



Obesity and heart – cardiologist's view

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**Obesity Is Now a
Global Health Threat**

**"OBESITY EPIDEMIC"
THE WORLDWIDE
PREVALENCE OF OBESITY**

**3.4
million**

**DEATHS CAUSED
by overweight
AND OBESITY**



**Obesity and overweight
INCREASED
27.5% IN ADULTS
47.1% IN CHILDREN
SINCE 1980**



**World Health
Organization**



**1 IN 3 CHILDREN
are overweight or obese**

0

**Number of
countries with
decreased
obesity in
recent 33 years**



IHME

**Institute for Health Metrics
and Evaluation**

Orthopedic disease
musculoskeletal disorders –
osteoarthritis, genua valga, aseptic tibiae epiphysis necrosis...

Oncologic diseases
breast cancer, ca ovarium colorectal carcinoma, ca kidney and prostatae...

Psychosocial and social effects
depression, anxiety
behavior problems
school absenteeism ...



Obesity consequences
↑ mortality and morbidity
reduce life expectancy



GIT
liver steatosis
cholelithiasis and GERD...

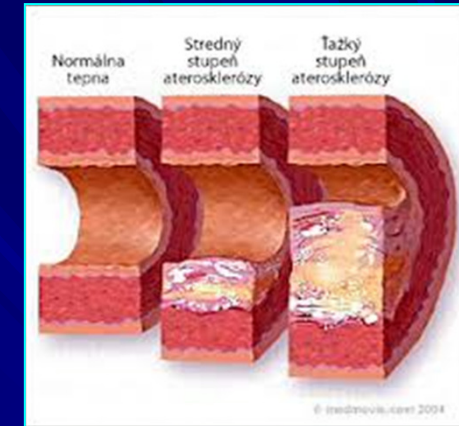
Respiratory tract
obstructive sleep apnea
night hypoxemia, asthma bronchiale...

Metabolic effects
diabetes mellitus
metabolic syndrome
gout
dyslipidemia...

Cardiovascular consequences ?



Obesity and ischemic heart disease (IHD)

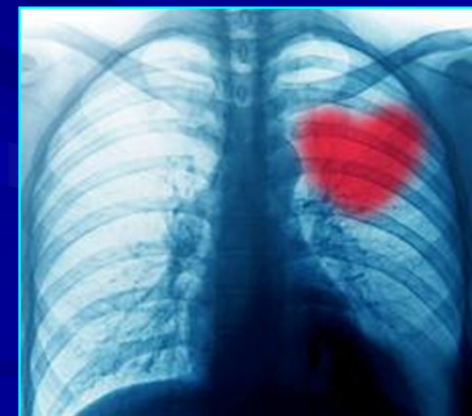


- **Framingham study** → BMI *independent risk factor* for IHD (effect multiplied by cumulating of other CV RFs)
- Number of coronary heart attacks → ↑ from BMI 20
- **Obesity** in **adolescents and young adults** → **accelerates atherosclerosis progression** much earlier before clinical manifestation of IHD

CASTELLI, W.P., et al.: The Framingham Study, 1986;
DAGENAIS, G.R. et al.: *Am Heart J*, 2005.

Obesity and congestive heart failure (CHF)

- **Framingham study** → ↑ BMI → ↑ risk of CHF (gradated according severity of obesity)
- Risk of CHF → ↑ by **5%** in men and by **7%** in woman for each BMI unit



Obesity and arterial hypertension

- 6 times more common in obese
- Bogalusa Heart Study → obese adolescents have 8.5 times ↑ probability of hypertension in adulthood

Parameter	Normal Body Weight		Overweight		Obesity	
	Mean	SD	Mean	SD	Mean	SD
Body weight (kg)	44.3	12.2	71.7*	15.1	77.4*	14.1
Occasional systolic BP (mm Hg)	106.2	11.2	116.1***	10.3	120.0~~	8.5
Occasional diastolic BP (mm Hg)	65.6	5.9	71.6**	8.0	73.0***	8,6
Mean systolic 24-h BP (mm Hg) (ABPM)	108.7	6.1	112.7	6.3	115.0~	6.4
Mean systolic day BP (mm Hg) (ABPM)	113.06	6.0	119.4~	8.1	122.8***	8.6

