Stent Thrombosis and restenosis in DM2 patients

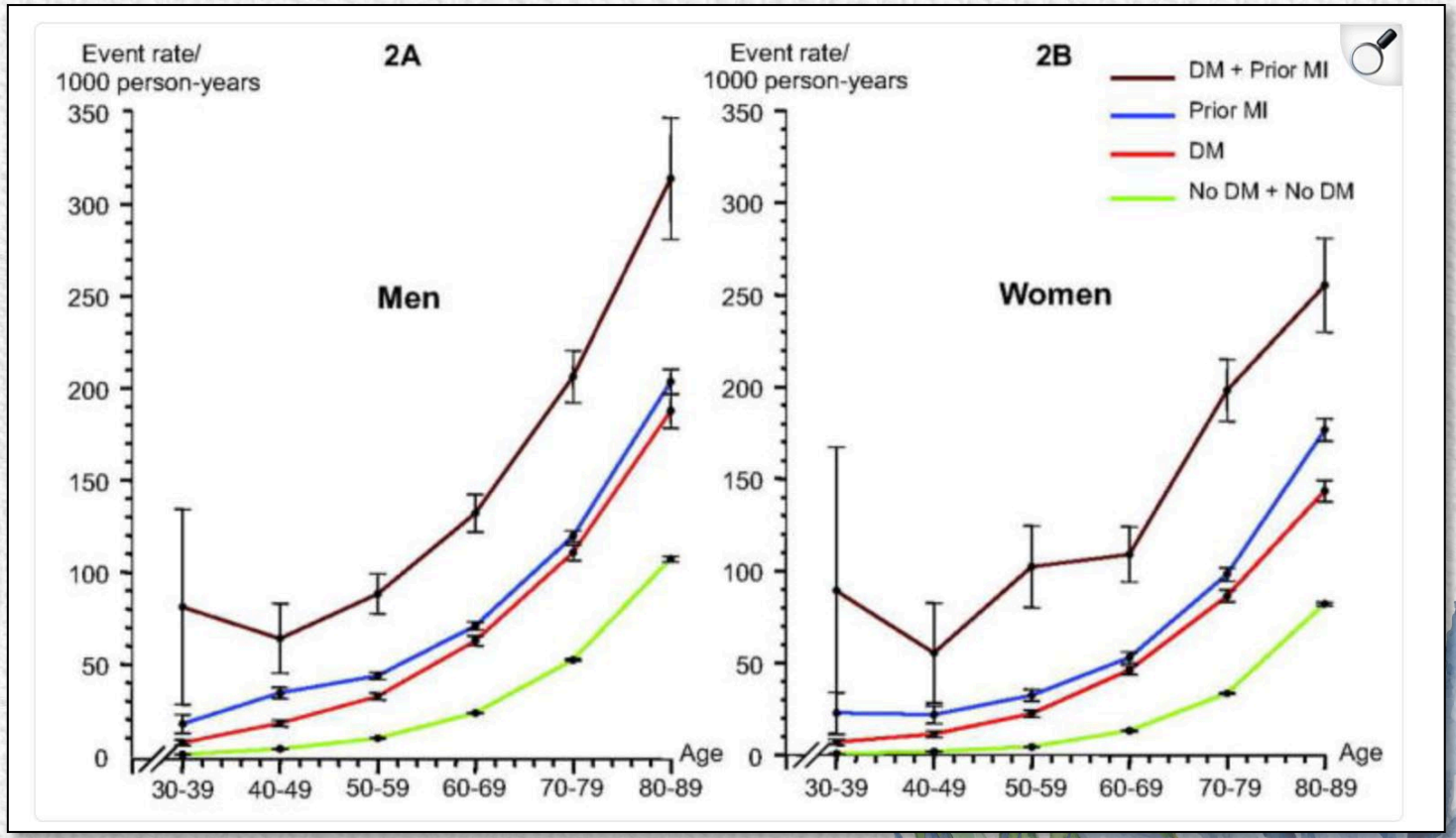
Dr. Alejandro Ricalde MD, FACC

Mexico City

Background

- Coronary heart disease is a major cause of morbidity and mortality among patients with diabetes mellitus.

