

# CORONARY SINUS NARROWING AND MICROVASCULAR DYSFUNCTION

## CHALLENGING CARDIAC FRONTIERS

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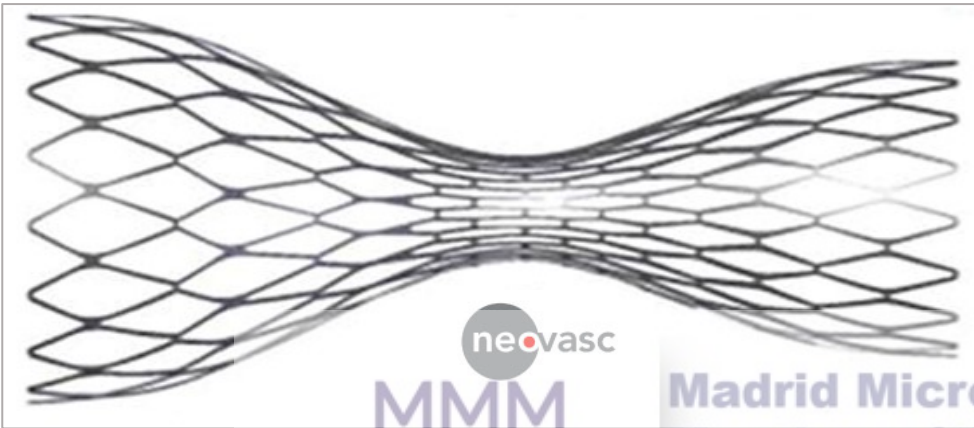
**29th - 30th  
November 2023**