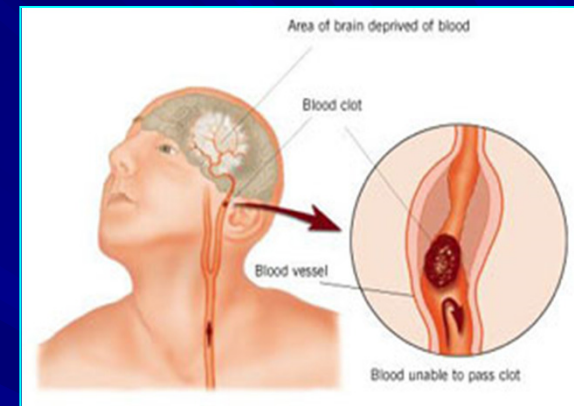
Mean age
13.5 y

p < 0.0001*
p < 0.01**
p < 0.005***
p < 0.05~;
p < 0.001~~

Daniels, S.R.: In *Pediatr Ann*, 1992; POIRIER, P. et al.: *Circulation*, 2006;
SCHUSTEROVA, I. et al.: *Eur J Cardiovasc Prev Rehabil*, 2008.

Obesity and stroke

- Obesity → **independent risk factor for stroke**
- 1 unit \uparrow BMI → \uparrow risk for *ischemic* stroke by **4%** a *hemorrhagic* stroke by **6%**
- Severity of stroke does not correlate with BMI

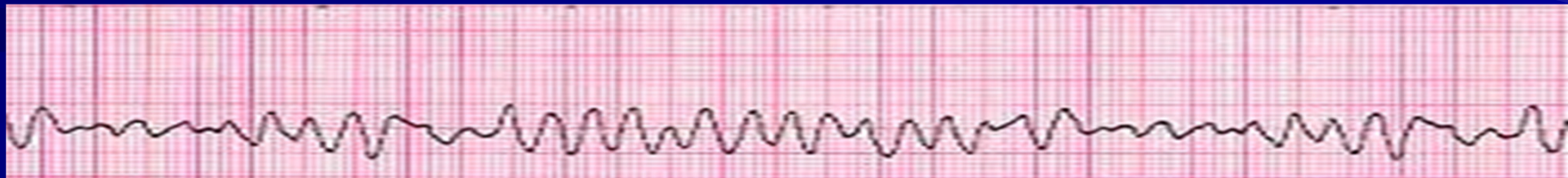


ABBOTT, R.D. et al.: *Stroke*; 1994; KURTH, T. et al.: *Arch Intern Med*, 2002..

Obesity and arrhythmias and sudden cardiac deaths (SCD)

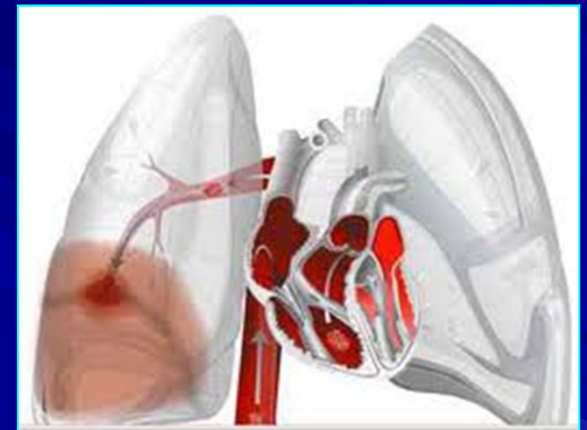


- Obesity → ↑ **arrhythmias and SCD**
(↑ with severity of obesity)
- **Framingham Study**: annual mortality rate for SCD is **40 times** ↑ in obese compare to nonobese
- **Prolonged QTc interval** (>420 ms) → ↑ risk of SCD aslo in healthy population



Obesity and thromboembolism

- ↑ risk **venous thromboembolism and pulmonary embolism**
- ↑ incidence **thromboembolic events** → after cardiac and noncardiac operation
- ↑ incidence **venous insufficiency**



