Mitral Valve Replacement With Chordal Preservation Provides Comparable Cardiac Function As Mitral Valve Repair: An Echocardiographic Study Based On Cardiac Energetics

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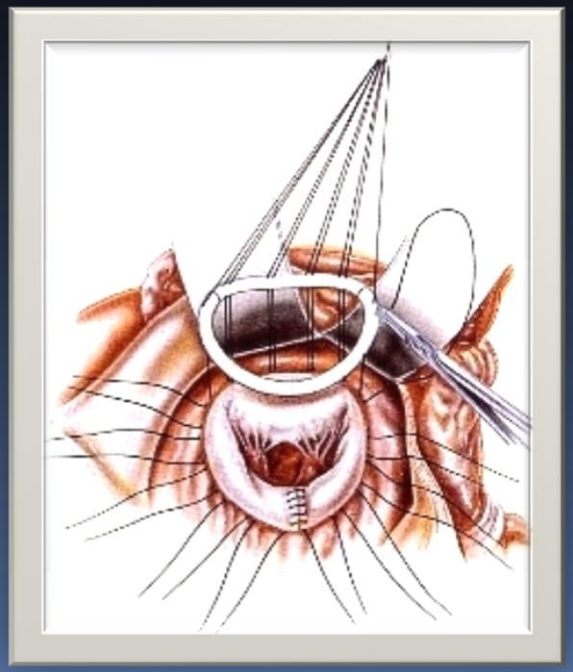
Background

Mitral valve surgery in chronic MR



Mitral valve repair (MVP) is superior to mitral valve replacement (MVR) with regard to the lower rate of reoperation, thromboembolism, valve infection, and anticoagulant-related hemorrhage.

There are many reports about the difference of the cardiac performance between MVP and conventional MVR (without chordal preservation) . However, whether LV function after MVP is better than that after MVR with chordal

Objectives

This report presents the results of the LV function about MVP and MVR with chordal preservation before and one month after surgery based on the data analyzed by the left ventricular energetics.

Mitral valve surgery in chronic MR

- **Number of Patients:** 41 cases (Jan. 2007 - Dec. 2009)
- **Gender:** Male 29, Female 12
- **Age:** 64 +/- 13 (28 - 87) years old
- **Etiology:**

myxomatous	24
infective endocarditis	4
prolapse	13

- **Valve procedure:**

MVP	29
MVR (with posterior leaflet preservation)	12

- **Exclusion criteria:**

+AVR	23
+CABG (ischemic MR)	12
ejection fraction<40%	4

- **Co-morbidity:**

High age (over 80 years old)	4
Atrial fibrillation	12

Transthoracic cardiac echocardiography

- LV end-diastolic volume index (EDVI)
- LV end-systolic volume index (ESVI)

} Teichholz method

- Ejection fraction (EF) = (EDV-ESV) x 100 / EDV

Teichholz method:

LV volume index = 7.0 x (LVDD or LVSD)^3/(2.4+ LVDD or LVSD)/BSA

LVDD: Left Ventricular Diastolic Diameter

LVSD: Left Ventricular Systolic Diameter

BSA: Body Surface Area

Cardiac energetics

- **Contractility: Ees = mean arterial pressure / EDVI**
- **Afterload: Ea = maximal arterial pressure / (EDVI-ESVI)**

Tanoue, et al. Circulation 2001;103:2176.

- **Ventriculoarterial coupling: Ea/Ees**

Burkhoff and Sagawa. Am J Physiol 1986;250:R1021.

- **Stroke work and pressure-volume area (SW/PVA):**

1/(1+0.5 x Ea/Ees)