**Location:**

Hospital Universitario de La Princesa,  
Innovation Room (1st Floor),  
Madrid

# Coronary Sinus Reducer Device

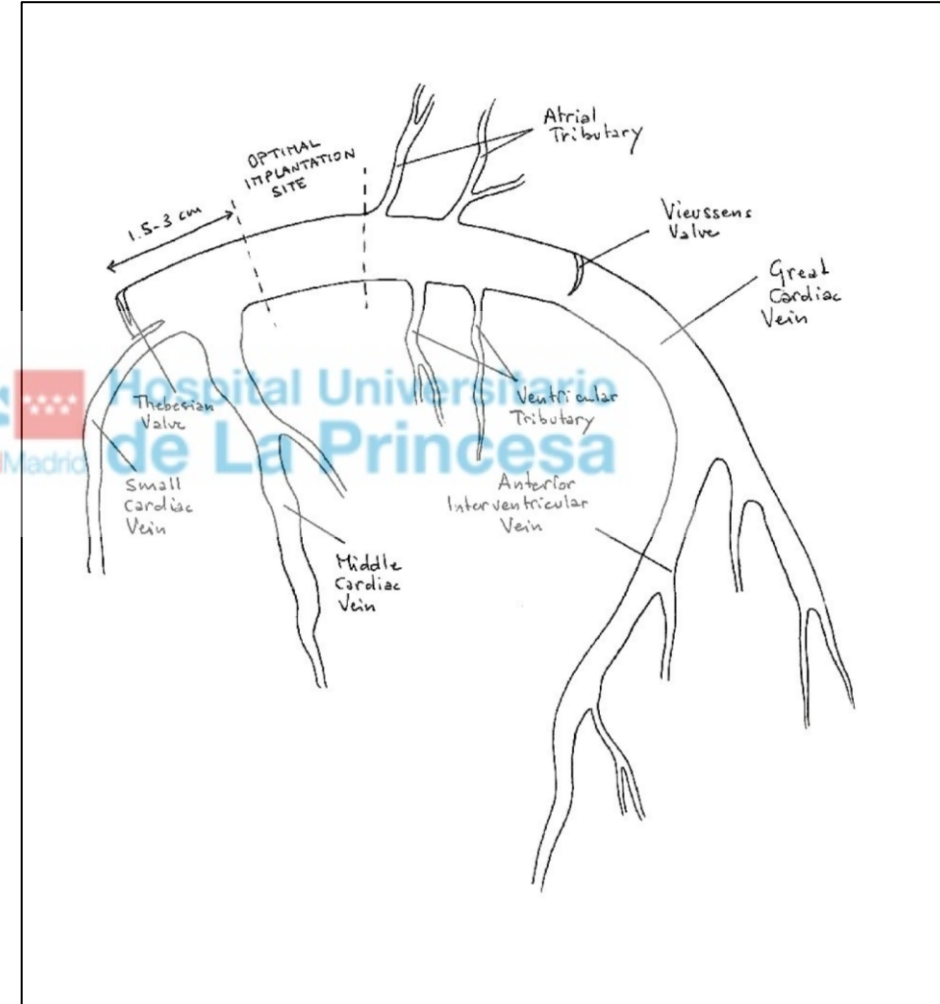
## NeoVasc Reducer®



neovasc

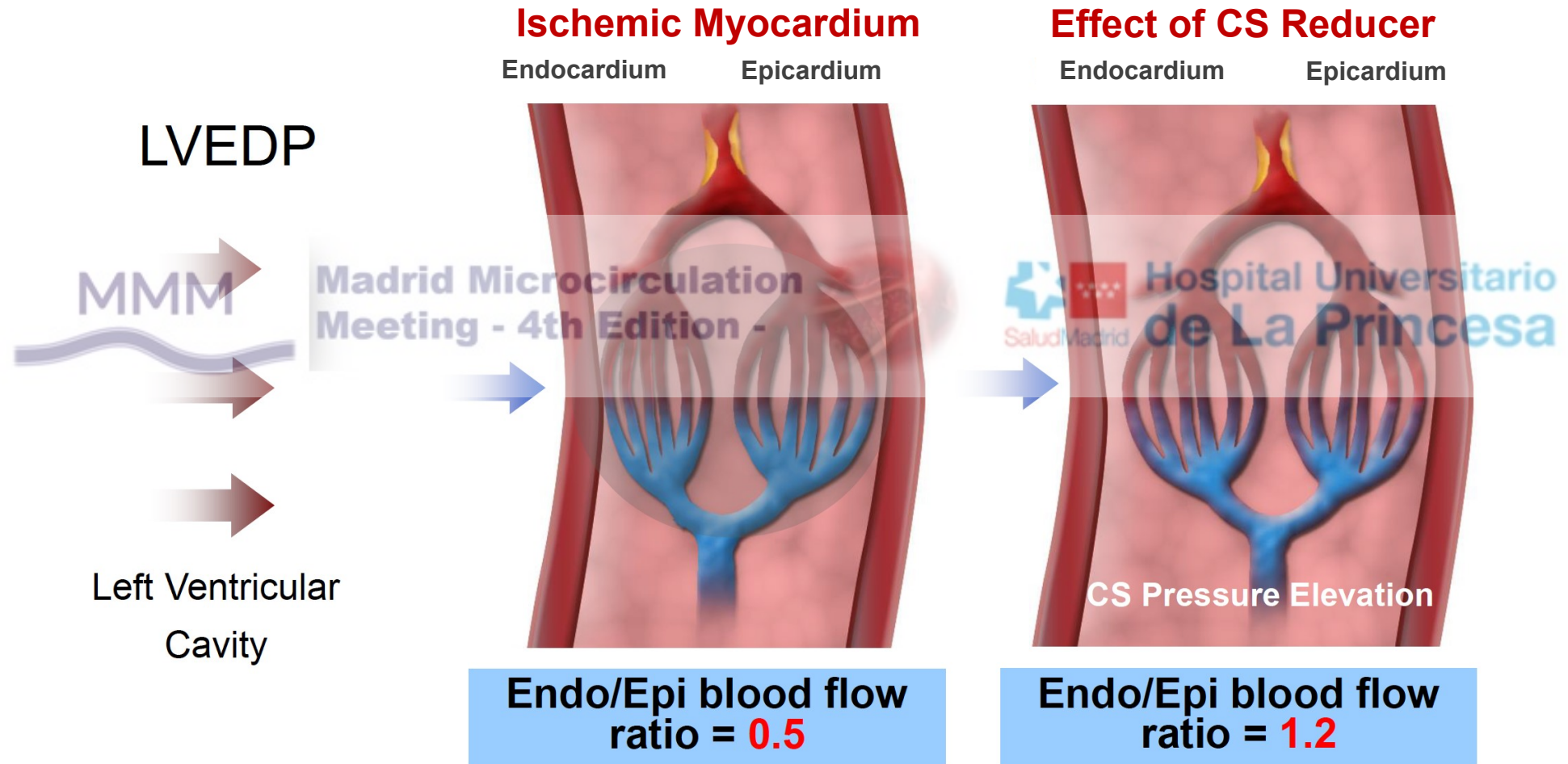
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# Mechanism of action - Coronary Sinus Reducer

## Improved coronary flow with decreased ischemia



# Clinical Evidence

## COSIRA Trial

104 patients

**Angina CCS III or IV  
Myocardial Ischemia**

**Not suitable for myocardial revascularization**

CSR vs SHAM

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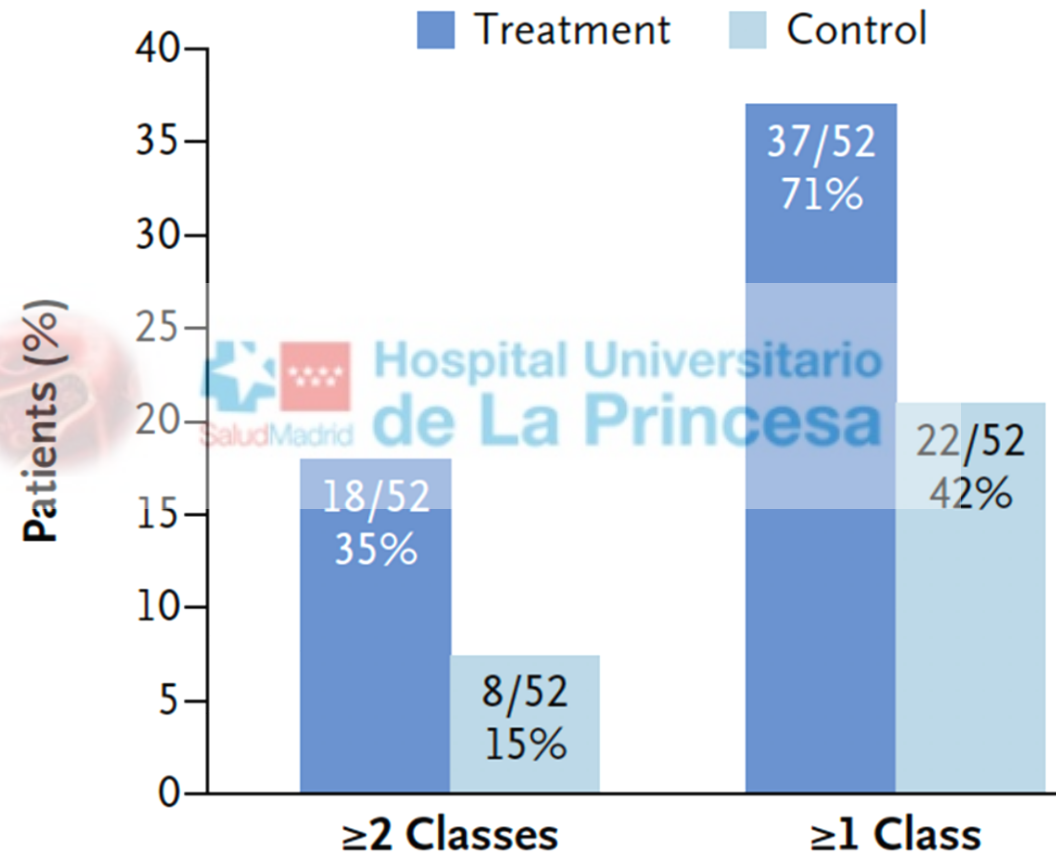
**Primary End Point**