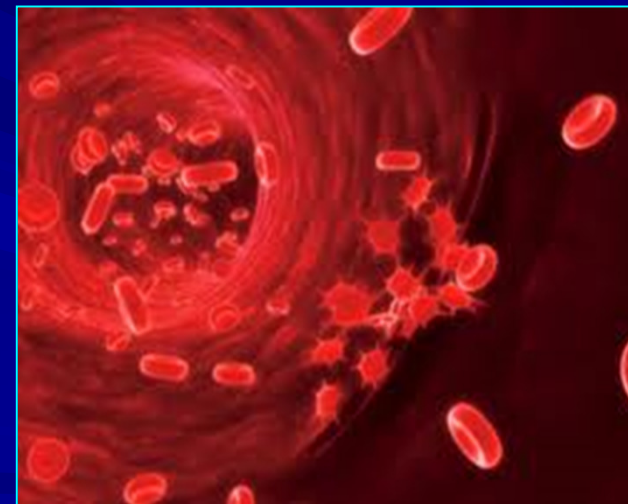
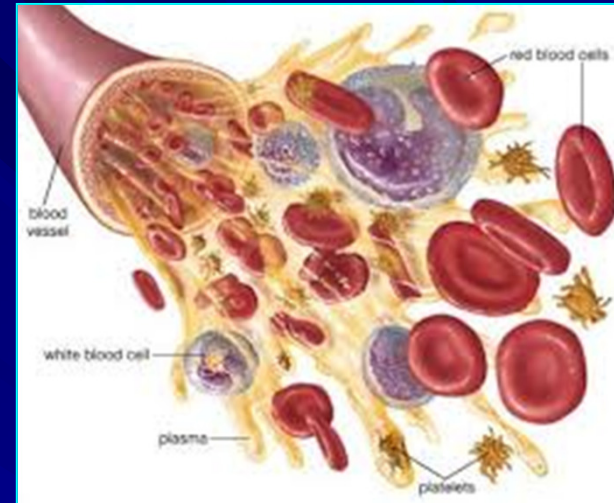
ROCKY, M.A.. et al.: *Can J Surg*, 2004; EISENSTEIN, E.L. et al: *Obes Res*, 2002.

Obesity and vessels

■ Obesity → ↑ arterial stiffness, ↓ aortic elasticity and ↓ vascular remodeling

→ RFs and predictors of CV mortality

■ ↑ arterial stiffness → early stadium of CV disease and atherosclerosis (also in adolescents)



*NEMES, A. et al.: Int J Cardiovasc Imaging 2008;
Wildamn R.P. et al.: Hypertension, 2003*

