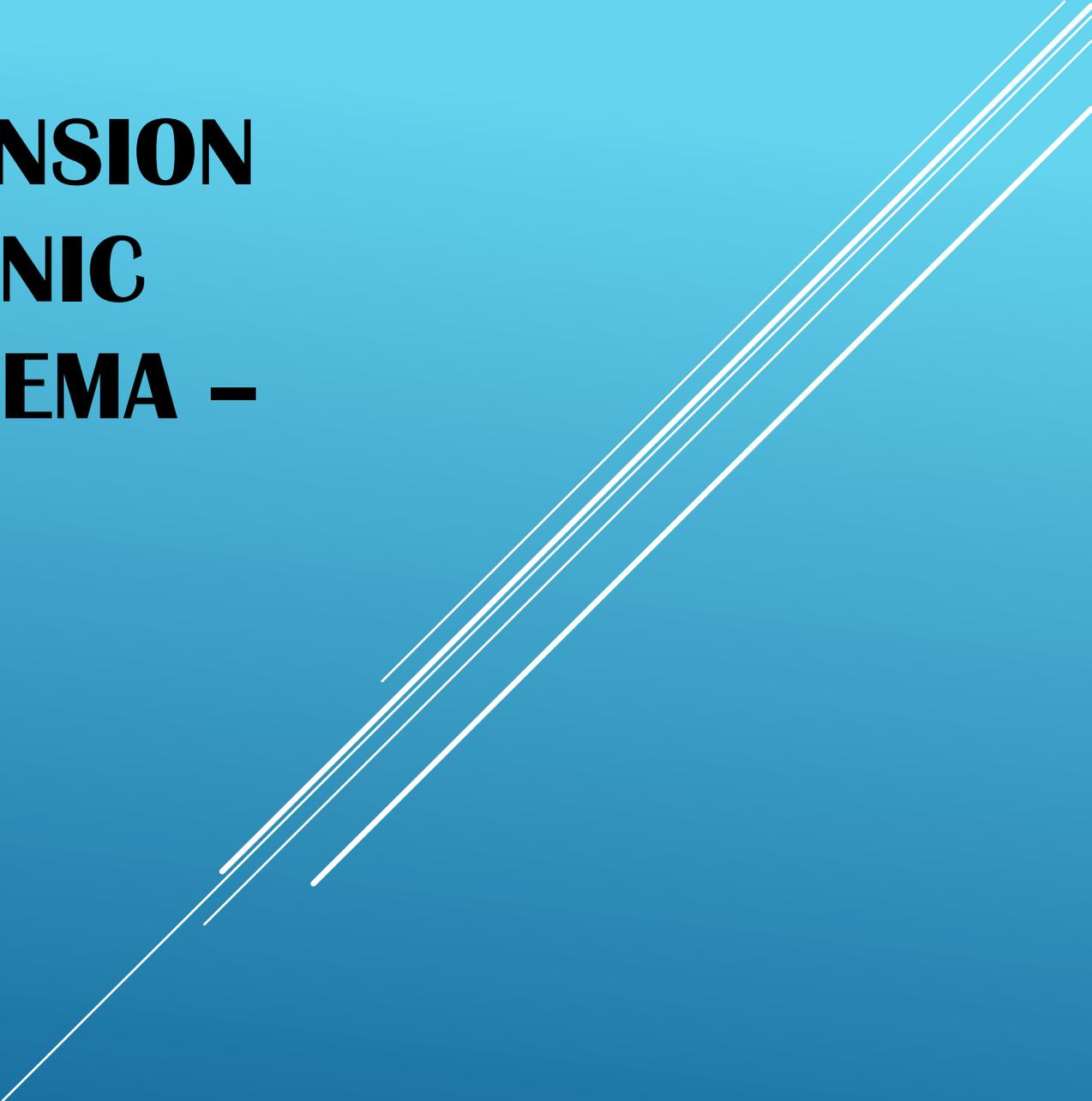


**PULMONARY HYPERTENSION  
PRESENTING AS CHRONIC  
LOWER EXTREMITY EDEMA –  
FPIN PROJECT  
DENIS KUZELJ MD**

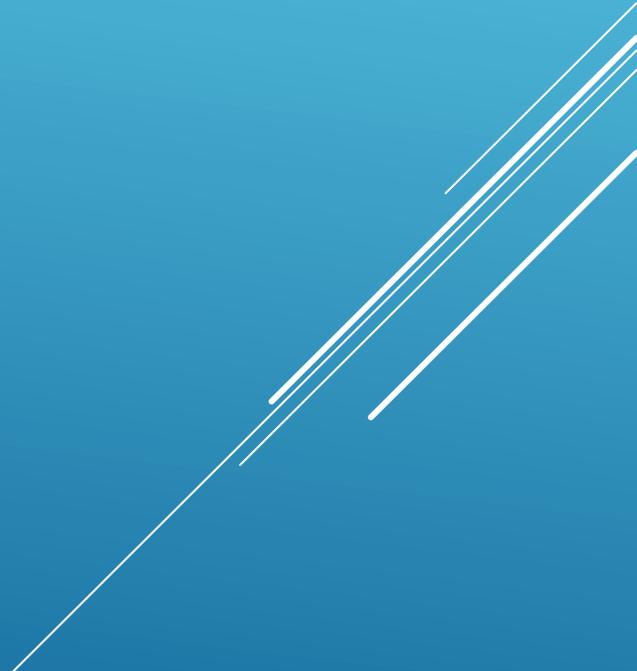
A decorative graphic consisting of several parallel white lines of varying thicknesses, extending diagonally from the bottom left towards the top right of the slide.