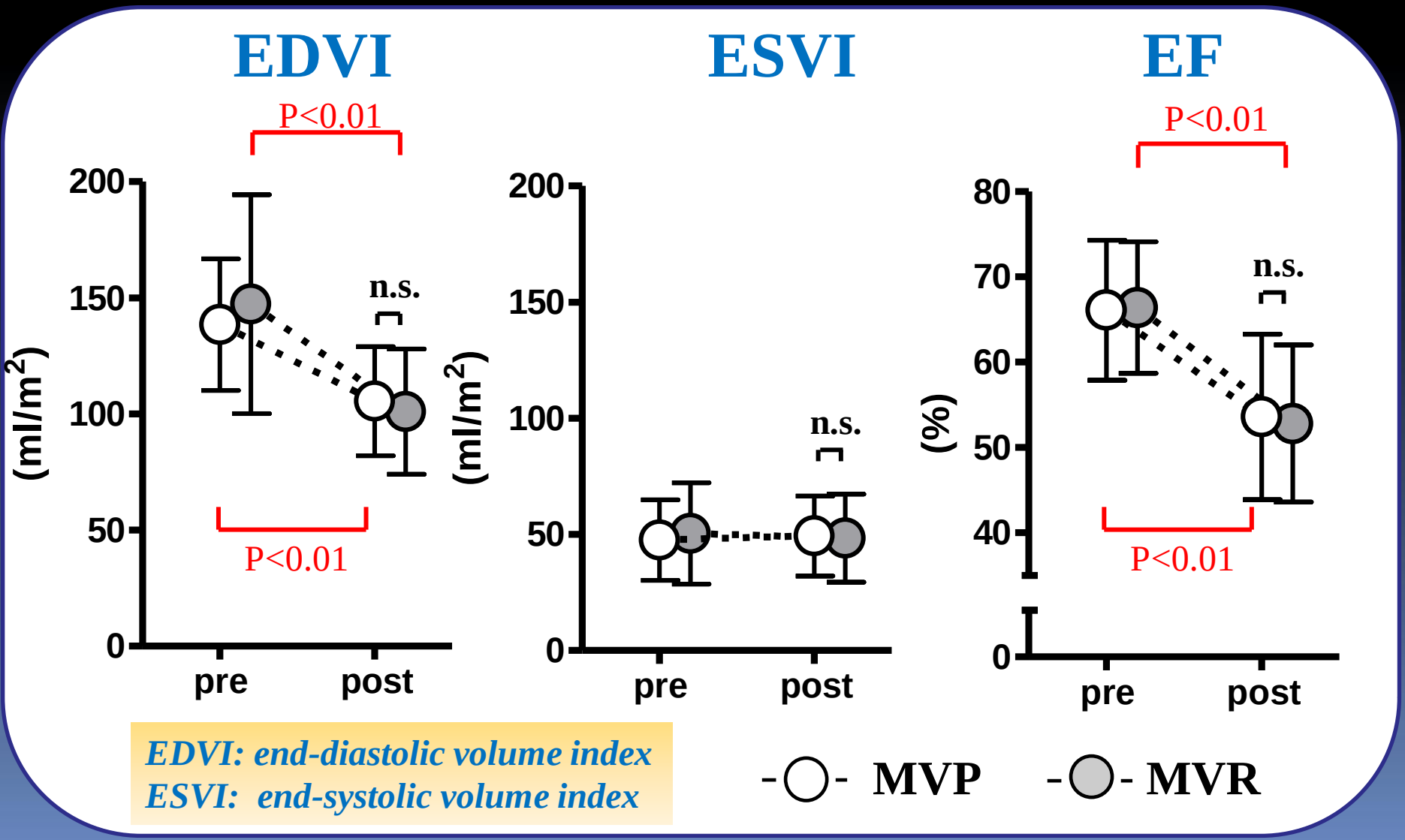
Nozawa, et al. Circulation 1988;77:1116.

- **Arterial blood pressure (BP) was measured by the Korotkoff technique using manchette methods.**
- **Mean BP = (systolic BP – diastolic BP)/3 + diastolic BP**
- **Data analysis was performed before and one month after the mitral valve surgery.**

