



Original article

Is a modified Senning with pericardial patch associated with less complications and better prognosis?

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Abstract

Introduction: The Senning procedure continues to be indicated for complex cases of transposition of the great arteries (TGA) that are not suitable to the anatomical correction (arterial switch operation). Some modifications of the Senning procedure were proposed to augment both the atrial septal flab and/or pulmonary veins. In our study, autologous pericardium treated by saline and heparin was used to augment the right atrium (pulmonary venous) pathway. The aim was to avoid pulmonary venous pathway stenosis (PVPS) complications.

Patients and methods: 74 patients who underwent a modified Senning procedure in Geneva University Hospital between 1989 and 2013 were analyzed retrospectively as well as prospectively during the time of the study. The follow up period extended up to 24 years, and any patient with follow up period less than 1 year was excluded.

Results: 67 patients (90%) were discharged with sinus rhythm, and in the latest follow up, 34 patients (45%) maintained their sinus rhythm. 26 patients (35%) experienced at least a single episode of arrhythmia in the early post-operative period. This episode was either nodal rhythm (n = 10), complete AV block (n = 8), supraventricular tachycardia (SVT) (n = 6) and bradycardia (n = 2). Permanent pacemaker (PM) implanted in 7 patients (9.5%) before discharge. During the follow-up period, 22 patients (29.7%), presented with SVT (all referred for ablation), 1 presented with nodal rhythm and 1 presented in AV block (both had a PM implantation). These two cases raised the total of patients who had PM implantation at the latest follow-up to 9 patients (12%). We had 3 patients (4.1%) who had experienced pulmonary venous pathway stenosis (PVPS). One patient had early presentation on the 3rd day post-operatively requiring surgical revision and patch augmentation. 2 patients had the presentation during the follow-up period, 3 and 5 years respectively after surgery. Both had reoperation with smooth post-operative course. We assessed the survival of patients along the follow-up period, using Kaplan Mayer showing 86.1% survival at 24 years. At the latest follow-up, 9 patients out of 74 patients included in our study (12.2%) died during the follow-up period; 6 patients due to heart failure, 2 patients due to fatal arrhythmias, and one post tricuspid valve implantation.

Conclusion: The modified Senning procedure using autologous pericardial patch augmentation, showed less incidence of late PVPS, and higher incidence of restoration of sinus rhythm at the time of discharge in comparison to the published results of the standard technique in the literature. It had a low mortality and comparatively better survival.

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Keywords: Senning procedure; Modified Senning procedure; Transposition of great arteries (TGA); Autologous pericardial patch augmentation; Pulmonary venous pathway stenosis (PVPS)

1. Introduction

The Senning procedure continues to be indicated for complex cases of transposition of the great arteries (TGA) who are not suitable to the anatomical correction (arterial switch operation) [1].

Some modifications of the Senning procedure were proposed to augment both the atrial septal flab [2] and/or pulmonary veins' pathway [3].

In our study, the autologous pericardium treated by saline and heparin was used to augment the right atrium (pulmonary venous) pathway. The aim was to avoid PVPS complications which is not uncommon with Senning procedure and can occur up to 15% according to the literature [4]. PVPS may cause a decrease in left ventricular filling volume and may contribute to low cardiac output and even sudden death in the presence of ventricular tachycardia [5].

2. Patients and methods

2.1. Study population

Approval of the study was granted by the institutional Ethics Committee. 74 patients who underwent a modified Senning procedure in Geneva University Hospital between 1989 and 2013 were analyzed retrospectively as well as prospectively during the time of the study.

Demographic and preoperative data are summarized in [Tables 1 and 2](#).

2.2. Surgical technique

The Senning procedures were performed by two cardiac surgeons. Standard techniques of cannulation and cardiopulmonary bypass were used. All cases underwent surgery in moderate hypothermia (28 °C–32 °C) with cold crystalloid cardioplegia. The atrial switch followed the principles of Senning's original technique ([Fig. 1](#)) except harvesting a patch of autologous pericardium, preparing it with saline and heparin and suturing it to the pulmonary venous atrial wall to augment it ([Fig. 2](#)).

Table 1
The demographic data of the studied group.

	Study group (n = 74)	
	No.	%
Sex		
Male	56	75.7
Female	18	24.3
Age(in month)		
Min. – Max.	1.25–132.0	
Mean ± SD	18.65 ± 25.14	
Median	11.0	
Weight(in kg)		
Min. – Max.	3.40–32.0	
Mean ± SD	7.65 ± 4.49	
Median	6.50	

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