- ▶ Chronic lower extremity edema is a frequent complaint encountered by general practitioners.
- ▶ most common etiologies of LEE are chronic venous insufficiency, medications, Idiopathic edema (IE) (women<50 years of age) and CHF/Pulmonary HTN. The less common causes include lymphedema, renal and/or liver disease, myxedema, lipedema and protein losing enteropathy.
- ▶ Pulmonary hypertension is not commonly diagnosed by primary care and it may often go unrecognized as the underlying etiology of lower extremity edema.

## INTRODUCTION

- ▶ Review of literature revealed only two cohort studies that looked at association of otherwise asymptomatic lower extremity edema with pulmonary hypertension.

## LITERATURE SEARCH

- ▶ A 1998 nonconsecutive cohort study evaluated the causes of bilateral leg edema among 58 adults (84% of whom were obese) enrolled from a family medicine clinic in Cleveland
  - ▶ Pulmonary hypertension was suspected in only one patient.
- 

Initial Clinical Diagnoses for 45 Patients with Bilateral Leg Edema\*

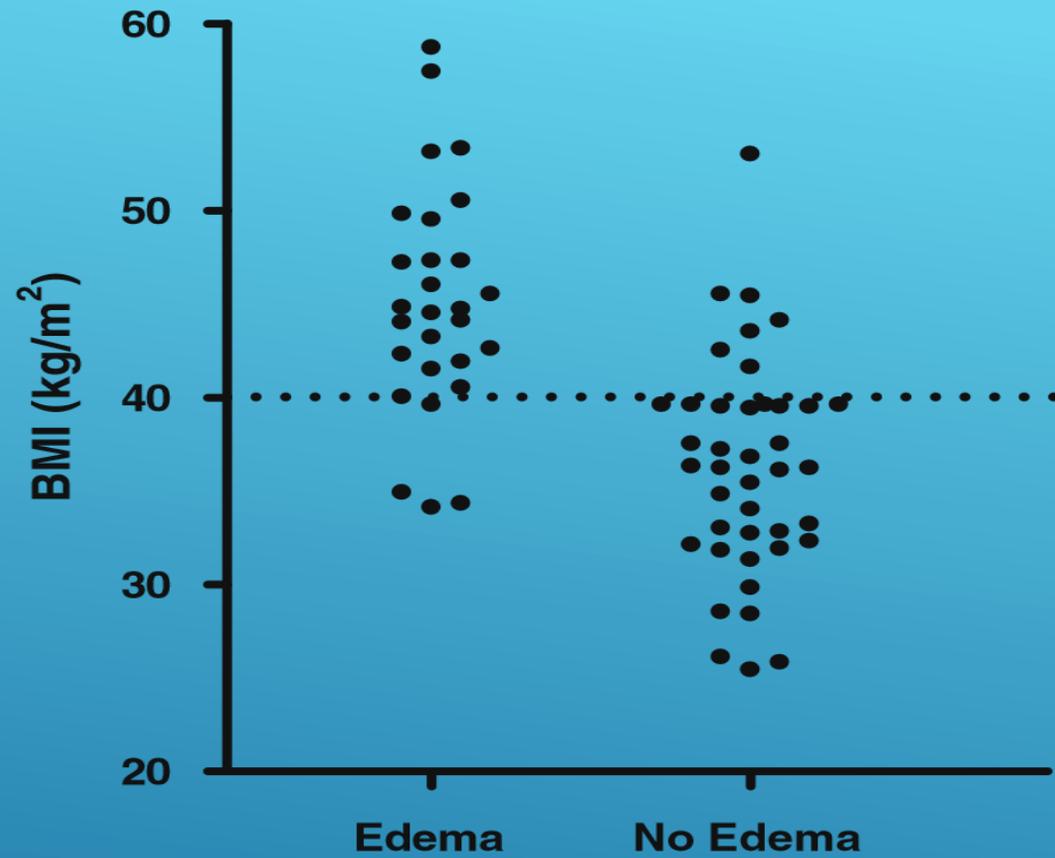
Patients could have more than one diagnosis.

