnormality is described as an Ebstein-like deformity with short, thick chordae tethering the valve, but unlike Ebstein’s anomaly, apical displacement of the septal leaflet with failure of delamination is rare. Clinically important insufficiency of the valve is seen in up to 40% of adults with congenitally corrected transposition. The tricuspid valve can also override and straddle, causing hypoplasia of left-sided morphologically right ventricle.
Ventricular Septal Defect

A ventricular septal defect is detected in at least 50% of patients. Due to the wedged position of the subpulmonary outflow tract in the morphologically left ventricle, there is gross malalignment between the atrial septum and the inlet part of the ventricular septum. If this malalignment gap is not filled, a perimembranous ventricular septal defect develops. Such perimembranous defects occupy a subpulmonary position, extending posteriorly and inferiorly toward the crux of the heart. The defect opens primarily into the inlet of the morphologically left ventricle; therefore, the posterior margin is formed by an extensive area of fibrous continuity between the leaflets of the pulmonary, mitral, and tricuspid valves. In rare instances, the defect can be subpulmonary but with exclusively muscular rims.

If there is pulmonary atresia or subpulmonary obstruction, the malalignment gap is not so prominent, and usually a large, nonrestrictive conoventricular defect, naturally committed to the aorta, is found. Defects can also be found in a doubly committed position, with absence of the septal component of the infundibulum.

Conduction System

In situs solitus {SLL}, the wedging of the pulmonary valve between the septum and the mitral valve diverts the atrial septum from the ventricular septum, making penetration of the atroventricular bundle, which originates from the regular atroventricular node, impossible. Instead, the atroventricular conduction axis originates from a second (anterior) anomalously located atroventricular node lodged between the annulus of the mitral valve and the superior and anterior aspect of the limbus of the fossa ovalis. After penetrating the fibrous trigone (pulmonary to mitral fibrous continuity) the conduction bundle runs superficially underneath the pulmonary valve, and then descends along the anterior septal surface of the subpulmonary outflow tract before diverging into the bundle branches. The cord-like right bundle branch extends leftward to reach the morphologically right ventricle, and a fan-like left bundle branch cascades down the smooth left ventricular septal surface. When there is a perimembranous ventricular septal defect, the conduction system travels along the anterosuperior margin of the defect.
However, the variability of the conduction system is probably significant. If there is minimal or no wedging of the pulmonary artery (severe obstruction within the morphologically left ventricular outflow tract, double outlet from the right ventricle or pulmonary atresia), better septal alignment is achieved. Then, both the regular and the anterior nodes (dual atrioventricular nodes) can give rise to penetrating bundles, producing a sling of conduction tissues. How mesocardia and dextrocardia in situs solitus effect the alignment of the septum remains to be seen. From a surgical perspective, the close relationship between the nonbranching bundle and the pulmonary valvar orifice complicates both closure of the ventricular septal defects, relief of the obstruction within the morphologically left ventricular outflow tract, or ventricular septal defect enlargement. The position of the atrioventricular node should be anticipated with respect to the degree of misalignment between the atrial and ventricular septae and the direction of the enlargement of the ventricular septal defect should be guided accordingly.

In situs inversus {IDD}, there is no septal malalignment, and the atrioventricular conduction axis originates from a posterior atrioventricular node to follow a conventional path along the posteroinferior margin of the ventricular septal defect.

### Coronaries

The Leiden convention is used to describe the origin of the coronary arteries. For the most common coronary pattern in congenitally corrected transposition {SLL}, sinus 1 (right-hand sinus), which is anatomically the leftward and posterior sinus, gives origin to the right coronary artery, and the sinus 2 (left-handed sinus), which is rightward and anterior, gives origin to the main stem of the left coronary artery. The usual coronary artery pattern is labeled as 1R; 2AD, Cx.

The ventricular topology determines the epicardial distribution of the arteries. The right-sided coronary artery is therefore a morphologically left coronary artery, with a short main stem dividing into the anterior descending and circumflex coronary arteries. The circumflex artery encircles the mitral orifice, and the anterior descending artery labels the position of the ventricular septum. The left-sided coronary artery is a morphologically right coronary artery. It has infundibular and marginal branches, while encircling the left-sided tricuspid orifice.
In situs inversus {IDD}, the epicardial arrangement of the coronary arteries is completely mirror imaged. The usual coronary artery pattern is labeled as 1AD, Cx; 2R.