- More likely to have coronary artery disease that is complex, diffuse, and involves multiple vessels.



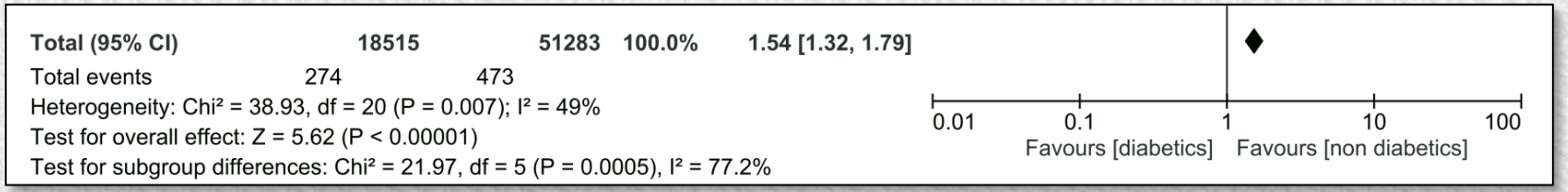
Cardiol Clin. 2014 Jun 10;32(3):439–455.

Background

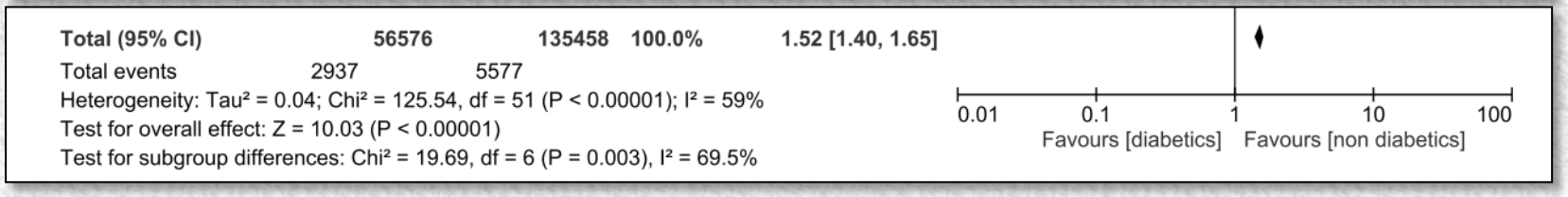
In-hospital, short-term and long-term adverse clinical outcomes observed in patients with type 2 diabetes mellitus vs non-diabetes mellitus following percutaneous coronary intervention

A meta-analysis including 139,774 patients. Outcomes: (Death, MI, Stroke, MACE, Bleeding & Stent Thrombosis)