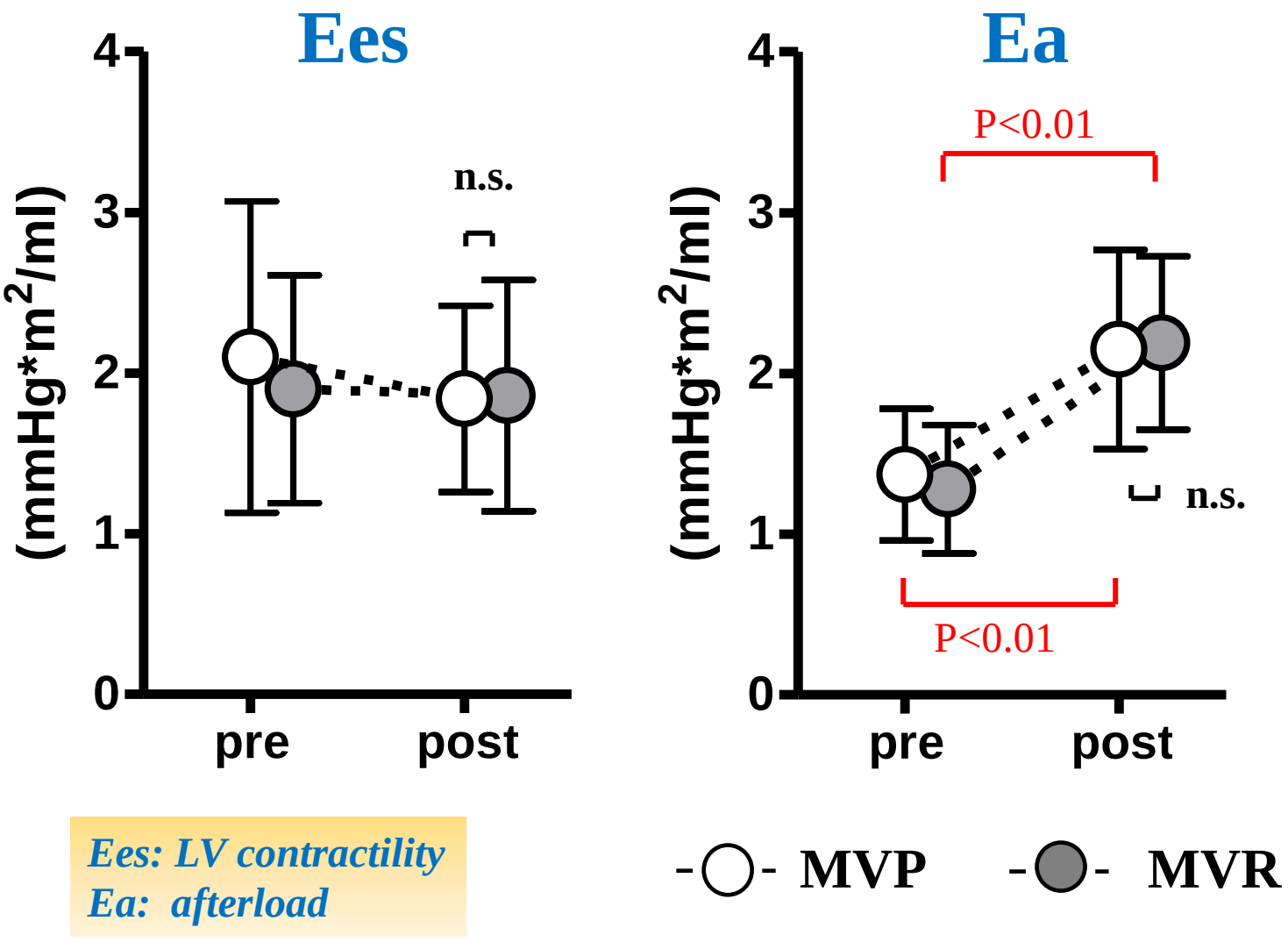
Patients characteristics and operative data

	MVP (n=29)	MVR (n=12)
Age	63+/-15	67+/-7
Gender (M/F)	20/9	9/3
Weight (kg)	60.3+/-12.0	56.1+/-8.5
The grade of MR	3.5+/-0.6	3.5+/-0.5
Operative procedure	*Chordal reconstruction 6*	*Mechanical 5*
	Resection and suture 21	*Bioprosthetic 7*
	Other 2	
	(Ring annuloplasty 29)	
+ TAP	9	5
+ MAZE/PV isolation	7	0
Ao cross clamp time (min)	118+/-31	121+/-41
CPB time (min)	170+/-34	181+/-49