**Anatomical Correction of Corrected Transposition of the Great Arteries**

**Indication for Anatomical Correction**

The indications, timing, and type of anatomical correction of congenitally corrected transposition with associated lesions vary according to the clinical state of the patient, the morphology of the heart, and the patient’s age. There is a trend toward performing the final correction at about 2 years of age.

Development of cyanosis due to severe left ventricular outflow tract obstruction requires either placement of a modified Blalock-Taussig shunt or stenting of the patent ductus arteriosus. The definitive operation is usually performed between the first and second years of life. The type of operation is determined by the position and size of the ventricular septal defect and morphology of the atrioventricular valves. A Senning-Rastelli correction with intraventricular rerouting is possible if there is a committed and nonrestrictive ventricular septal defect. A Senning–Bex-Nikaidoh operation is indicated if creation of a straight intraventricular tunnel is impossible due to an inlet and/or restrictive ventricular septal defect. Pulmonary artery banding is placed either to control congestive heart failure or to prepare the left ventricle for systemic function. In that case a “loose” pulmonary artery banding should be placed to achieve 50% of systemic pressure in the left ventricle and to allow patients to “grow into” the pulmonary artery banding. This policy simplifies the postoperative course after pulmonary artery banding, and training of the left ventricle is gradual. Excessive pulmonary artery banding tightening leads to reduced left ventricular function and edema of the myocardium. Occasionally, retraining of the left ventricle can be achieved only by sequential pulmonary artery banding. The cutoff for retraining the morphologic left ventricle is about 15 years of age. A ratio of left to right ventricular systolic pressure of 0.8 or greater, in the presence of a well-preserved left ventricular function, with the indexed left ventricular mass to left ventricular volume ratio >1.5, is considered to be adequate for anatomical correction.
The double switch procedure is indicated as primary surgery between 3 and 6 months of age or when the left ventricle, after the banding, is properly trained for systemic function. The modified Senning operation is applicable regardless of the situs, the position of the apex of the heart and the age of the patients.

**Approach and Cardiopulmonary Bypass Strategy**

The heart is approached through a median sternotomy. The standard technique of cardiopulmonary bypass with full flow and mild to moderate hypothermia (32–28°C) is used. The aortic cannula is positioned high, close to the base of the innominate artery.

High cannulation of the superior vena cava or cannulation of the innominate vein is preferable, using an angled venous cannula.

The inferior vena cava is cannulated as low down as possible and somewhat laterally to preserve the Eustachian valve. Myocardial protection is provided by crystalloid antegrade cardioplegia.
Modified Senning Operation

The Goal of Surgery

The technique of a modified Senning procedure differs from the original concept, being adapted to the specific atrial morphology of the corrected transposition of the great arteries with underdevelopment of the free right atrial wall, especially in situs solitus with mesocardia or dextrocardia, or in situs inversus with levocardia.

There are several important technical points to keep in mind:

1. Dissection and mobilization of the superior vena cava–right atrium junction is abandoned to preserve pericardial reflection around the right upper pulmonary vein.
2. The initial incision of the right atrium should be close to the atrial–ventricular groove to preserve the anterior free wall of the right atrium for the systemic venous baffle.
3. The interatrial septum should be completely resected.
4. The superior aspect of the limbus of the fossa ovalis must be effectively cut off to avoid baffle obstruction from the superior vena cava to the contralateral tricuspid valve. At the same time, the trapezoid-shaped patch, which is used for the posterior wall of the systemic baffle, must be seated low, beneath the superior vena cava–right atrium junction, and should be kept away from the left pulmonary vein to avoid a purse-string effect on their entrance points.
5. During construction of the pulmonary venous atrium, with pericardium in situ, care is taken to avoid the sinus node and phrenic nerve.
6. It is important to provide adequate capacity of the pulmonary venous atrium and to prevent distortion and tension on the atrial–ventricular groove, thus keeping the mitral valve in an optimal position.

With the technical aspect of the modified Senning procedure well accomplished, the operation is feasible, regardless of age, and allows an earlier indication for correction. The operation is simple, highly reproducible, and applicable, regardless of the situs and position of the apex of the heart. Furthermore, this technique has the potential to provide adequate capacity of the pulmonary venous atrium, to preserve optimal geometry of the mitral valve, to minimize damage to the sinus node, and to make the coronary sinus accessible for electrophysiological studies or intervention.
**Modified Half-Mustard Operation**

**The Goal of Surgery**
Baffle rerouting of the inferior vena cava to the contralateral tricuspid valve is indicated if a bidirectional Glenn anastomosis is already in place, or when one and half ventricle anatomic repair is considered. After resection of the interatrial septum, the inferior vena cava entrance is connected to the tricuspid valve annulus using an appropriately shaped and longitudinally opened Gore-Tex® prosthesis. The coronary sinus is incorporated into the baffle.