**Improvement of at least two CCS  
angina classes at 6 months**

**35% (Reducer) vs 15% (control)**

**P=0,02**

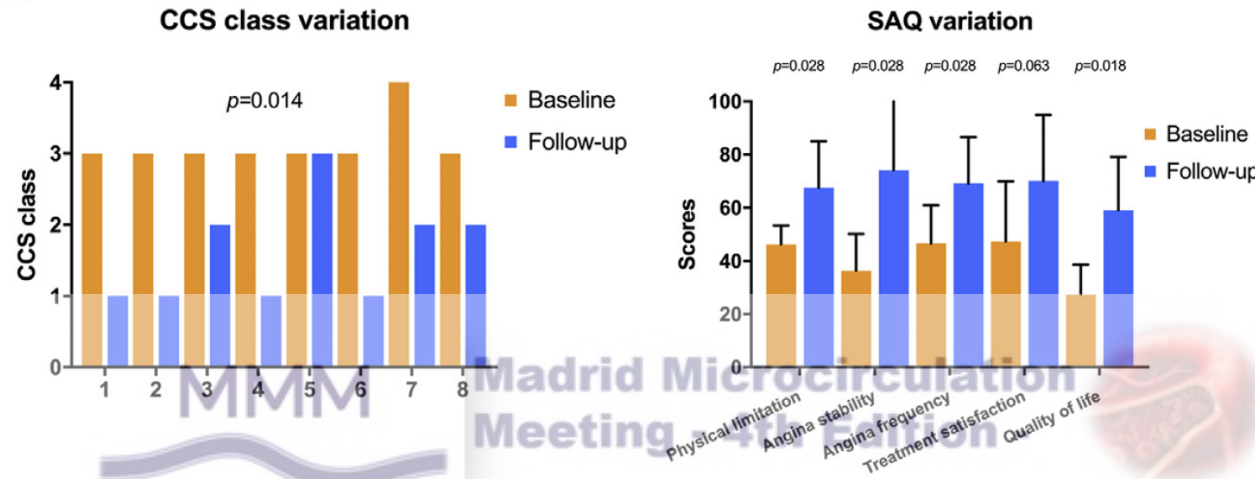
### Improvement in CCS Class



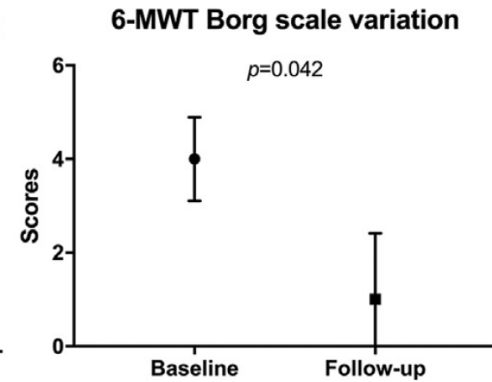
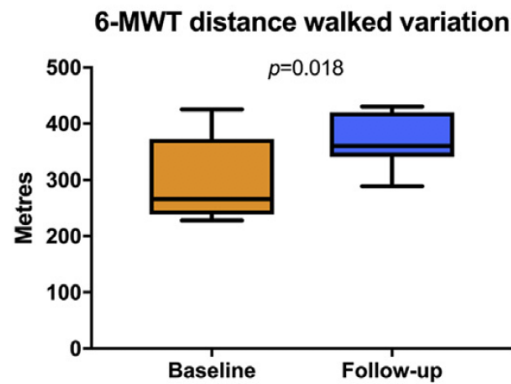
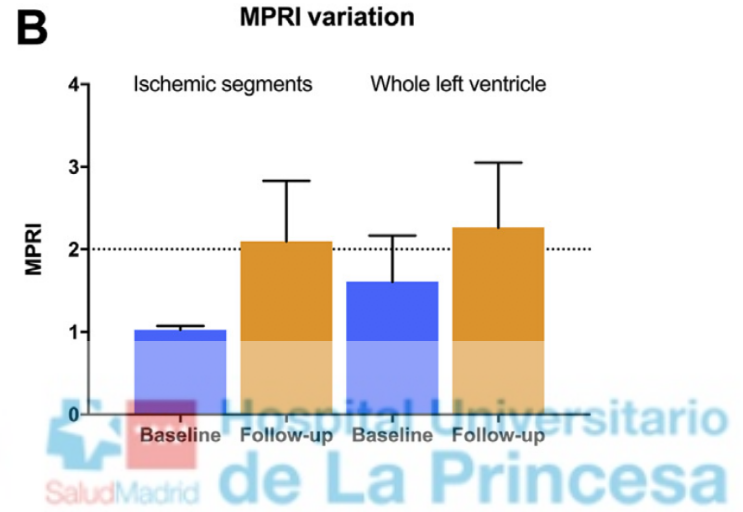
# CSR and Microvascular Dysfunction - First Evidences

## Refractory Angina due to Microvascular Dysfunction

**A**



**B**



**8 patients without obstructive coronary disease**

**Myocardial ischemia**

**Refractory Angina**

**CSR Compassionate Implant**

# CORONARY SINUS REDUCER – PATIENT 3

Woman - 75 years old  
HTN  
Dyslipidemia

Long-standing exertional angina (CCS IV)  
Frequent nocturnal episodes that make night rest difficult.

Evidence of anterior ischemia



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May 2011 Non-significant LAD stenosis

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Apr 2014 IVUS-MLA 4 mm<sup>2</sup> - PCI with DES in LAD



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April 2014: PCI in LAD (IVUS guided)

Persistence of symptoms at rest and anterior ischemia



May 2016 LAD stent without ISR

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Oct 2017 LAD stent without ISR

# CORONARY SINUS REDUCER – PATIENT 3

Jan 2019

Clinical Course:

"She usually refers CF III angina that subsides with NTG sl. She also refers episodes at rest, especially in the afternoon, evening and early morning, which forces her to get out of bed and take the NTG sl. The pain is very typical, oppressive, central thoracic, radiating to both arms and with vegetatism (...).

Cardiac MRI has been performed showing large circumferential subendocardial inducible perfusion defect from base to apex, suggestive of microvascular dysfunction".