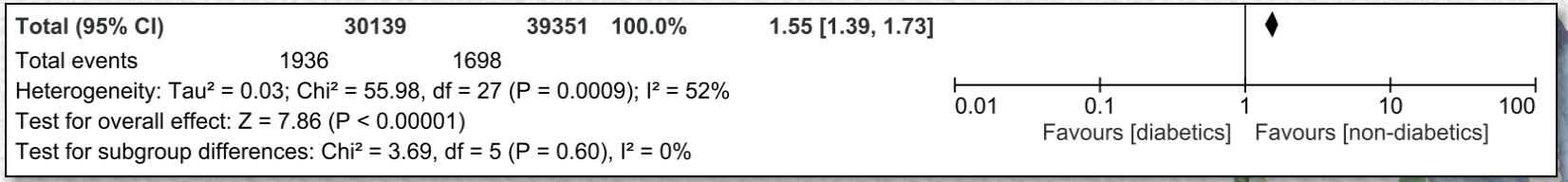
In Hospital



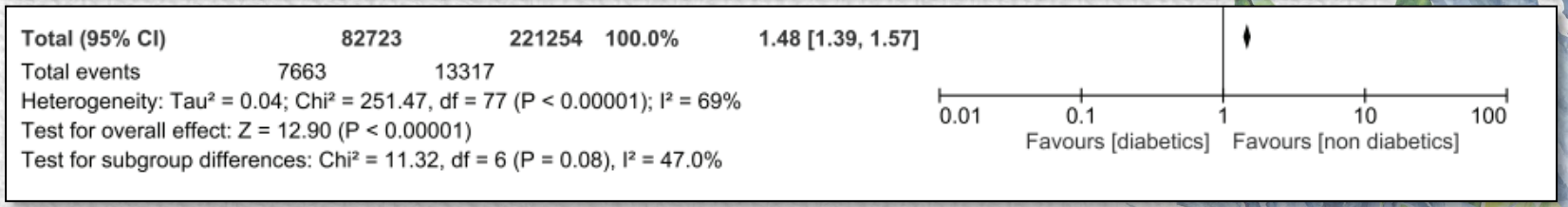
Short Term



< 1 year



> 1 year



Medicine (2019) 98:8(e14669)

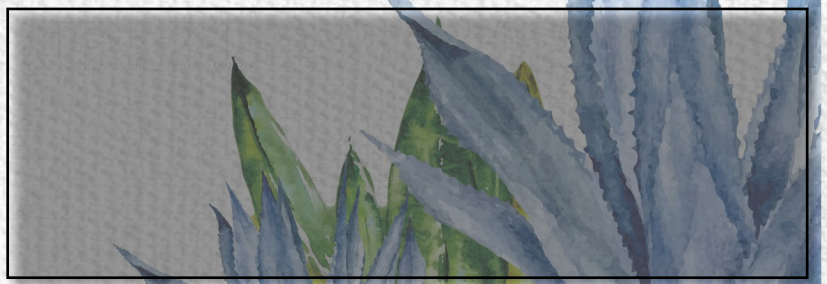
Outcomes in DM Vs Non DM post PCI

In Hospital

Higher Risk

Mortality /MACE

Same Risk (MI/ Stroke/ Bleeding/ Stent Thrombosis



A meta-analysis including 139,774 patients.

Medicine (2019) 98:8(e14669)

Outcomes in DM Vs Non DM post PCI

Short Term

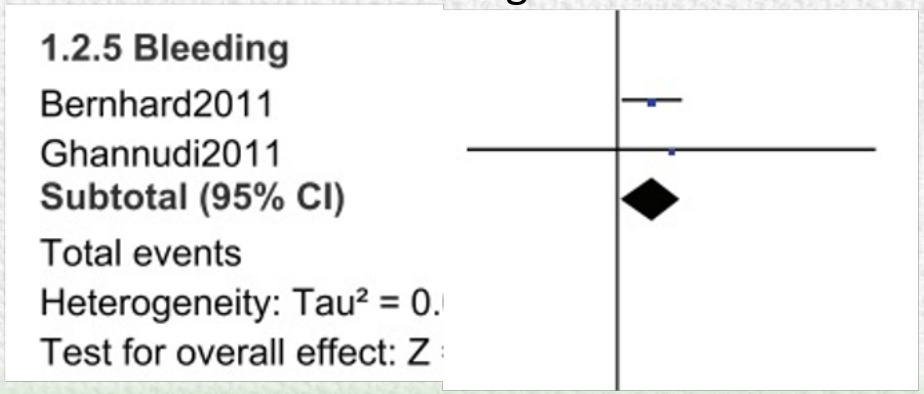
Mortality

Myocardial Infarction

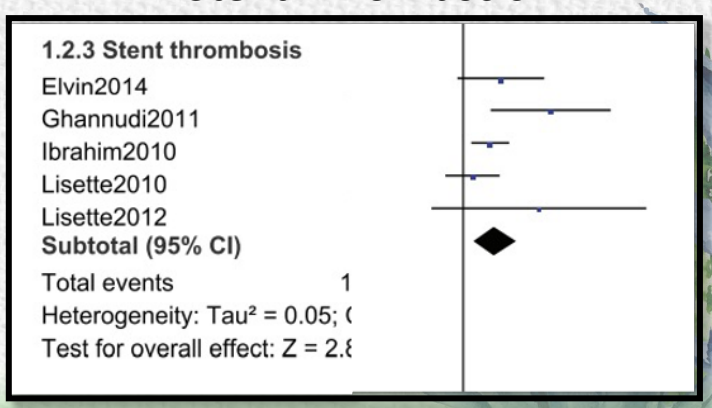
MACE

Higher Risk

Bleeding



Stent Thrombosis



A meta-analysis including 139,774 patients.

