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AN INNOVATIVE SURGICAL TECHNIQUE FOR CONTINUOUS SUTURING OF PROSTHESIS IN MITRAL VALVE REPLACEMENT

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ABSTRACT

Mitral valve replacement (MVR) is usually performed in two methods of running and interrupted suturing. In running method, the suturing of the valve is usually with some traction on the annulus and also there is a risk of aortic valve injury. This study was conducted to evaluate a new technique for suturing to avoid these complications and decrease the time of cardiac arrest. One hundred and seventy-seven cases undergoing isolated MVR or MVR with other valve replacements were operated by the new method and compared with 77 cases of routine method, as control group. The patients were followed up 1-4 years. In the control group, one case of mortality occurred due to heart failure. In both groups one case of late mortality was observed not related to surgical operation. No paravalvular leakage or aortic valve injury was observed.

The highlights of this technique are the simplicity of operation, short period of valve implantation and aortic clamp time, which indicated 6 and 11 minutes decrease in average time, respectively. This method is recommended for all cases of rheumatic mitral valve disease, especially for those having a small atrium.

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Keywords: heart valve prosthesis, mitral valve surgery.

INTRODUCTION

There are two methods of continuous and interrupted suturing of prosthetic valve in MVR. Although it has been reported that the rate of periprosthetic leakage in the continuous method is high following the operation,[1,2] it is supposed that this high rate of leakage is not common in rheumatic valve disease, because the annulus in these patients is usually thick and fibrotic.[3,4] The routine method of running suturing is usually started at the inferior rim of the annulus (6 o'clock)[1,5] and after implantation of the prosthetic valve, suturing from 8 to 12 o'clock is impossible unless the surgeon makes some traction on the annulus which, in turn, can increase the risk of injury to aortic valve leaflets and the left circumflex artery (LCX). To avoid this complication and diminish the time of cardiac arrest, which is important for lowering the mortality and morbidity rate of operation,[6,7,8] we modified the running method of prosthetic valve suturing.

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MATERIAL AND METHODS

In this method the first suture is started at 12 o'clock and is continued counterclockwise; while the needle passes from outside of the prosthetic ring and then from inside of the annulus (left ventricular side) to the outside (out-to-in, in the prosthetic ring and in-to-out, in annulus) as shown schematically in Fig. 1(a,b). The direction of the suturing at the mitral valve changes at the last stitch of each prolene, while the annulus is protected by a small piece of pericar-

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Table I. The comparison between mitral valve implantation and clamp time in the case and control groups of patients.

	Case n =77	Control n =177	Difference	*P*-value
Clamp time (minute) mean ± SD	29.90 ± (5.5)	40.85 ± (4.8)	10.9	< 0.05
Implantation time (minute) mean ± SD	19.99 ± (3.0)	26.02 ± (3.2)	6.0	< 0.05

dium as a felt, Fig. 1(b).

Suturing through the annulus is simple and the exact site of needle passage is seen directly (while the needle holder is used in backhand fashion). Suturing continues as far as 6 o'clock. At this point the valve is implanted on the annulus and the rest of the suturing is continued counterclockwise. It is recommended that the sutures must be tightened up via a nerve hook before each tie. To increase the safety of this continuous method and prevention of periprosthetic leakage we usually use at least 5-6 No.(0) polypropylene sutures for each mitral valve replacement.

We performed 177 cases of isolated MVR or MVR with other valves repair or replacement by this new method during December 1994 to December 1999, consequently. 77 patients were considered as control group and operated according to the routine method. All of the operations were performed through midsternotomy, using cardiopulmonary bypass and moderate hypothermia. Cardiac arrest was accomplished by aortic cross clamp and infusion of high-potassium (20mEq/L) blood cardioplegia (20 mL/kg) into the aortic root or coronary ostium. The same solution was repeatedly infused at 20-minute intervals (10 mL/kg) during aortic cross clamp and immediately before unclamping. The patients were followed for 1- 4 years. At the end of follow-up, mortality rate, the duration of valve implantation and aortic clamp time were compared in both groups ($p<0.05$).