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Apr 2019

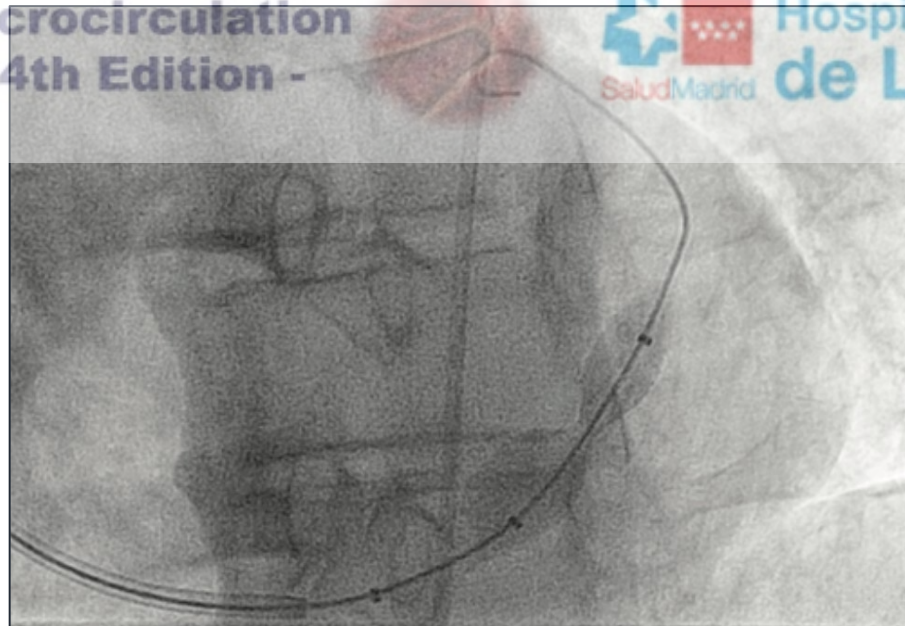
Coronary Sinus Reducer implant

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Apr 2019

Coronary Sinus Reducer implant

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Aug 2019

Clinical Course:

"Virtually asymptomatic with no pain episodes. She has increased activity at home more and more and walks outside a lot. She had not been this well for many years.

Cardiac MRI has been performed showing mild inducible circumferential subendocardial perfusion defect, which has clearly improved with respect to the previous study. "

# CSR AND MICROVASCULAR DISEASE – ONGOING TRIALS

● COMPLETED

**NCT04523168**

**Feasibility and Efficacy of Coronary Sinus Narrowing in Patients With Coronary Microvascular Dysfunction**

Conditions

Coronary Microvascular Dysfunction

Locations

Rochester, Minnesota, United States

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● ACTIVE, NOT RECRUITING

**NCT05174572**

**IMR Evaluation in Patients With Coronary Sinus Reducer Implantation (INROAD Study)**

Conditions

Refractory Angina Pectoris

Locations

Ferrara, Italy

● RECRUITING

**NCT04892537**

**Coronary Sinus Reducer Objective Impact on Symptoms, MRI Ischaemia and Microvascular Resistance**

Conditions

Refractory Angina

Locations

Basildon, United Kingdom Bournemouth, United Kingdom  
London, United Kingdom (3)

● RECRUITING

**NCT05492110**

**Coronary Sinus Reducer Implantation in Patients With Ischaemia and Non-obstructed Coronary Arteries and Coronary Microvascular Dysfunction.**

Conditions

Angina Pectoris Coronary Disease Microvascular Angina Microvascular Coronary Artery Disease Refractory Angina

Locations

London, United Kingdom

● RECRUITING

**NCT04606459**

**COSIMA: COronary Sinus Reducer for the Treatment of Refractory Microvascular Angina**

Conditions

Coronary Microvascular Disease Refractory Angina

Locations

Mainz, Rheinland-Pfalz, Germany

## The Effect of Coronary Sinus Narrowing on Coronary Microvascular Function

Tel Aviv Medical Center Reducer MVD Prospective Study

**Population** Subjects with refractory angina (CCS class 2-4) and coronary microvascular dysfunction (IMR>25, CFR≤2.5) in the absence of obstructive CAD (FFR≥0.8)

**1° Endpoint** The change in IMR values at 4 months after Reducer implantation, compared with baseline -

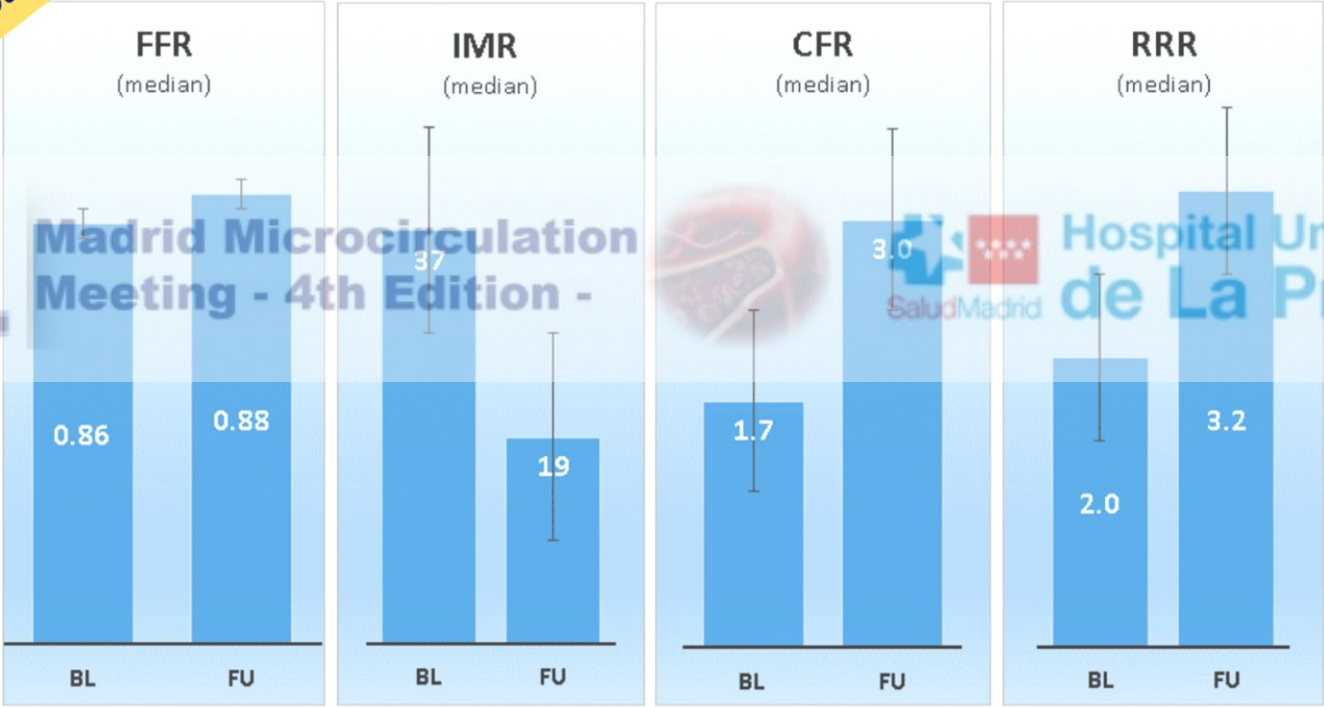
- 2° Endpoints**
- Change in CFR
  - Change in RRR
  - Change in FFR
  - Change in angina severity (CCS class)
  - Change in QOL as assessed by the Seattle Angina Questionnaire (SAQ)
  - Change in 6MWT