LV function before and after the MV surgery

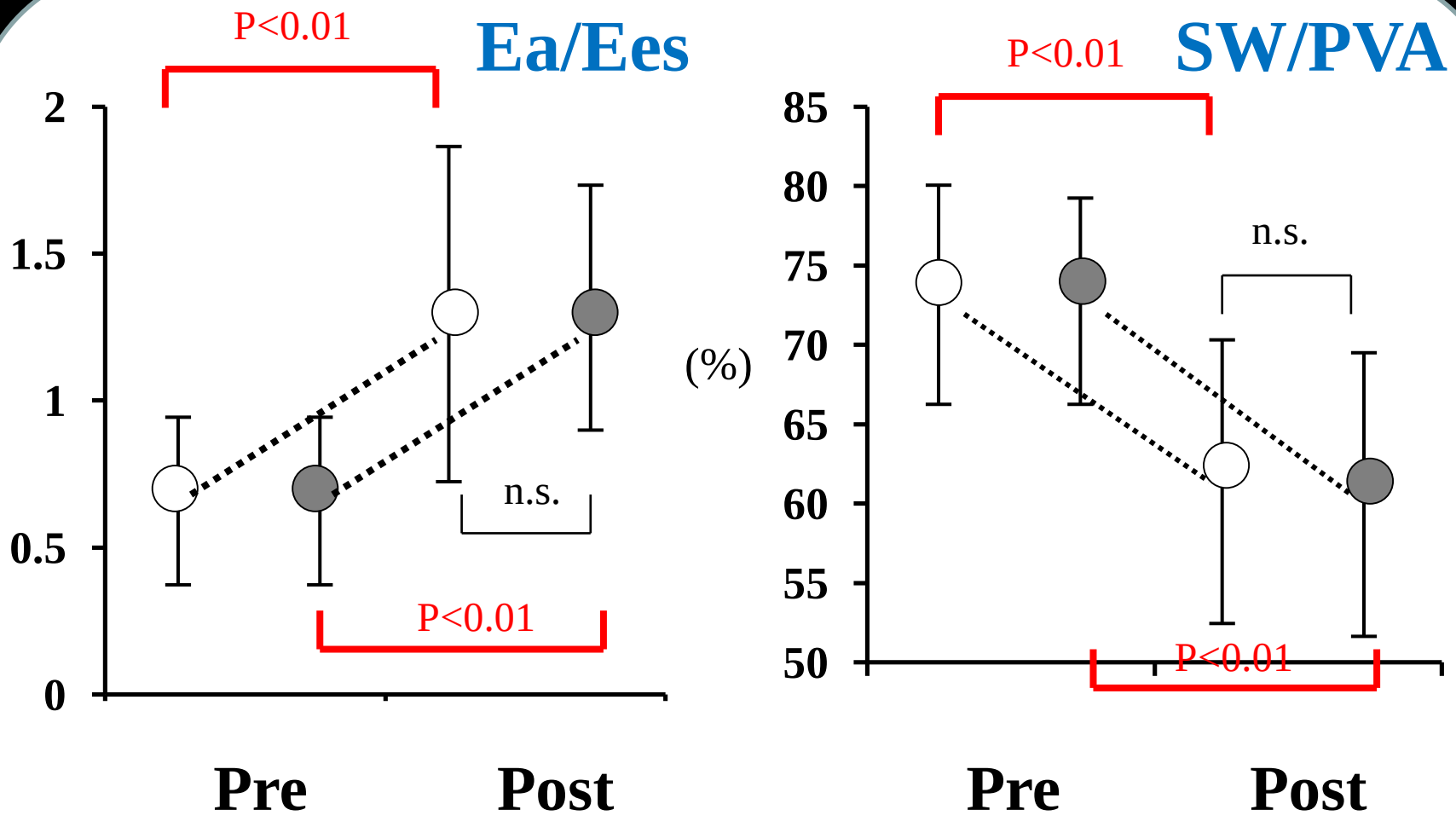


LV function before and after the MV surgery



Ees: LV contractility
Ea: afterload

LV function before and after the MV surgery



Ea/Ees: Ventriculoarterial coupling
SW/PVA: Stroke work and pressure-volume area

Summary

- Early after MVP or MVR with chordal preservation, ejection fraction decreased significantly, primarily as the result with the decline of the preload and the increase of the afterload due to the correction of MR.
- However, Ees, which is known as the load-independent contractility index, was maintained after the mitral valve surgery. This suggests that the cardiac pump function was preserved both after MVP and after MVR with chordal preservation.

Conclusions

- MVR with chordal preservation yields equal cardiac pump function as MVP during the early postoperative period.
- MVP is the best procedure for patients with isolated degenerative valve disease which is so simple lesion that repair is feasible. However, when valvular pathology is so severe that repair is infeasible, we can select MVR with the subvalvular apparatus, which preserve the postoperative LV function.