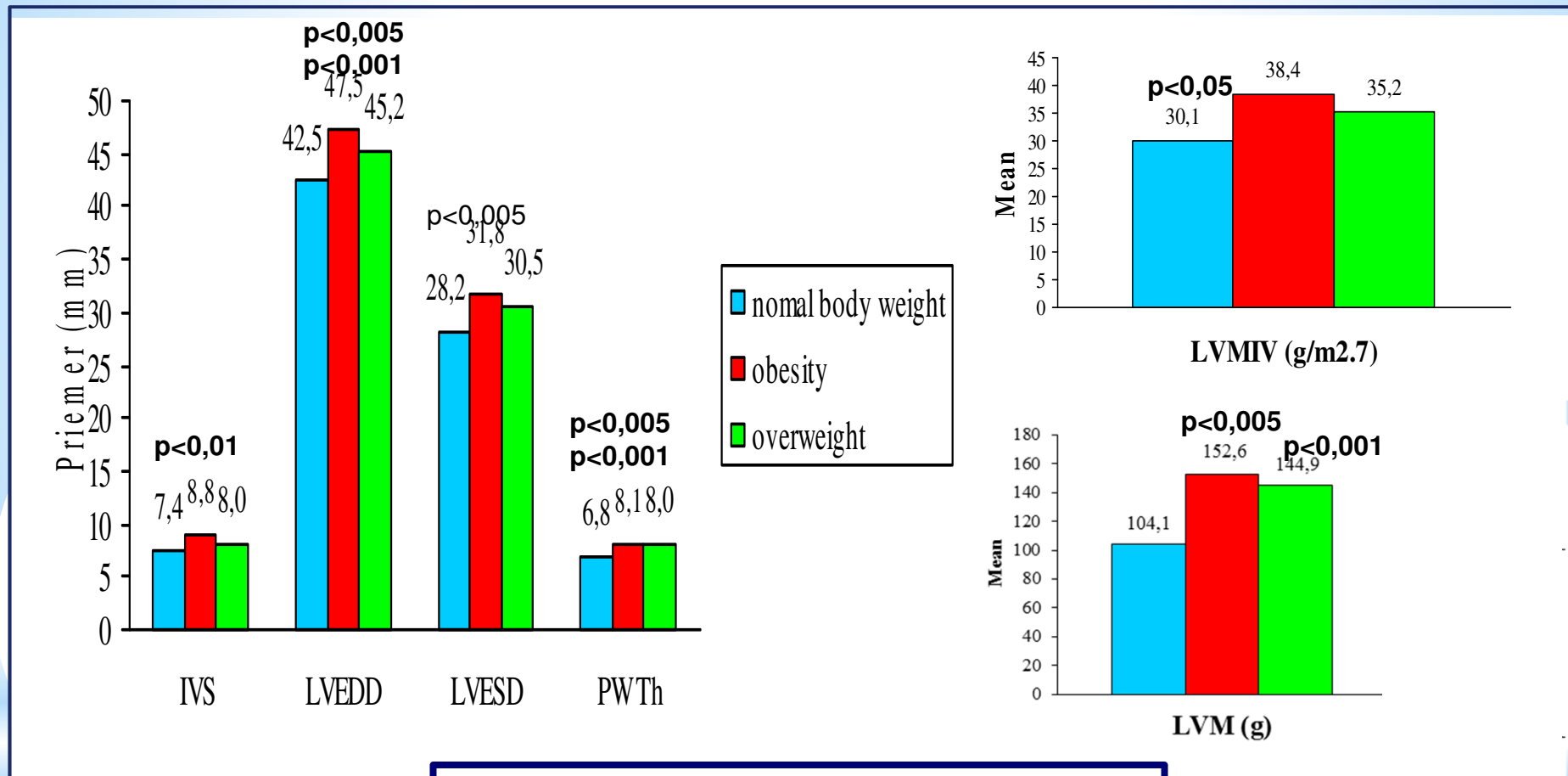
OBESITY AND HEART

Obesity cardiomyopathy

- Different, but typical *form of CMP* → functional and structural cardiac changes in obese → *consequences of volume overload and adiposity*
- Obesity cardiomyopathy is presented also in obese children
- Etiology of CMP controversial...
 - ? Result of ↑ heart adiposity
 - ? Result of concomitant disease (hypertension, DLP, DM)
 - ? Progression changes to CHF **without IHD**



OBESITY AND LEFT VENTRICLE I.

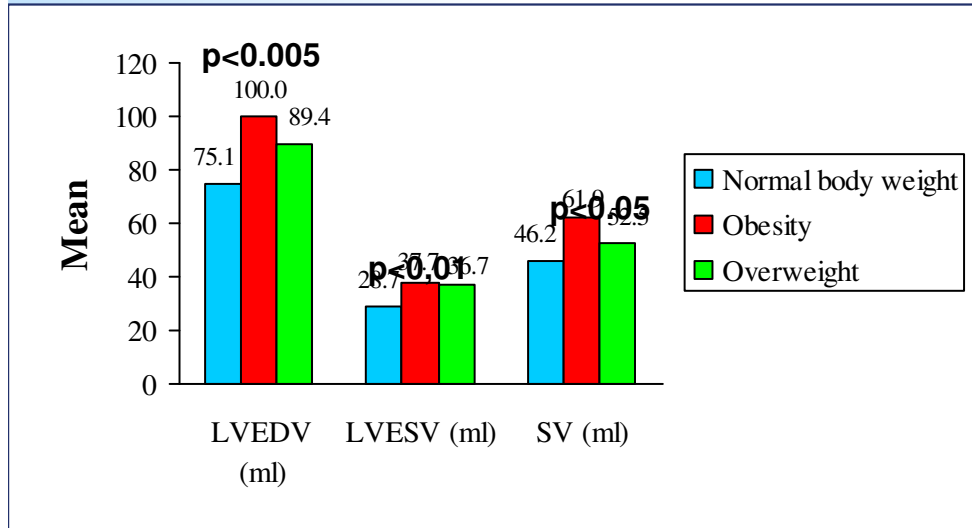


Obesity causes increase in LV size and LV mass

IVS - interventricular septum; LVEDD – left ventricle enddiastolic diameter; LVESD - left ventricle endsystolic diameter; PWTh – posterior wall thickness; LVM – left ventricle mass; LVMIV –LVM k height^{2,7}

Schusterova, I. et al.: *J Am Soc Echocardiogr*, 2008;
 Schusterova, I. et al.: *Atherosclerosis Suppl*, 2005.