# CSR AND MICROVASCULAR DISEASE – ONGOING TRIALS

## The Effect of Coronary Sinus Narrowing on Coronary Microvascular Function

Preliminary Results  
Interim analysis of the  
first 10 patients (out of 30)

### Invasive Coronary Blood Flow Physiology Evaluation



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Tel Aviv Medical Center single center study  
N=10



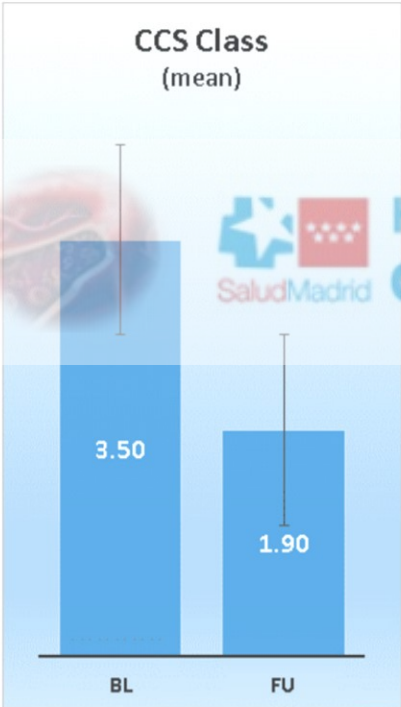
# CSR AND MICROVASCULAR DISEASE – ONGOING TRIALS

## The Effect of CS Narrowing on functional capacity and angina severity in ANOCA patients

Functional capacity and QOL

Preliminary Results  
Interim analysis of the  
first 10 patients (out of 30)

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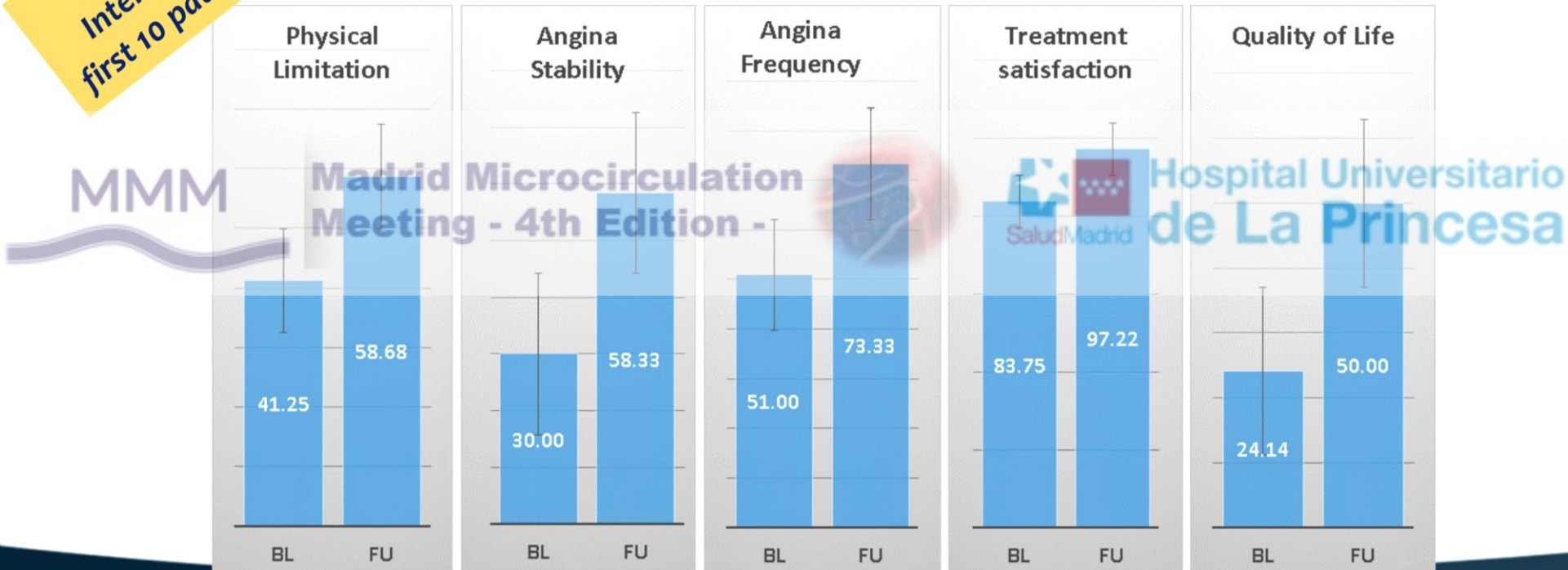
Tel Aviv Medical Center single center study  
N=10