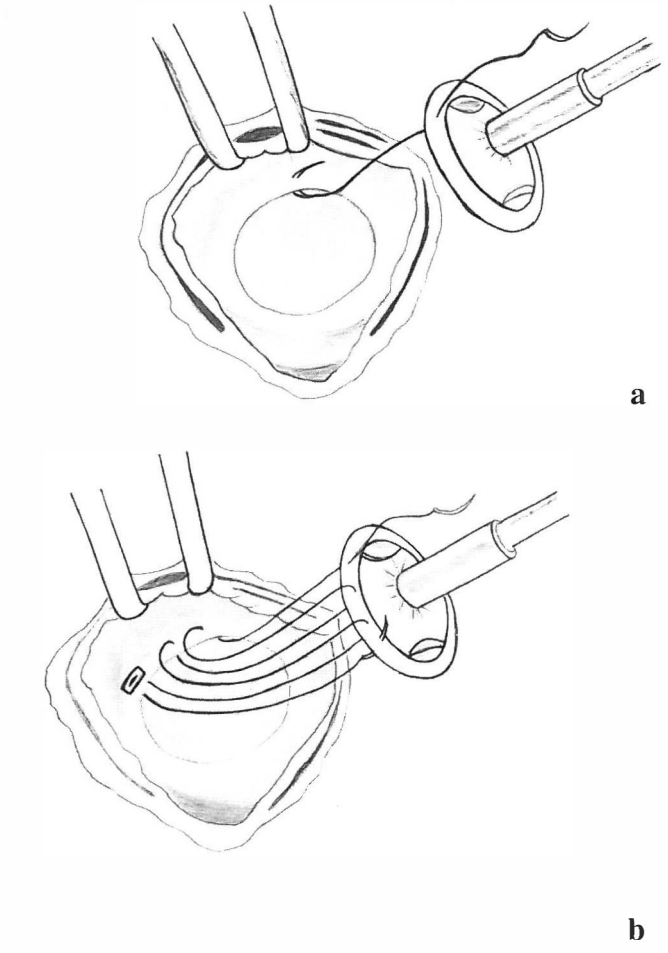


Fig. 1. Lateral views of operative field from patient's right side: (a) our method of MVR with sutures beginning from 12 o'clock and (b) continuing counter-clockwise.

RESULTS

We operated 8 cases with three-valve replacement, 67 cases of isolated MVR, 8 cases of MVR-AVR and tricuspid valve repair, 55 cases of both MVR and AVR, 29 cases of MVR with TV repair and 10 cases of MVR and aortic valve repair.

One case of early mortality was observed as a result of heart failure in the control group. In each group, one case of late mortality, not related to surgical operation, was seen. There was no paravalvular leakage in the two groups during follow-up. The duration of aortic clamp and valve implantation were compared in both groups ($p < 0.05$) (Table I). There was no statistically significant difference in mortality rate between the groups but this difference was clinically important.

DISCUSSION

Applying this method causes to abate the duration of valve implantation and clamping time. Apart from this, it is a simple, secure and reliable method for valve replacement. The method minimizes the risk of injury to aortic valve leaflets and LCX artery where the sutures of aorto-mitral conti-

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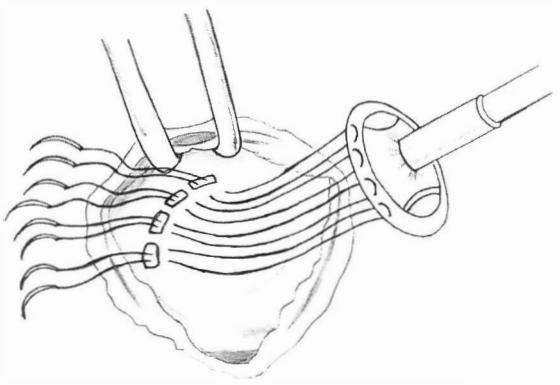


Fig. 2. Modification of the method with interrupted suturing.

nuity and left half of the annulus are performed by direct viewing. Furthermore, it will avoid tension on the annulus in this area.

According to Cohn's report,[2] non-coronary cusp entrapment of the aortic valve is induced usually from 10-12 o'clock during routine mitral valve suturing. In this new method, as the first suture starts from 12 o'clock position and follows counterclockwise, it is possible to observe the ventricular side of the needle passage, so the aortic cusp entrapment can be prevented. On the other hand, as Kirklin and Barret Boyes noted,[1] in continuous suturing, the risk of periprosthetic leakage is increased to about 10% within 4 years post-operation. It is suggested that application of at least 5-6 polypropylene sutures for each mitral valve replacement, tightening up the sutures by a nerve hook, using pericardial felt in every change of suture direction and limitation of this method in rheumatic cases are the probable causes of low periprosthetic leakage rate.

This method is recommended for patients requiring valve replacement due to rheumatic valve disease, especially in cases of severe mitral stenosis and small atrium, but it is not recommended for patients with degenerative valvular disease. In these cases, the use of pledgeted interrupted sutures is preferred. Here the same method can also be modified (Fig. 2).

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