OBESITY AND LEFT VENTRICLE II.



LVEDV –left ventricle enddiastolic volume; LVESV – left ventricle endsystolic volume; SV – stroke volume

EF did not differ

Param.	Normal body weight	Overweight	Obesity
	Mean	Mean	Mean
Peak A wave (m/s)	0,48	0,59 <i>p<0,05</i>	0,63 <i>p<0,005</i>
Peak E wave (m/s)	1,0	1,01	1,01
E/A Ratio	2,19	1,8 <i>p<0,05</i>	1,68 <i>p<0,05</i>
DT (ms)	150,5	157,8	180,4 <i>p<0,05</i>
IVRT (ms)	101,8	106,2	115,9 <i>p<0,05</i>

Obesity causes changes in LV function parameters and impaired LV performance diastolic function

Peak A – Peak velocity of late diastolic filling; Peak E - Peak velocity of early diastolic filling; IVRT – isovolumetric relaxing time; DT – decelerate time

Schusterova, I. et al.: *Circulation*; 2008

BODY WEIGHT REDUCTION

Yes

NO

?

Body weight reduction

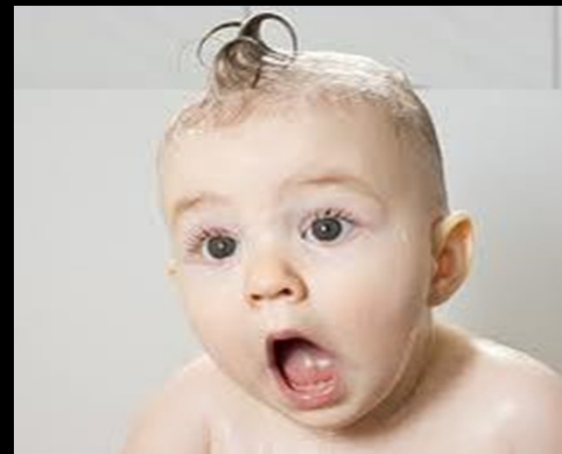
YES

- ↓ BP
- ↓ LV size
- ↑ LV systolic and diastolic function
- ↓ RF
- ↑ endothelial function
- ↓ inflammatory markers
- ↓ Afi a arrhythmias

Bruyndoncky L.e et al, *Pediatrics*, 2015, MacMahon et al, Pathak, R.K. et al. *Can J Cardiol*, 2015; Jonker, J.T et al.: *Int J Cardiovasc Imaging*, 2014., Lavie, C.J. et al.: *Obesity, Fitness, and Prognos*, 2014