# CSR AND MICROVASCULAR DISEASE – ONGOING TRIALS

Preliminary Results  
Interim analysis of the  
first 10 patients (out of 30)

## The Effect of CS Narrowing on QOL in ANOCA patients

Seattle Angina Questionnaire



Tel Aviv Medical Center single center study  
N=10

## STUDY DESIGN

- 30 subjects
- Invasive coronary reactivity testing at baseline and 120-days post CS Reducer\* implantation
- Primary endpoint
  - Change in invasive CFR or % increase in CBF to Ach at 120-days compared to baseline
- Secondary endpoints
  - Change in CCS angina class
  - Change in Seattle Angina Questionnaire scores

\*Limited to investigational use in the United States

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# CSR AND MICROVASCULAR DISEASE – ONGOING TRIALS

## CLINICAL AND PROCEDURAL CHARACTERISTICS

- 32 eligible patients
- 2 patients excluded due to unsuitable coronary sinus (CS) anatomy
- Successful CS Reducer\* implantation in 30 patients
- No CS Reducer\* MACE, device migration, or CS occlusion
- 2 wire-related CS perforations managed conservatively

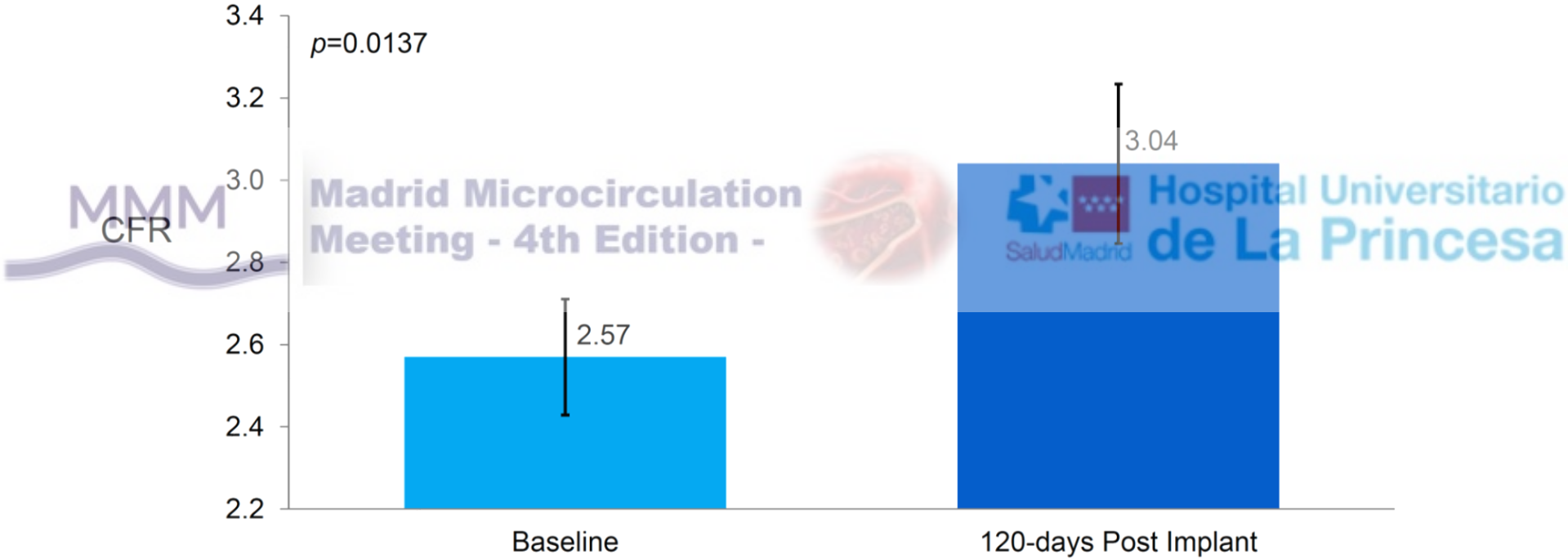
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Baseline Demographics	
Age, y; mean ± SD	54.2 ± 10.7
<b>Sex, n (%)</b>	
Female	19 (65.5%)
Male	10 (34.5%)
BMI, kg/m <sup>2</sup> , mean ± SD	30.8 ± 7.0
<b>Blood pressure (mmHg), mean ± SD</b>	
Systolic	123 ± 18.1
Diastolic	76 ± 10.7
<b>Cardiovascular Medications, n (%)</b>	
Beta Blockers	8 (27.6%)
Long-Acting Nitrates	15 (51.7%)
Calcium Channel Blockers	23 (79.3%)
Ranolazine	8 (27.6%)
Statins	17 (58.6%)
ACE inhibitors	7 (24.1%)
L Arginine	14 (48.3%)
<b>Medical History, n (%)</b>	
Hypertension	14 (48.3%)
Diabetes Mellitus	7 (24.1%)
Hyperlipidemia	16 (55.2%)
<b>Smoking History, n (%)</b>	
Never	21 (72.4%)
Former	8 (27.6%)
Current	0 (0%)

