LONG-TERM RESULTS OF ATRIAL SWITCH IN TGA

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Åke Senning, 1915-2000
First description of atrial correction of TGA

Senning, Opuscula Medica (!) 1958
Correction of TGA at the University Hospital Zurich, 1962-2000 (493 pts.)

Atrial vs. arterial repair

- **Atrial repair**
- **Arterial repair**

Year: 1962-2000

- **Atrial repair** is depicted in orange bars.
- **Arterial repair** is depicted in blue bars.
Correction of TGA at the University Hospital Zurich

Age at the time of correction

Genoni et al., 1999
TGA: 32 years of atrial repair

Actuarial survival in hospital survivors
(follow-up 95.3 % complete)

Genoni et al., 1999
TGA: 32 years of atrial repair
Actuarial survival in hospital survivors

Genoni et al., 1999
ATRIAL CORRECTION OF TGA

Cause of late death

University Hospital Zürich, 1962 - 1987 (33/239 patients)

- Sudden: 21.9%
- Heart failure: 62.5%
- Pulmonary embolism: 3.1%
- Malignancy: 3.1%
- Accident: 6.3%
- Unknown: 3.1%
FAILING RIGHT VENTRICLE AFTER ATRIAL CORRECTION OF TGA

- Does this disease truly exists?
- Is it inevitable in majority of atrial repair survivors?
- Which are predictors of RV failure?
- Possible causes?
- Treatment options?
- Magnitude of the problem?
FAILING RIGHT VENTRICLE AFTER ATRIAL CORRECTION OF TGA

Time of onset (after 1st operation)

Zurich University Hospital, 17/220 patients operated 1964-1985, follow-up 95.3 % complete
RV failure after atrial correction for TGA as function of age at correction

hazard function

Differences are not significant!
FAILING RIGHT VENTRICLE AFTER ATRIAL CORRECTION OF TGA

*Surgical options*

- Correction of all residual anomalies.
- Restoration of AV synchrony (DDDR or biventricular pacing).
- Repair of systemic AV valve.
- Banding + arterial switch (Mee’s technique).
- Damus-Stansel-Kaye procedure (PA-Aorta anastomosis, RV- PA homograft).
- Heart transplantation.
FAILING RIGHT VENTRICLE AFTER ATRIAL CORRECTION OF TGA


- 10 patients after Mustard or Senning repair
- Anatomic correction in 5 pts. (Arterial switch in 3 and Damus-Stansel-Kaye in 2)
- Heart transplantation in 5 pts.
- Results: 1 early death (switch), 90% survival @ 27 months
- Complications: 3 AI in switch group with 1 AVR; 1 lymphoma in TX group
SWITCH CONVERSION LATE AFTER ATRIAL REPAIR FOR TGA


- 24 patients after Mustard or Senning repair
- Direct conversion in 4 pts. with 1 early death
- PA banding in 20 pts.: 3 deaths, 2 unsuitable for correction, 15 suitable.
- Staged switch in 12 with 2 deaths
- Late survival of switch conversion 80% @ 1 year, majority with improved LV function
Roger Mee’s results in patients with previous atrial correction of TGA

FAILING RIGHT VENTRICLE AFTER ATRIAL CORRECTION OF TGA

Possible causes

- Inherent inability of RV to support systemic circulation for the whole life span
- Damage to the RV due to long-standing cyanosis and volume overload ("late corrections")
- Perioperative damage to the right ventricle (deficient myocardial protection)
- Atrial dysrhythmias
- Tricuspid valve incompetence
PROBLEM AREAS OF ATRIAL SWITCH FOR TGA

Related to surgical technique:
- SVC or IVC stenosis
- Pulmonary vein stenosis
- Atrial dysrhythmias

Related to the method:
- Tricuspid valve incompetence
- Failure of systemic (right) ventricle
Prevention of pulmonary vein stenosis after atrial correction:
Augmentation of pulmonary venous atrium with autologous in-situ pericardium
Prevention of pulmonary vein stenosis in atrial correction:
Augmentation of pulmonary venous atrium with autologous in-situ pericardium
LATE RESULTS IN ADULT SURVIVORS OF ATRIAL TGA CORRECTION
Puley et al, Am J Card 1999;83:1080-4

- 86 patients >18 years old
- Late deaths: 8 pts. (9 %)
- Late heart failure in 9 pts. (10 %)
- Atrial arrhythmia's in 73 % of survivors
- Pacemaker implants in 22 %

Authors’ conclusion: these patients remain at risk for premature death, supraventricular tachycardia, and congestive heart failure
(a) Freedom from severe systemic ventricular dysfunction after surgical repair of TGA. (b) Freedom from severe AV-valve insufficiency after surgical repair of TGA. TGA, transposition of the great arteries.


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ATRIAL CORRECTION OF TGA

University Hospital Zürich, 1962 - 1997
231 patients, average follow-up 13.4 years, (158 patients @10, 22 @ 20 years)

- NYHA I: 66%
- NYHA II: 29%
- NYHA III/IV: 5%
ATRIAL CORRECTION OF TGA: INTELLECTUAL DEVELOPMENT

University Hospital Zürich, 1962 - 1997
205 patients, average follow-up 10.1 years

Genoni et al., 1999
ATRIAL CORRECTION OF TGA:
Present occupation
University Hospital Zürich, 1962 - 1997
(82 adults)
Marital status and births: comparison of women who had undergone atrial repair with a control group consisting of 26 year old women living in Switzerland in 1993. 10 live births in TGA survivors, all free of heart malformations

Genoni M et al. Heart 1999;81:276-277
ATRIAL CORRECTION OF TGA: INCIDENCE OF PACEMAKER IMPLANTS

University Hospital Zurich, 1962 1987 (239 Patients)
(a) Freedom from loss of sinus rhythm after surgical repair of TGA. (b) Freedom from pacemaker implantation after surgical repair of TGA. (c) Freedom from right bundle branch block after surgical repair of TGA. TGA, transposition of the great arteries.


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Conduction system in Senning’s correction of TGA

Avoid sutures in the vicinity of AV and SA node
TRANSPOSITION OF THE GREAT ARTERIES

Why has arterial correction replaced the atrial method for total correction of TGA?

- Total correction can be performed at neonatal stage
- No “interval mortality” after Rashkind
- Lower operative mortality and smoother postoperative course
- Technically less demanding
- Left ventricle in systemic circulation
“Double switch” in corrected TGA: Senning atrial correction and arterial switch, to restore appropriate ventricles to systemic and pulmonary circulation.
ARGUMENTS FOR A (LIMITED) UTILIZATION OF ATRIAL CORRECTION

• Senning’s atrial correction has accumulated > 30 years experience; long-term outlook for arterial switch is less well known (neoaorta, coronaries, reoperations).

• Technical problems of atrial correction (stenosis SVC or pulmonary veins) are avoidable.

• Failure of systemic ventricle is not obligatory.

• Atrial correction was performed in older children with long-standing cyanosis which might have caused late heart failure.

• Dysrhythmias remain a problem in atrial correction
Present Limited Role Of Atrial TGA Correction

• TGA presenting later in life with normal PA pressure. Long-term advantages of banding + AP shunt followed by arterial switch are unproven.

• Double switch in some patients with corrected transposition (VSD or PS).