Rane promjene u deformaciji i funkciji miokarda nakon zamjene aortne valvule zbog teške aortne stenozе

Early regional myocardial deformation and function changes in patients with severe aortic stenosis after aortic valve replacement

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KEYWORDS: echocardiography, 2D strain, aortic stenosis, systolic/diastolic function change, aortic valve replacement.

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UVOD: U pacijenata s teškom aortnom stenozom (AS) i očuvanom sistoličkom funkcijom lijeve klijetke (LVEF), mjere miokardijalne deformacije kao što je globalna longitudinalna deformacija (GLS) su često reducirane zbog tlačnog opterećenja ili ireverzibilne sistoličke disfunkcije. Nakon zamjene aortne valvule (AVR), dolazi do reverznog remodeliranja hipertrofičnog miokarda lijeve klijetke (LV) i longitudinalna funkcija LV se oporavlja. U ovom radu želimo istražiti promjene u sistoličkoj i dijastoličkoj funkciji LV tijekom ranog postoperativnog perioda.

PACIJENTI I METODE: Uključeno je 45 pacijenata s teškom simptomatskom AS (AVA/BSA $0.33 \pm 0.09 \text{ cm}^2/\text{m}^2$), očuvanom LVEF (57.3 ± 8) i koncentričnom hipertrofijom LV te im je učinjen transtorakalni ehokardiografski pregled i studija globalne i regionalne longitudinalne deformacije (LS) metodom 2D speckle tracking preoperativno i u ranom postoperativnom periodu (7,5 $\pm$ 6,2 postoperativnog dana).

REZULTATI: GLS je prije operacije bio značajno reduciran ($-12.6 \pm 6.7\%$). Nakon AVR, LVEF je bila značajno bolja ($p=0.013$), kao i dijastolička funkcija ($p=0.014$), ali nije bilo značajnog oporavka GLS ($p=0.888$). Daljnje studije deformacije bazalnih segmenata LV nisu pokazale poboljšanje LS nakon AVR, osim u području bazalnog interventrikularnog (iv) septuma ($r=0.344$, $p=0.011$). U grupi prije operacije, uočili smo snažnu pozitivnu korelaciju između LS bazalnog segmenta lateralne stijenke i ostalih bazalnih segmenata LV (osim bazalnog iv septuma; inferiorna stijenka $r=0.532$, $p=0.002$, anterior $r=0.580$, $p=0.001$, posteriorna $r=0.600$, $p<0.001$). Nije bilo značajne razlike među spolovima, osim u AVA i volumenu LV, što je bilo i očekivano, s obzirom na razlike u površini tijela (BSA).

ZAKLJUČAK: Rezultati su prikazali značajno poboljšanje LVEF i dijastoličke funkcije LV. Nije bilo značajnih promjena GLS, osim oporavka LS u području bazalnog iv septuma, što se može objasniti Laplace-ovim zakonom i tlačnim rasterećenjem. Niske preoperativne vrijednosti LS nisu znak ireverzibilnog oštećenja te ne isključuju mogućnost oporavka nakon AVR. Vrijednost LS bazalnog segmenta lateralne stijenke snažno korelira s ostalim segmentima LV te bi mogao biti marker za procjenu globalne longitudinalne funkcije LV prijeoperacije. Nakon AVR, već u ranom postoperativnom periodu dolazi do diskretnih promjena u sistoličkoj i dijastoličkoj funkciji LV, što možemo registrirati i analizirati samo visoko osjetljivim novim ehokardiografskim studijama deformacije.

INTRODUCTION: In patients with severe aortic stenosis (AS) and preserved left ventricular systolic function (LVEF), myocardial deformation parameters like global longitudinal strain (GLS) are often reduced, due to pressure overload or subtle irreversible systolic dysfunction. After aortic valve replacement (AVR), reverse remodeling of the hypertrophied left ventricle (LV) occurs, and LV longitudinal strain (LS) recovers. We wanted to investigate immediate changes in systolic and diastolic function in early postoperative period.

PATIENTS AND METHODS: 45 patients with severe symptomatic AS (AVA/BSA $0.33 \pm 0.09 \text{ cm}^2/\text{m}^2$), preserved LVEF (57.3 ± 8) and concentric LV hypertrophy, underwent baseline and early postoperative (7,5 $\pm$ 6,2 postoperative day) transthoracic echocardiography with speckle tracking 2D analysis of the global and regional LS.

RESULTS: GLS was reduced before AVR ($-12.6 \pm 6.7\%$). We found a significant improvement in LVEF ($p=0.013$) and diastolic function ($p=0.014$), but no significant difference in GLS ($p=0.888$). Further strain analysis of the LV basal segments showed no significant differences after AVR, except in the basal interventricular (iv) septum ($r=0.344$; $p=0.011$). In a preoperative group, we found a strong positive correlation between LS of the lateral wall and the other LV basal segments (except basal iv septum, inferior $r=0.532$, $p=0.002$; anterior $r=0.580$, $p=0.001$; posterior $r=0.600$, $p<0.001$). There were no significant differences according to gender, except in AVA and LV volume, which was expected because of differences in body surface area (BSA).

CONCLUSION: Our results demonstrate significant changes in LVEF and improvement in diastolic LV function. GLS did not change in early postoperative period, but there was significant increase in LS of the basal iv septum. This can be explained by Laplace's law, regarding pressure unloading. Even low LS values in this segment do not implicate that these changes are irreversible and do not exclude possibility of recovery after AVR. According to results, basal lateral wall segment LS correlates strongly with other LV segments so it could be a good marker of the global longitudinal LV function estimation prior surgery. Subtle functional changes in both systolic and diastolic LV function occur immediately after AVR and can be detected by highly sensitive speckle tracking myocardial deformation analysis.

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