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# CSR AND MICROVASCULAR DISEASE – ONGOING TRIALS

## MEAN CFR BEFORE AND AFTER CS REDUCER\* IMPLANTATION, ALL PATIENTS (N=30)



\*Limited to investigational use in the United States

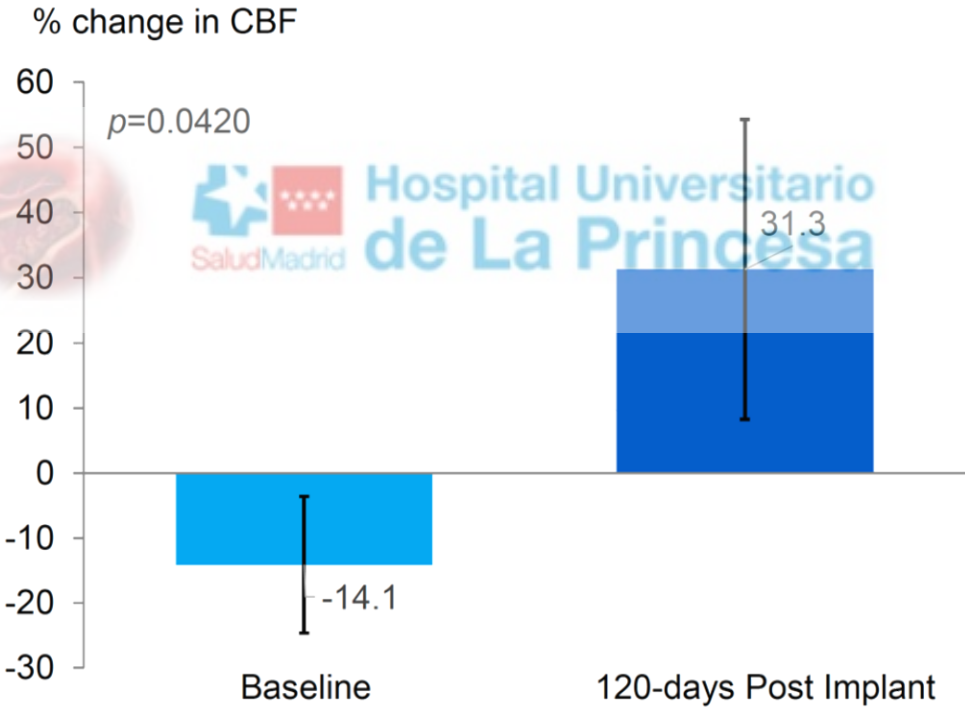
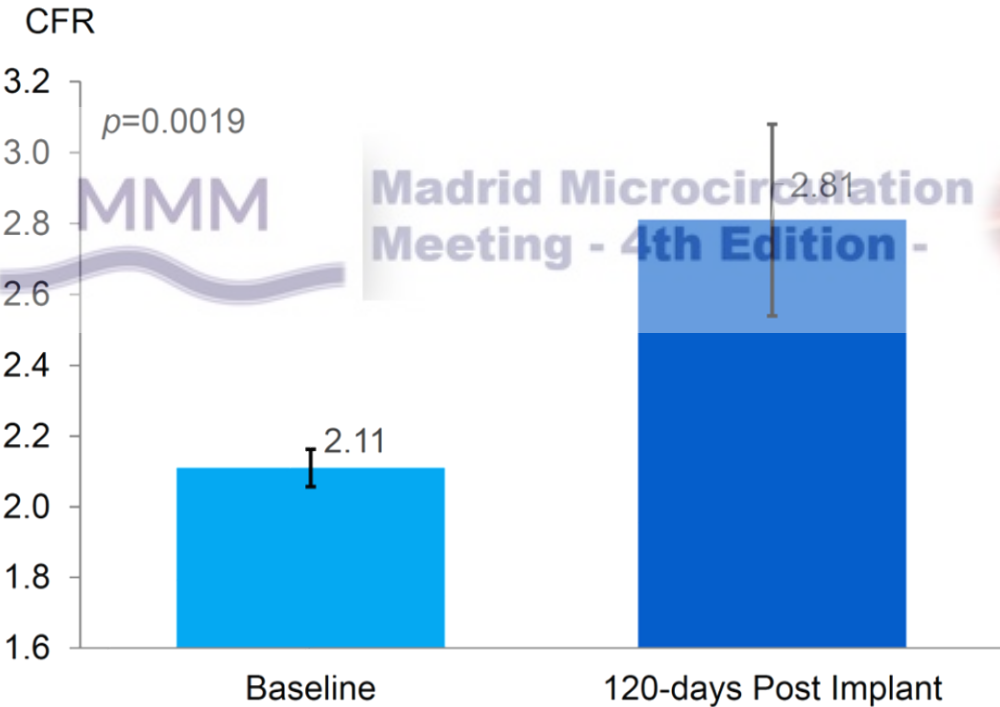
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# CSR AND MICROVASCULAR DISEASE – ONGOING TRIALS

## CORONARY MICROVASCULAR FUNCTION FOLLOWING CS REDUCER\* IMPLANTATION

Endothelium Independent Function (n=19)

Endothelium Dependent Function (n=11)