Medicine (2019) 98:8(e14669)

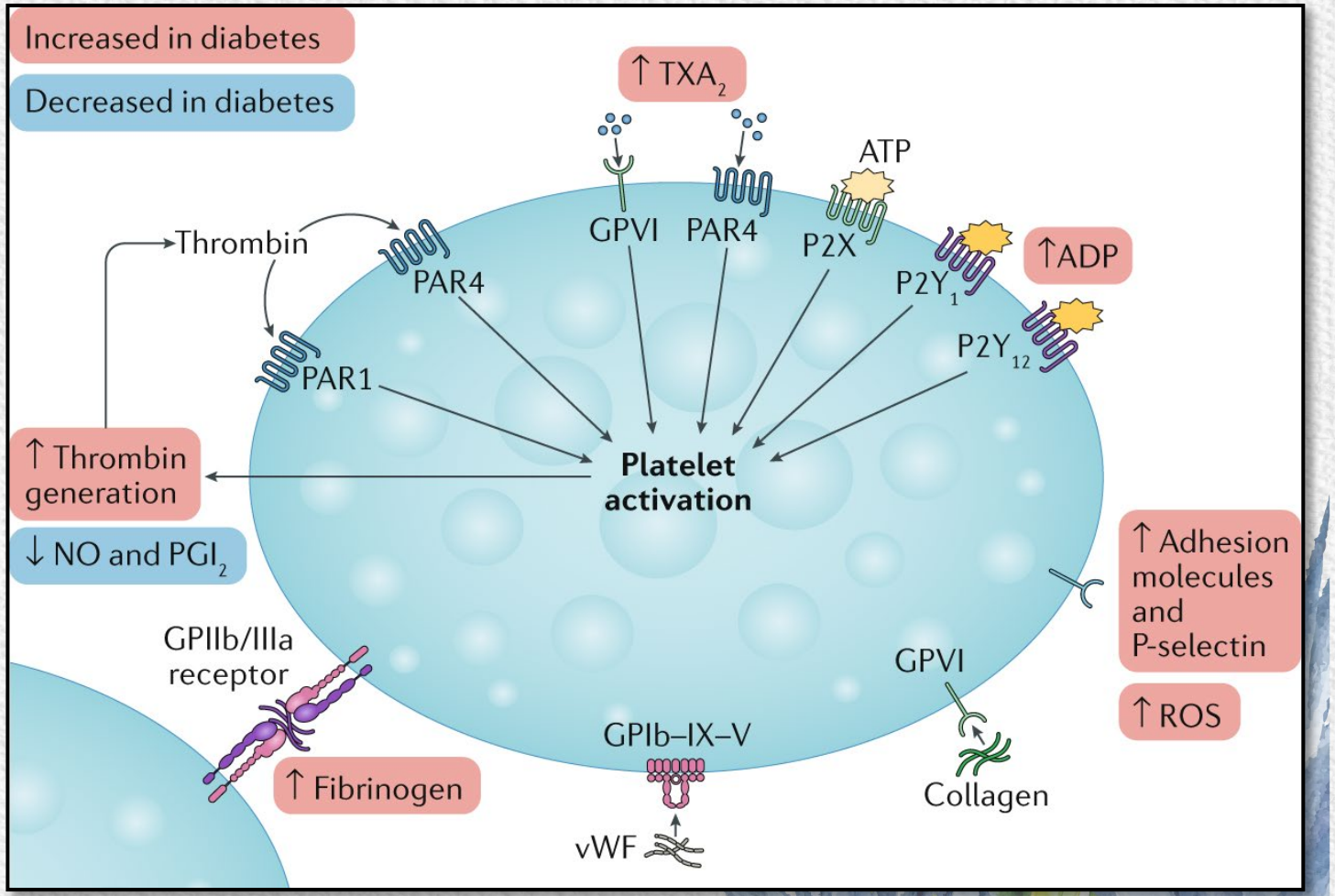
Increased Risk of Stent Thrombosis in DM patients