**„ THE NEGATIVE
EFFECTS OF
OBESITY ???**

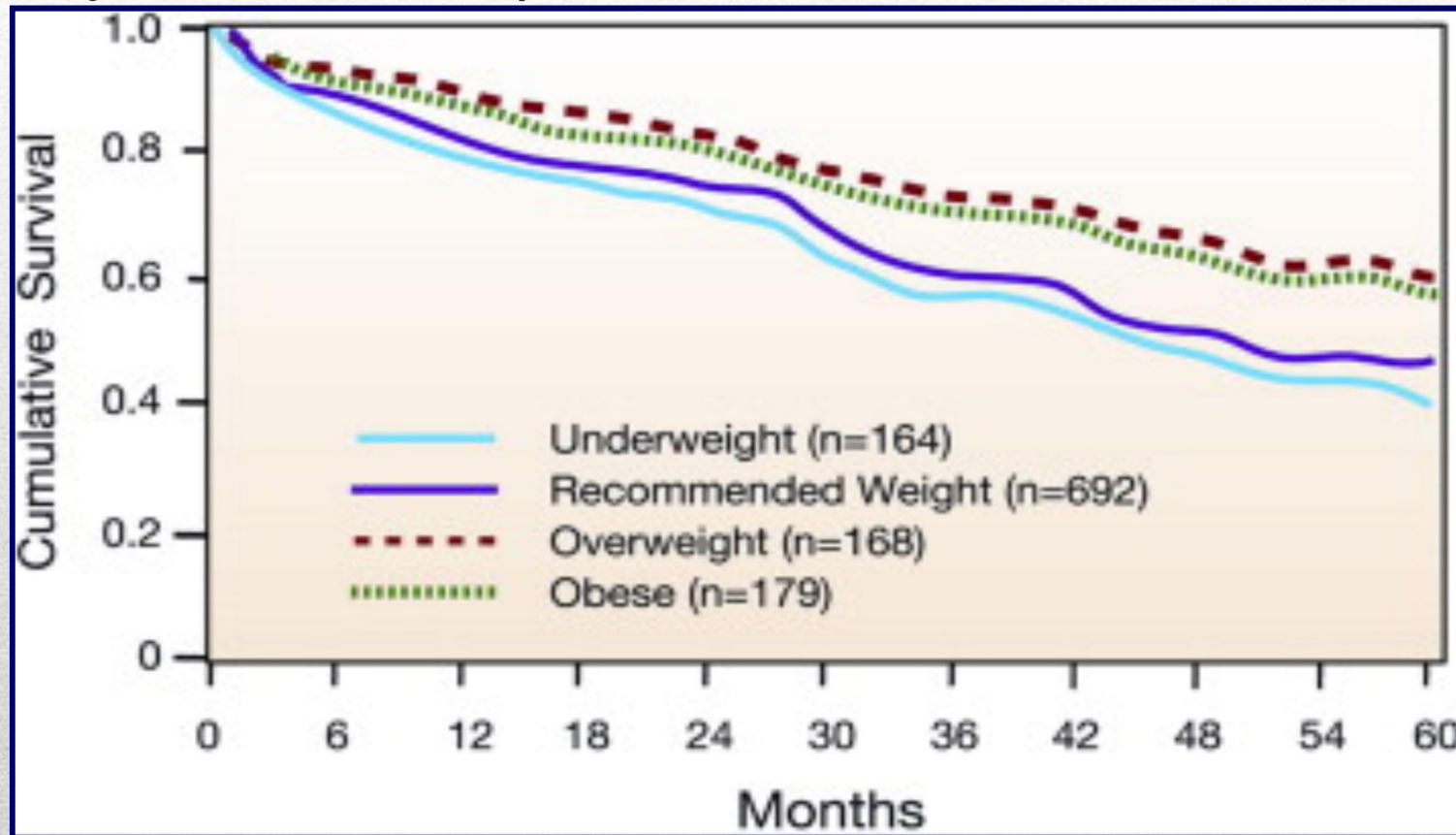
IS IT REALLY SO ?