Diagnosis	Number (%)
Congestive heart failure	8 (18)
Venous insufficiency	33 (71)
Nephrotic syndrome	6 (13)
Lymphedema	1 (2)
Pulmonary hypertension	1 (2)
Cor pulmonale	1 (2)
Hypoalbuminemia	1 (2)
Use of nonsteroidal anti-inflammatory drug	1 (2)
Use of corticosteroids	1 (2)
Sleep apnea	1 (2)
Obesity	1 (2)
Uncertain	3 (7)

Final diagnosis	
Diagnosis*	Number (%)
<b>Cardiac diagnosis</b>	
Left ventricular systolic dysfunction	8 (18)
Right ventricular systolic dysfunction	1 (2)
Diastolic dysfunction	4 (9)
Mitral regurgitation	1 (2)
Aortic stenosis	1 (2)
Atrial septal defect	1 (2)
Atrial fibrillation	2 (4)
<b>Pulmonary diagnosis†</b>	
Pulmonary hypertension (.40 mm Hg)	9 (20)
Borderline pulmonary hypertension (31–40 mm Hg)	10 (22)
Venous insufficiency	10 (22)
Nephrotic syndrome	1 (2)
Transient renal disease	1 (2)
Proteinuria (.1 g but .3 g per day)	6 (13)
Hypoalbuminemia	1 (2)
Lymphedema	1 (2)
Stenosis of inferior vena cava	1 (2)
Use of nonsteroidal anti-inflammatory drug (definite)	1 (2)
Use of corticosteroid or nonsteroidal antiinflammatory drug (probable cause)	6 (13)
Idiopathic (none of the above)	12 (27)

- ▶ A 2009 consecutive cohort study involving 70 patients with newly diagnosed obstructive sleep apnea.
  - ▶ Twenty-nine (41%) had pretibial edema.
  - ▶ Out of the 28 patients with OSA and pretibial edema on whom right heart catheterization data was obtained, elevated right atrial pressures were found in 26 patients (93%) indicating right heart failure
  - ▶ Elevation in mean pulmonary artery pressure was found in 24 of 28 patients (86%) and an elevated pulmonary artery systolic pressure was found in 23 of 28 patients (82%).
  - ▶ Severe pulmonary hypertension was found in seven of 28 patients (25%).
- 

	Prefibrial edema (n=29) Mean (SD)	No edema (n=41)	p value
Age (years)	54 (10)	51 (10)	0.2360
Weight (kg)	141 (21)	112 (18)	<0.0001
BMI (kg/m <sup>2</sup> )	46 (6)	36 (6)	<0.0000
FVC (l)	3.6 (0.8)	4.3 (0.9)	0.0004
FVC % Predicted	87 (17)	102 (17)	0.0006
FEV <sub>1</sub> (l)	2.6 (0.7)	3.2 (0.9)	0.0034
FEV <sub>1</sub> % Predicted	76 (18)	91 (22)	0.046
TLC (l)	5.5 (1)	6.3 (1)	0.0029
FEV <sub>1</sub> /FVC	72 (9)	73 (13)	0.6669
TLC % Predicted	87 (15)	97 (12)	0.0018
FRC (l)	2.5 (5)	2.8 (1)	0.0816
FRC % Predicted	70 (16)	77 (21)	0.1153
RV (l)	1.9 (0.5)	1.9 (0.8)	0.9175
RV % Predicted	87 (21)	88 (28)	0.9583
DLCO % Predicted	81 (16)	88 (19)	0.1149
pCO <sub>2</sub> (mm Hg)	44 (6)	41 (3)	0.0053
pO <sub>2</sub> (mm Hg)	71 (12)	79 (11)	0.0074
End Exp P <sub>PL</sub> (cm H <sub>2</sub> O) (n)	5 (4.3) (11)	2 (4.4) (21)	0.0617



HISTORY OF THE 29 PATIENTS WITH LOWER EXTREMITY EDEMA COMPARED TO THOSE OF THE 41 PATIENTS WITHOUT EDEMA. THE GROUPS WERE SIMILAR IN AGE AND HEIGHT, BUT PATIENTS WITH EDEMA HAD A SIGNIFICANTLY HIGHER BMI. THE PATIENTS WITH LOWER EXTREMITY EDEMA TYPICALLY HAD A  $BMI \geq 40 \text{ KG/M}^2$

- ▶ Pulmonary hypertension is often overlooked as underlying etiology of lower extremity edema.
- ▶ With the increasing prevalence of obesity and associated obstructive sleep apnea (OSA), pulmonary hypertension (PH) should be strongly considered as one of the underlying etiologies of lower extremity edema.
- ▶ Lower extremity edema can be the only manifestation of pulmonary hypertension, especially in morbidly obese patients ( $\text{BMI} \geq 40 \text{ kg/m}^2$ ) with obstructive sleep apnea.
- ▶ More research is needed to determine true prevalence of pulmonary hypertension as etiology of lower extremity edema.

## CONCLUSIONS

Daniel O'Hearn J, et al. Lower extremity edema and pulmonary hypertension in morbidly obese patients with obstructive sleep apnea. *Sleep & breathing Journal* Vol. 13 Issue 1 March 2009.

Blankfield RP, Finkelhor RS, Alexander JJ, et al. Etiology and diagnosis of bilateral leg edema in primary care. *Am J Med* Vol. 105 Spetember 1998; 105:192-197

## REFERENCES