Increased platelet reactivity in diabetes:

- Higher levels of:
  - Thrombin
  - Thromboxane A_2 (TXA_2)
  - Hyperresponsiveness of PAR4 to thrombin and TXA_2.
  - Increased plat membrane expression of
    - P-selectin, adhesion molecules and glycoprotein (GP) IIb/IIIa.
- Production of reactive oxygen species (ROS)

Decrease

- Vascular synthesis of nitric oxide (NO)
- Prostaglandin is decreased.



Nature Reviews Cardiology **volume 16**, pages113–130 (2019)

Outcomes in DM Vs Non DM post PCI

LONG TERM (> 1YR)

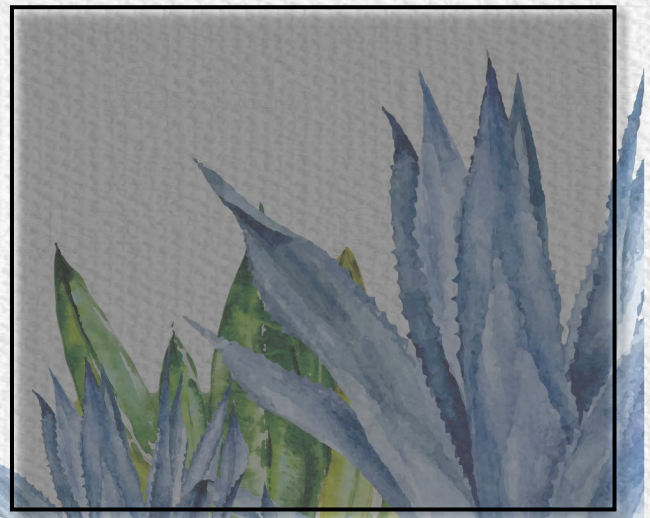