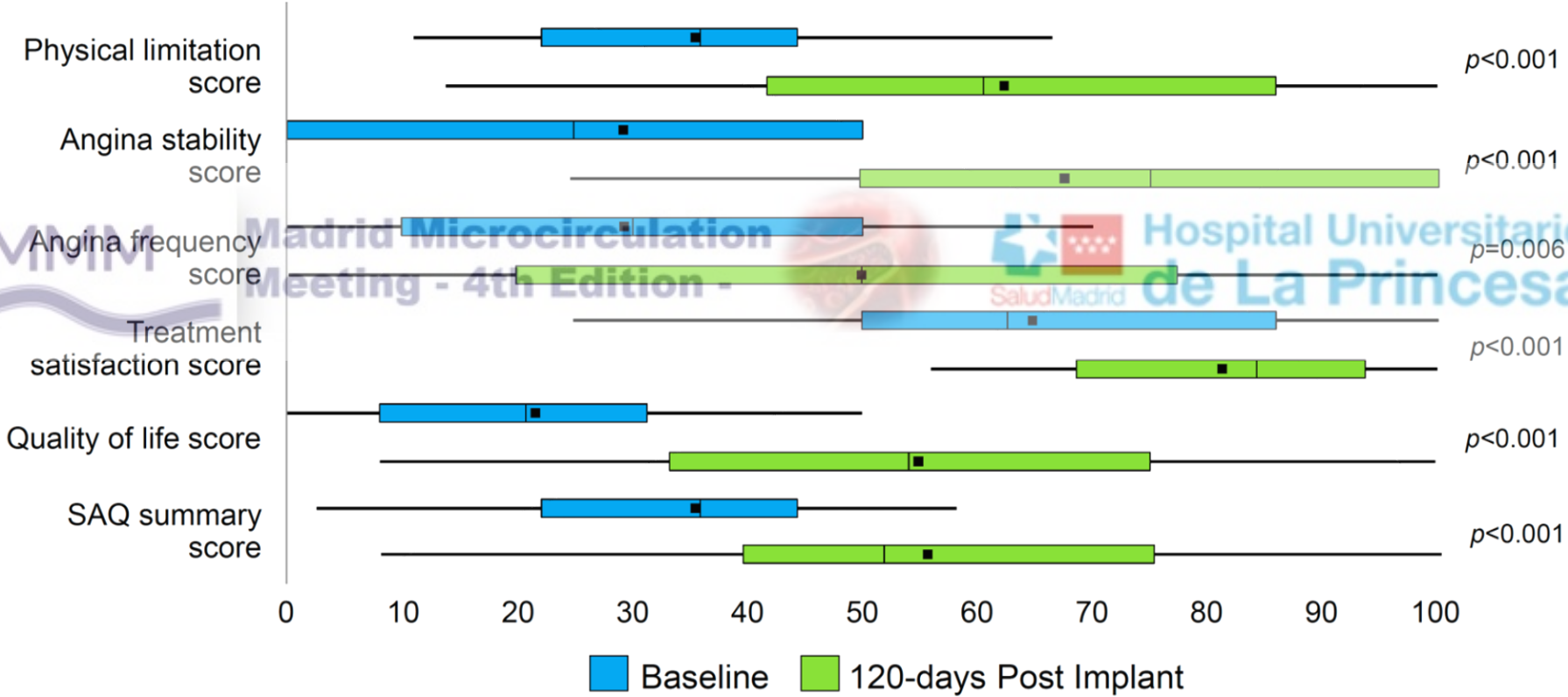
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# CSR AND MICROVASCULAR DISEASE – ONGOING TRIALS

## SEATTLE ANGINA QUESTIONNAIRE

Seattle Angina Questionnaire results at baseline compared to 120-day follow-up

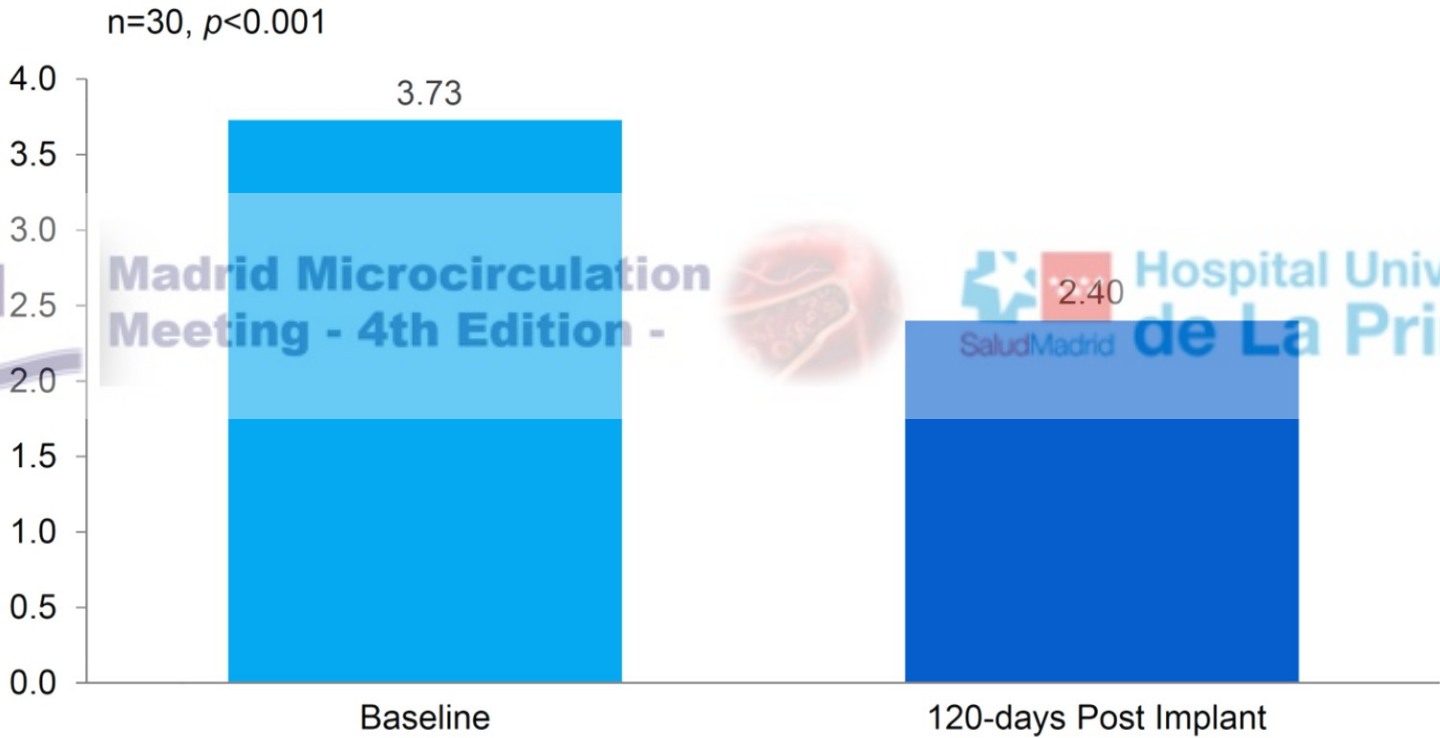


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# CSR AND MICROVASCULAR DISEASE – ONGOING TRIALS

## CCS ANGINA CLASS

CCS angina class at baseline and 120-days



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# CONCLUSIONS

CSR implantation in patients with ANOCA and coronary microvascular disease:

- Seems a safe and feasible procedure
- Seems to improve both endothelium dependent and endothelium independent microvascular function
- Seems to improve IMR, CRF and RRR
- Seems to improve symptoms and quality of life
- May emerge as a novel therapy for microvascular angina
- Further evaluation with larger RCT is warranted

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