**Arterial Switch Operation for Corrected Transposition of the Great Arteries**

**The Goal of Surgery**
The goal and technique of the arterial switch operation for corrected transposition of the great arteries is the same as for complete transposition of the great arteries. The arterial switch is the procedure of choice if the left ventricle has been exposed to sufficiently high blood pressure and is therefore able to take over acutely at systemic pressure, and if the left ventricular outflow tract is free or surgical relief of obstruction on any level is amenable.

**Rastelli Operation for Corrected Transposition of the Great Arteries**

**The Goal of Surgery**
The goal and technique does not differ from a Rastelli correction of complete transposition of the great arteries with left ventricular outflow tract obstruction. The Rastelli operation is chosen in the case of a nonresectable left ventricular outflow tract obstruction and adequate capacity of the right ventricle. Construction of an obstruction-free and straight intraventricular tunnel is essential for preserving left ventricular function. In corrected transposition of the great arteries with pulmonary atresia, the ventricular septal defect is not restrictive and usually is naturally committed to the aorta, thus allowing the creation of a straight intraventricular tunnel. In theory, this should be the best morphology for intraventricular rerouting. The enlargement of a borderline ventricular sep-
tal defect, while achieving better commitment of the ventricular septal defect toward the aorta, is a significant risk for surgically acquired heart block. An anterior position of the conduction system in {SLL} and a posterior position in patients with {IDD} is to be generally expected, and enlargement of the ventricular septal defect is performed accordingly. An unfavorable anatomy, such as a noncommitted and/or restrictive ventricular septal defect or significant straddling of the atrio-ventricular valve, can preclude a Rastelli operation. Under these circumstances, consideration should be given either to conversion to the Fontan procedure, or in suitable patients, to aortic translocation.

**Bex–Nikaidoh Procedure for Corrected Transposition of the Great Arteries**

**The Goal of Surgery**

The goal and technique of the Bex–Nikaidoh procedure for corrected transposition of the great arteries is the same as for complete transposition of the great arteries. Aortic translocation results in better-aligned outflow tracts. The divided outlet septum offers excellent visualization of the atrio-ventricular valve’s attachment as well as the ventricular septal defect borders. Enlargement of the left ventricular outflow tract with the patch can be performed easily despite the atrio-ventricular valve straddling. The translocated aorta is directly committed to the left ventricle. The anatomy of the right ventricular outflow tract is favorable for placement of an oversized pulmonary conduit, and orthotopic placement minimizes the risk of sternal compression. This can result in improved longevity of the conduit.

However, aortic translocation in corrected transposition of the great arteries with complex left ventricular outflow tract obstruction is a challenging procedure that should be considered only if the anatomy is inadequate for an intraventricular baffle. The specific issue in corrected transposition of the great arteries is the risk of damage to the conduction system during the division of the outlet septum. In {IDD} conduction, the atrioventricular bundle arises from the posterior node to follow the conventional path along the posteroinferior margin of the ventricular septal defect, which allows the risk-free transection of the outlet septum. In contrast, in {SLL} the atrioventricular conduction axis runs anteriorly and cephalically to the pulmonary valve, and then descends along the anterior margin of the ventricular septal defect before diverging into the bundle
branches. Other issues are related to the transfer of the coronary arteries, which in corrected transposition of the great arteries must be detached and extensively mobilized, and to progressive aortic valve regurgitation. Usually, aortic regurgitation is apparent immediately after surgery, confirming the importance of the technical aspects of aortic root transfer.

Double Switch Operation for Corrected Transposition of the Great Arteries (SLL), with Resection of the Subpulmonary Obstruction in Situs Solitus and Levocardia

Patient Characteristics

| **Age at surgery:** 16 months | **History:**  
| Diagnosis: | 1. Prenatal diagnosis  
| 1. Corrected transposition of the great arteries (2LC; 1R) | 2. Elective surgery  
| 2. Left ventricular outflow tract obstruction due to accessory tissue from the mitral valve | Procedure:  
| 3. Secundum atrial septal defect | 1. Modified Senning  
| 4. Situs solitus | 2. Arterial switch operation  
| 5. Levocardia | 3. Resection of accessory tissue obstructing the left ventricular outflow tract |

Specific Steps of Operation

**DVD** Clip 1

Preoperative findings.
After subtotal removal of the thymus and harvesting of the pericardium, the external anatomy is examined closely.

