Summary of the dissertation

Impact of minimally invasive approach on pulmonary function in patients undergoing aortic valve replacement

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The most common minimally invasive approach to aortic valve replacement is upper hemisternotomy, which has been implemented at our department, as well. Preserving the lower half of thoracic cage could lead to lower postoperative drop of pulmonary function, apart from other benefits. Nevertheless, publications on this topic are insufficient and controversial. Our aim was to perform a prospective randomized trial comparing upper hemisternotomy with standard (median) sternotomy in terms of pulmonary function changes perioperatively. We also added a novel exercise tolerance test, one-minute sit-to-stand test, and a quality of life evaluation to the study.

We included patients indicated for elective isolated aortic valve replacement with bioprosthesis who were older than 65 years, signed informed consent, and in which both surgical approaches were technically feasible. Exclusion criteria were re-do surgery and concomitant cardiac surgery. Patients were randomized to minimally invasive and standard group in 1:1 ratio. On the day of admission, on the 7th postoperative day and 3 months postoperatively, the patients underwent pulmonary function testing and one-minute sit-to-stand test. They filled Short Form-36 quality of life questionnaire preoperatively and 3 months after it, as well. These data were statistically analyzed together with standard perioperative measures.

Between May 2017 and September 2019, 40 patients were included to the study. One half was operated through upper hemisternotomy and the other half through median sternotomy. There was zero in-hospital mortality in both groups. Minimally invasive group had significantly longer operation time ($p = 0,02$) and lower blood loss postoperatively ($p < 0,001$). Regarding pulmonary function, we recorded a significantly greater early postoperative drop of FEV1, MEF50%, VC and FVC in minimally invasive group. However, this group had significantly better outcomes in the preoperative period. One-minute sit-to-stand test showed a significant drop on 7th postoperative day and a significant rise after 3 months (beyond preoperative values).

There was no difference between the groups. We recorded a significantly higher increase in quality of life in category of physical functioning in minimally invasive group postoperatively. General health evaluation was better in minimally invasive group postoperatively, as well.

Upper hemisternotomy is a minimally invasive approach that offers reduction of perioperative morbidity while preserving comparable mortality at the cost of higher technical demand. According to the outcomes of our study, it is not associated with better postoperative pulmonary function. Moreover, it may lead to greater drop of parameters of obstruction and restriction. Early postoperative quality of life is better in this approach. One-minute sit-to-stand test was for the first time applied in cardiac surgery settings without significant complications. It is able to evaluate perioperative changes of exercise tolerance, however, both groups had comparable outcomes.