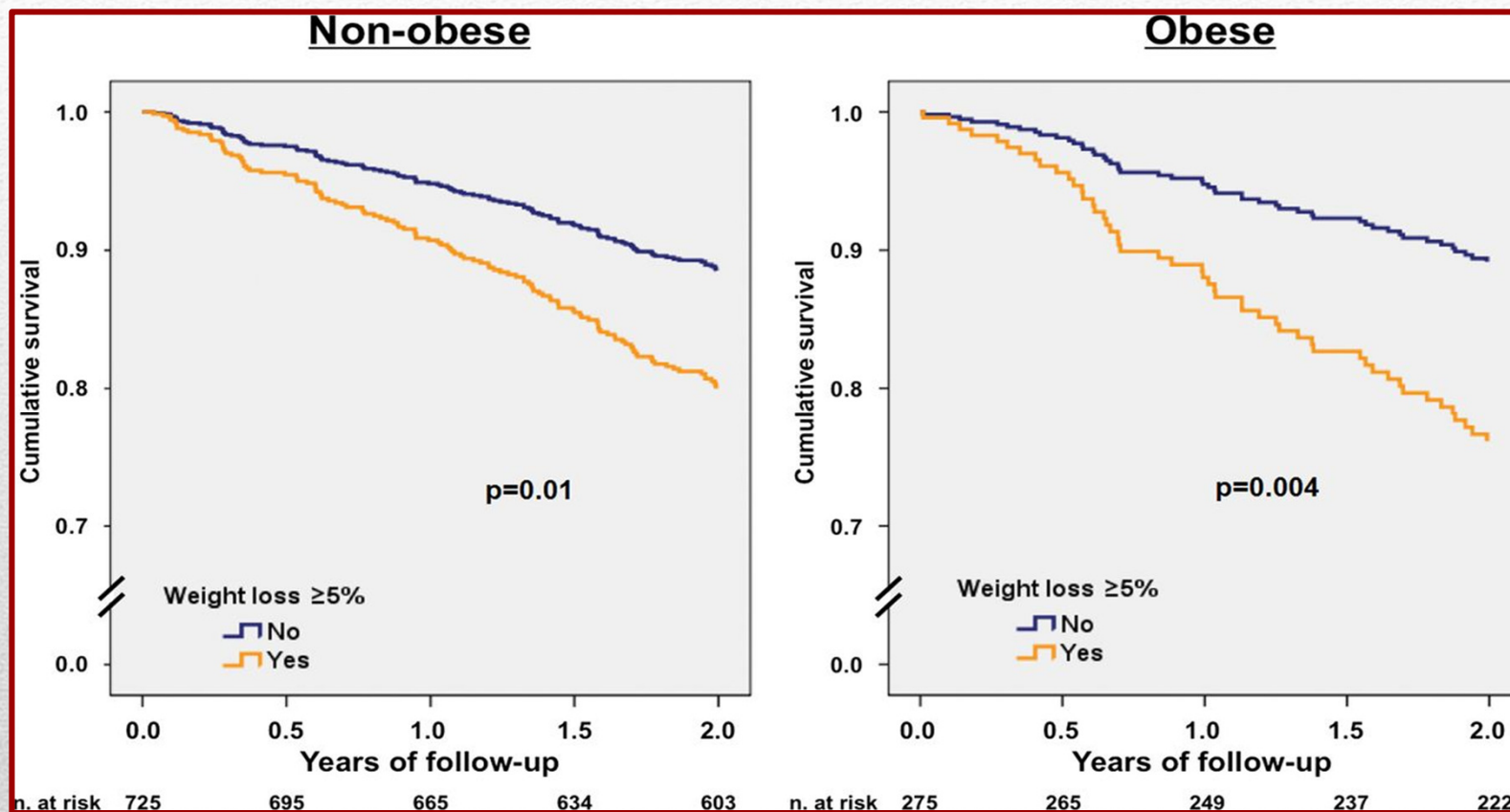
Obesity and Survival in Heart Failure

5 years survival pts with moderate to severe HF



Survival was significantly better in the overweight and obese

Adjusted survival curves for all-cause death according to the presence of significant weight loss



Weight loss $\geq 5\%$ in patients with chronic HF was associated with high long-term mortality, particularly among obese patients with HF

OBESITY- a favourable RF ?

Obese

- ↓ Hospitalization mortality due to cardiac decompensation
- Better survival **after stroke**
- Better prognosis pts with **arrhythmias** (Afi)
- Risk severity is decreasing with increasing patient's BMI



BODY WEIGHT REDUCTION

Yes

NO

Again ?

Body weight reduction

- ↓ **Body weight in patients with IHD and with DM**
- → ↑ **mortality**
→ **unfavorable influence of longevity**
- **Starvation, low caloric diet → ↑ risk of malignant dysrhythmias (QTc interval prolongation)**

No ?

Bruyndoncky L.e et al, *Pediatrics*, 2015, MacMahon et al, Pathak, R.K. et al. *Can J Cardiol*, 2015; Jonker, J.T et al.: *Int J Cardiovasc Imaging*, 2014., Lavie, C.J. et al.: *Obesity, Fitness, and Prognos*, 2014

Obesity

- Associated with **↑ CV RFs** and impaired LV function and structure
- Associated with **↑ prevalence of most CV diseases**

BUT: pts with *overweight and obesity and present CV disease* → **better prognosis** compare to normal weight subjects with similar diseases

Obesity paradox

- Most seen in patients with **↓ physical condition, fitness**
- Patients with CV diseases and in **good physical condition** → better prognosis, obesity paradox disappear

Obesity paradox. How to do it?

Adult obese. . .

- Guidelines of more associations : ... **Body weight reduction in all obese...**
- **BUT ! Not in all obese** is CV risk ↑ in presence of obesity
→ metabolic healthy subjects in good physical condition
- **CONTRVERSIAL:** „Is body weight reduction appropriate in all obese patients ?“
- **Fitness vs Fatness → COMPROMIS →**
maintain a healthy lifestyle, physical activity and condition
which is more effective than body weight reduction alone

More studies are required...

Obese children ???



- „Tracking“ obesity do adulthood
- Affection of obesity in children → ↓ mortality a morbidity

1. Body weight reduction in children ?

YES

2. Why ?

Prevention of CV disease associated with obesity

3. How ?

Maintain a healthy lifestyle ,
↑ physical activity and ↑ fitness and good physical condition



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