The right atrium is opened in an oblique fashion.
Resection of the subpulmonary obstruction.

Evaluation of the left ventricular outflow tract.
Corrected Transposition of the Great Arteries

**Clip 6**

Excision of the interatrial septum and opening of the entrance of the right pulmonary veins. Evaluation of the intra-atrial anatomy.

**Clip 7**

Development of the posterior wall of the systemic venous baffle with a trapezoid-shaped GORE-TEX® patch.
The anterior wall of the systemic venous baffle is developed.

Development of the pulmonary venous atrium using pericardium in situ (Shumaker modification).
Both great vessels are transected.

Harvesting of the buttons of the right and left coronary arteries.
Clip12
Implantation of the left coronary artery button.

Clip13
Implantation of the right coronary artery button.
**DVD Clip 14**

Lecompte maneuver and reconstruction of the ascending aorta.

**DVD Clip 15**

Reconstruction of the neopulmonary trunk with an autologous pericardial patch that has been pre-treated with glutaraldehyde for 15–20 min.
Final result.

Postoperative echocardiogram findings.
Closure of the Ventricular Septal Defect During the Double Switch Procedure

As part of the double switch procedure, when the systemic venous baffle is completed, the ventricular septal defect is approached by working through the mitral valve. All sutures should be placed from the left side of the septum due to the variability of the conduction system, and one never knows if the conduction system travels along the anterosuperior margin of defect only or if there is a conduction sling. Alternatively, one could consider closing the ventricular septal defect by working through the right ventriculotomy or through the aorta, thus eliminating undue tension on the crux cordis.
Senning–Rastelli Operation for Corrected Transposition of the Great Arteries (SLL) with Ventricular Septal Defect, Pulmonary Atresia, and Dextrocardia

Patient Characteristics

<table>
<thead>
<tr>
<th>Age at surgery: 14 months</th>
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<tbody>
<tr>
<td><strong>Diagnosis:</strong></td>
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<tr>
<td>1. Corrected transposition of the great arteries {SLL}</td>
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<tr>
<td>2. Pulmonary atresia</td>
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<td>3. Ventricular septal defect</td>
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<tr>
<td>4. Left pulmonary artery stenosis</td>
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<tr>
<td>5. Dextrocardia</td>
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<td>6. Secundum atrial septal defect</td>
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<tr>
<td>7. Status post-Blalock–Taussig shunt</td>
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<td>8. Status post-stenting of the left pulmonary artery</td>
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<tr>
<td><strong>History:</strong></td>
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<tr>
<td>1. Postnatal diagnosis</td>
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<td>2. Palliation with a Blalock–Taussig shunt at the age of 1 week and placement of the stent into the left pulmonary artery</td>
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<td>3. Elective surgery</td>
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<td><strong>Procedure:</strong></td>
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<tr>
<td>1. Modified Senning procedure</td>
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<tr>
<td>2. Rastelli operation</td>
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Specific Steps of Operation

[Image: Preoperative findings.]
Corrected Transposition of the Great Arteries

**Clip 2**

External anatomy of the heart.

**Clip 3**

Opening of the right atrium and development of the systemic venous baffle.
Completion of the systemic venous baffle.

Development of the pulmonary venous atrium using in situ pericardium.
**Clip 6**

Creation of the intraventricular baffle.

**Clip 7**

Placement of the conduit.
Postoperative findings.
Senning–Rastelli Operation for Corrected Transposition of the Great Arteries {IDD} with Noncommitted Ventricular Septal Defect, Pulmonary Stenosis, Situs Inversus, and Levocardia

Patient Characteristics

**Age at surgery:** 15 months

**Diagnosis:**
1. Corrected transposition of the great arteries {IDD}
2. Noncommitted, inlet ventricular septal defect
3. Pulmonary atresia
4. Stenosis of the right-sided pulmonary artery
5. Azygos continuation of the inferior vena cava
6. All pulmonary veins are connected with the left-sided right atrium, creating the appearance of total anomalous pulmonary venous drainage, while the interatrial septum with restrictive foramen ovale is “shifted” to the right.
7. Patent ductus arteriosus
8. Secundum atrial septal defect
9. Levocardia with left isomerism

**History:**
1. Patent ductus arteriosus stenting after birth
2. Elective surgery

**Procedure:**
1. Modified Senning operation
2. Rastelli operation with enlargement of the ventricular septal defect
3. Right pulmonary artery plasty

Specific Steps of Operation

Preoperative findings.
External anatomy of the heart.

