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Appendix A. Conference discussion

Dr J. Stark (*London, United Kingdom*): In the options for the right ventricular failure, you didn't include transplantation in your original slide. Is it because you have not performed any transplantations, or in view of the last slide, you would consider it as an option now?

Dr Hörer: Yes, that is correct, there was no heart transplantation in this Senning group. We did one cardiac transplantation in a group of 88 Mustard patients, but in the Senning group there was no transplantation.

Dr Stark: Until what age would you consider conversion to arterial switch?

Dr Hörer: This is a difficult question. I don't think that it's just a matter of age. We consider the conversion under the age of 16, but all of our patients now are older than 16. The mean age of the Senning patients now is 20. That's why I concluded that this will probably no longer be an option for those patients.

Dr Stark: Because it is also in the literature, certainly from Dr Mee, that the results over 16 are poor, so probably transplantation would be a better option.

Dr Hörer: Yes. It would be the same cut-off point as for patients with congenitally corrected transposition who are scheduled for a double switch procedure.

Dr R. Pretre (*Zurich, Switzerland*): You also had some patients in your cohort with LVOT obstruction who might have a trained left ventricle without any banding. Would you consider an anatomical correction then?

Dr Hörer: In principle, yes, they are ideal candidates if they have systemic pressure in the left ventricle and at the same time low pressure in the pulmonary artery.

Editorial comment

Dr Lange's group [1] from the German Heart Centre in Munich has provided further evidence of the long-term reliability of Senning's operation, and has demonstrated a low incidence of late complications, when the procedure was performed properly, respecting the anatomy of the systemic and pulmonary venous inflow. Their results complement our previously published experience [2] with this operation, with similar extended outlook for atrial correction of the TGA. Furthermore, their analysis lends strong support to the notion of using patient's own tissue in correction of cardiac anomalies, especially when performed early in life, because the natural growth of the tissue provides superb anatomical results into adulthood. The reported long-term survival is excellent, although it must be mentioned that the paper analyses only the survivors of the initial operation, i.e. those who went home after the total correction of TGA. One regrets the lack of some crucial information:

1. There is no indication of the age at the initial total correction of the patients with complications when compared with those surviving without reoperation, especially those presenting later with the failure of systemic ventricle. Does the long-term exposure to systemic hypoxia in patients submitted to total correction at the higher age (beyond first year of life) represent a risk factor for development of systemic ventricle failure? Does the very early operation (in the first weeks of life) predispose the patient to more baffle and inflow complications later in life?
2. The authors do not provide information about the cardiac rhythm at the last follow-up. The incidence of atrial dysrhythmias, the stability of sinus rhythm, the incidence of significant arrhythmias and of pacemaker implantations in this large patient population with atrial correction are important questions which arise in the late follow-up of this population. Our own data [3] show the necessity of careful rhythm monitoring, to detect those patients who might profit from the pacemaker or defibrillator implantation. Such interventions might be considered as reoperations in wider sense.

Several remarkable results deserve comment. Conversion to the arterial correction, colloquially known as Mee's procedure, does carry a substantial risk, and has caused the majority of early deaths encountered by the authors. The attempts at the correction of systemic AV valve incompetence are also doomed to failure, because they do not attack the underlying disease, i.e. failure of systemic ventricle. On the other hand, the authors provide further evidence for the surprising efficiency of simple arterial banding after atrial correction of TGA, which seems to provide a good palliative relief. It is a surprising finding in a group of patients that elsewhere might be considered as good candidates for heart transplantation, which was indeed performed in a small proportion of our patients with failure of systemic ventricle, but with excellent long-term results.

Good extended results obtained by the authors and by others in long-term assessment of Senning's correction lend support to two possible clinical indications for this operation in the 21st century: It seems that a careful exploration of the double-switch technique for the selected patients with corrected transposition of the great arteries [4] can be warranted. Furthermore, this operation is still an option in the less-developed countries, where one might encounter older patients with the complete transposition of the great arteries and normal pulmonary artery pressure, where the

results of preliminary banding, followed by a later arterial switch, might be burdened with an unacceptable mortality, and Senning's procedure can lead to a lasting success with minimal operative risk.

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