

ABSTRACT

INTRODUCTION: Aortic regurgitation is a valvular heart disease that accounts for 13-21% of significant valvular diseases. If the primary lesion leading to the development of aortic regurgitation is the dilatation of the aortic root or the ascending aorta, the surgical procedure, apart from intervention on the valve itself, must additionally include excision of the dilated aortic segment and its replacement with a vascular prosthesis. In such situation, the aortic valve leaflets are usually normal – with no structural changes. Excision of a "healthy" valve and its replacement with a mechanical or biological valve resulting from the surgical method is a kind of injury for the patient. In such a case, the patient is included in the group exposed to the valve-related complications. It remains to be one of the most important issues for cardiac surgeons specializing in aortic valve surgery and has led to the development of valve sparing aortic root replacement operations.

AIM OF THE STUDY: The aim of the study is to assess the early results of aortic root remodeling with external aortic annuloplasty as a newly introduced method. The main question is whether the use of methods standardizing the procedure developed by other researchers, allows to obtain early results comparable to the operating method used so far. Is it possible after a short training, considering the other technique required many years of experience?

The data in the literature report the use of a smaller size of vascular prosthesis for surgery with the introduced method compared to the reimplantation procedure used so far. An attempt was made to assess if there is an improvement in the function of the aortic valve after surgery because of that fact. The smaller size of the prosthesis may improve the coaptation of the aortic valve leaflets. The aim was to evaluate the effect of using a smaller aortic root prosthesis on the reduction of valve regurgitation after surgery.

At the same time, the use of a smaller vascular prosthesis requires the use of a smaller outer ring to stabilize the aorto-ventricular junction. The work is to answer the question about the risk of generating postoperative aortic stenosis in the study group.

MATERIAL AND METHODS: 78 patients were included in the study. Surgeries were performed at the Department of Cardiac Surgery and Transplantology of the Institute of Cardiology in Warsaw in 2012-2018 and the Department of Cardiac Surgery of the University Hospital in Białystok in 2019-2020. Data were collected and analyzed retrospectively. The patients were divided into two groups. The only differentiating criterion was the type of the surgical procedure – modified Yacoub procedure in the study group and David procedure in the control group.

The study group includes patients operated on from 27/09/2016 to 14/01/2020 - 37 patients who underwent remodeling of the aortic root with stabilization of the aortic annulus and aortic valve repair. The group consisted of 8 women and 29 men aged 25 to 74, mean age 50.62. The control group consists of 41 patients operated on in the period from 02/07/2012 to 04/12/2019. Patients in the control group underwent David's surgery - reimplantation of the aortic valve. The group consisted of 9 women and 32 men aged 16 to 72 years, mean 45.20 years.

All patients were candidates for valve sparing aortic root replacement. The patients in the study group were treated using the method of aortic root remodeling with external aortic annuloplasty, and when necessary, aortic valve repair - central plication of the cusp free margin. In the control group the aortic valve reimplantation was performed and if necessary, valve repair as well - the central plication of the cusp free margin.

Both study groups underwent echocardiographic preoperative, intraoperative and postoperative evaluation. The pre- and postoperative examinations were transthoracic examinations, the intraoperative examination was a transesophageal examination in an anesthetized patient, and included both pre- and postprocedural assessment. The first part of the transesophageal examination was to assess the anatomy and confirm or establish the primary lesion of the aortic complex, the second part is to assess the repair of the valve.

RESULTS: There were no significant differences between the groups in terms of age and sex. Patients with clinical symptoms of NYHA II or higher were significantly more frequent in the study group. Most of the preoperative echocardiographic parameters did not differ between the groups. Only the difference in the degree of preoperative aortic regurgitation was statistically significant. In the study group the median was moderate regurgitation, while for the control group - mild. There were no differences in extracorporeal circulation and cross clamp times between the groups. However, the difference in the dimensions of the vascular prosthesis used for the procedure in both groups reached the significance level. In the study group 28 mm aortic grafts were used for the majority of patients, while in the control group 30 mm grafts. The degree of postoperative aortic regurgitation did not differ between patients operated with both methods. On the other hand, the calculated degree of improvement between groups after the treatment was statistically significant. In the group of patients with remodeling, the reduction in regurgitation was significantly greater (on average by 2 points on the scale) than in the reimplantation group (on average by 1 point). Both surgical techniques used in this study require some kind of intervention in the width of the aortic ring. In the two groups the maximum and mean aortic valve gradients were examined in postoperative echocardiography. There were no significant differences in gradients between groups. The mean values of both parameters are

slightly higher in the control group (reimplantation) despite the previously demonstrated difference in the size of the used vascular grafts in favor of this group. However, the obtained values of transvalvular gradients had no haemodynamic significance, and the surgical technique did not cause aortic stenosis. No in-hospital deaths were recorded in both groups. The need for early replacement of the aortic valve due to unsuccessful repair occurred in two patients in the study group and one in the control group – statistically non-significant. The reoperations rates for bleeding were similar, although the surgical technique might suggest a higher bleeding risk in the group of patients with remodeling - one suture line, compared to two lines for reimplantation. Postoperative renal failure requiring renal replacement therapy occurred in one patient in each of the groups. There were no statistically significant differences in the incidence of neurological complications. The study groups also did not differ in terms of the occurrence of postoperative sternal dehiscence. A significant difference between the two studied groups was demonstrated for the occurrence of post-operative atrial fibrillation. It occurred in 10 patients (27%) from the group of patients operated on with the root remodeling method and in 3 patients (7.3%) after David's surgery.

CONCLUSIONS: After analysis of the obtained results, the following conclusions were drawn:

1. The use of intraoperative measurements of the elements of the aortic complex in aortic root remodeling as a form of standardization of the procedure allows for a quick introduction of a newer surgical method with early results comparable to those obtained with the traditional method.
2. Greater reduction of the degree of aortic regurgitation in the study method than in the control method may be associated with the use of a smaller vascular prosthesis, a fragment of which is used for external aortic annuloplasty.
3. The use of a smaller vascular prosthesis in the study method does not cause the higher aortic gradients than in the control method – there is no risk of early postoperative aortic stenosis