Transection of the stented duct and mobilization of the pulmonary arteries.
**Clip 4**

Oblique opening of the left-sided atrium and resection of the interatrial septum.

**Clip 5**

Development of the posterior wall of the systemic venous baffle with a trapezoid-shaped GORE-TEX® patch.
The anterior wall of the systemic venous baffle is developed.

Development of the pulmonary venous atrium using pericardium in situ.
**DVD Clip8**

Evaluation of intracardiac anatomy.

**DVD Clip9**

Creation of the intraventricular baffle.
Stent resection and placement of the conduit.

Postoperative findings.
Modified Half-Mustard and Rastelli Operation for Corrected Transposition of the Great Arteries \{SLL\} in Situs Solitus with Dextrocardia

Patient Characteristics

**Age at operation:** 5 years

**Diagnosis:**
1. Corrected transposition of the great arteries \{SLL\}
2. Pulmonary atresia
3. Ventricular septal defect
4. Straddling and partial overriding of the mitral valve
5. Secundum atrial septal defect
6. Patent ductus arteriosus
7. Left superior vena cava
8. Dextrocardia

**History:**
1. At a different institution, the single-ventricle pathway had been chosen:
   a. After birth, a Blalock–Taussig shunt operation, with transection of the duct and ligation of the left superior vena cava, was performed.
   b. At the age of 6 months, a bidirectional Glenn anastomosis was performed.
2. At the age of 5 years, the patient was referred to our institution for possible anatomical repair.

**Procedure:**
1. Modified Half-Mustard
2. Rastelli Operation

Specific Steps of Operation

Preoperative findings.
The interatrial septum is resected. Using a short, longitudinally opened GORE-TEX® prosthesis, the inferior vena cava is tunneled toward the left-sided tricuspid valve, incorporating the coronary sinus inside the tunnel.
A cyanotic, 2-year-old girl was referred to our center with a diagnosis of congenitally corrected transposition of the great arteries {IDD} and severe subpulmonary obstruction. The echocardiogram revealed an inlet type of ventricular septal defect, with straddling of the tricuspid valve and valvular and subvalvular pulmonary stenosis. Catheterization confirmed a long segment of left ventricular outflow tract obstruction, with systemic pressure in the left-sided, morphological left ventricle, and good architecture of the pulmonary artery, with low pulmonary artery resistance. Because of the inlet-type of ventricular septal defect, the long segment of subpulmonary narrowing, valvar pulmonary stenosis, and straddling of tricuspid valve, aortic translocation was considered as a treatment option instead of a Rastelli operation combined with a Senning.
Specific Steps of Operation
After finishing the Senning procedure, the Bex–Nikaidoh procedure was performed with the following steps:

1. Dissection and mobilization of the left coronary artery

2. The aorta and pulmonary artery are transected.
3. The left and right coronary arteries are excised and extensively mobilized. The left coronary artery, in particular, is mobilized with all the ventricular branches that supply the right ventricular outflow tract. The aortic root is harvested from the right ventricle with an 8- to 10-mm cuff of muscle.

4. The pulmonary valve is excised, and the outlet septum is transected into the superior corner of the ventricular septal defect. A vessel loop passes through the ventricular septal defect from one inlet to another. One of the primary chordal attachments of the tricuspid valve to the ventricular septal defect has to be detached because of straddling (this cannot be seen).
5. The aortic root is seated into the left ventricular outflow tract using a continuous suture technique. At this point, there is a large anterior defect in the left ventricular outflow tract from the margin of the ventricular septal defect to the aortic root. This area is covered with a Dacron patch, using interrupted pledgeted sutures. The rest of the aortic root is attached to this newly created interventricular septum by continuous suture technique. Half of the anastomosis is reinforced by another suture line using the remnant of the pulmonary artery wall. The detached chordae of the tricuspidal valve is re-attached to the appropriate position.

6. The right coronary artery is implanted into the harvest site (not shown). The left coronary artery is implanted anterior and to the right of the harvest site. The harvest site is covered by pericardium. After the Lecompte maneuver, the aortic root is anastomosed with the ascending aorta.
7. The aortic cross clamp is released. During rewarming, a 22-mm diameter pulmonary homograft is placed into the right ventricular outflow tract. The bifurcation of the pulmonary artery is partially closed, moving the anastomosis between homograft and pulmonary artery to the right.

8. Angiography 1 year after surgery
Recommended Reading