Mortality

Myocardial Infarction

MACE

TLR

Higher Risk

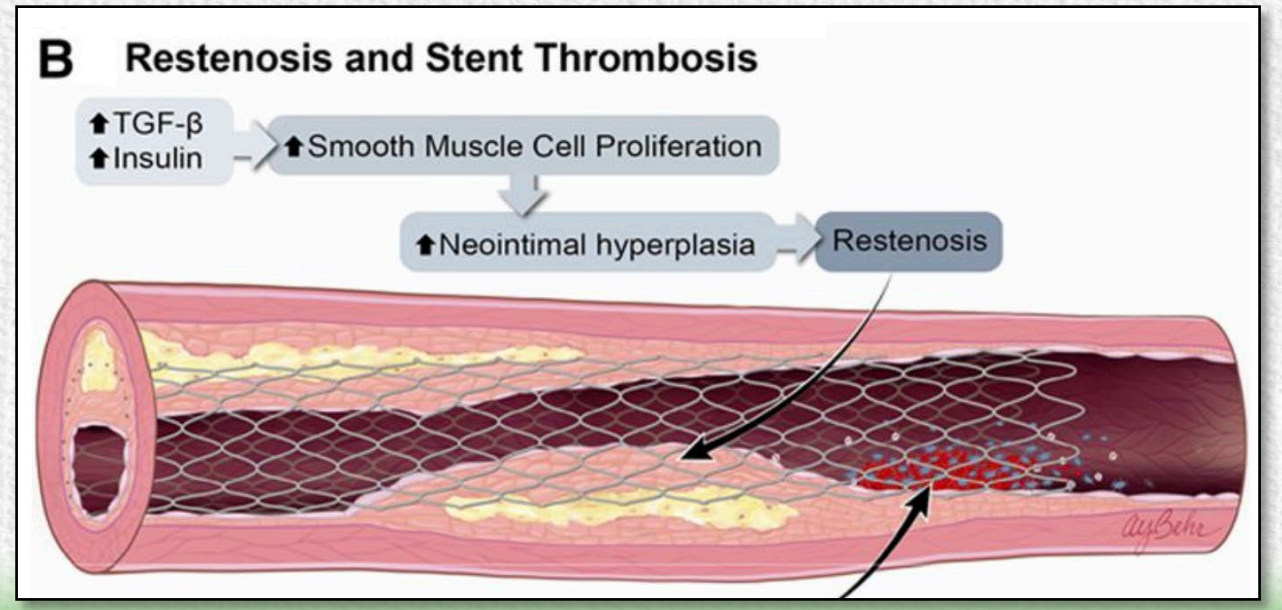


A meta-analysis including 139,774 patients.

Medicine (2019) 98:8(e14669)

In-Stent Restenosis in DM

- In-stent restenosis (ISR) complicates 1-2% of drug eluting stents / year
- Diabetes mellitus (DM) = known risk factor for major adverse cardiac events and ISR after de novo vessel PCI



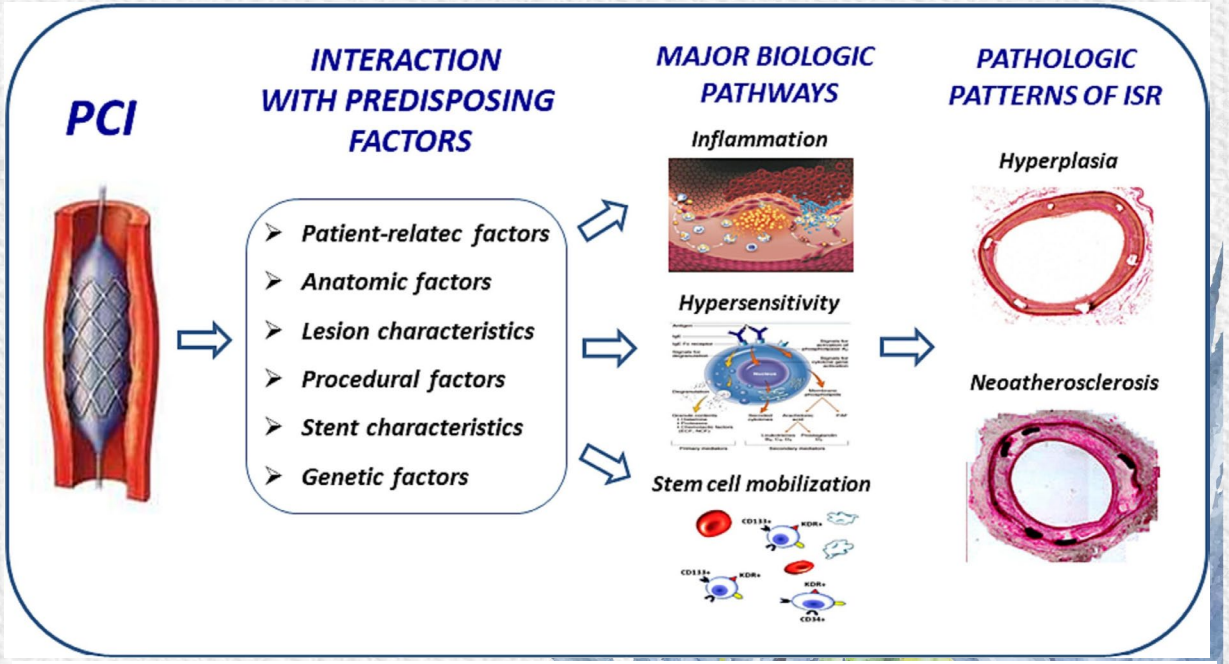
In-Stent Restenosis in DM

Table 3. The most important atherogenic mechanisms in patients with DM.

Inflammation	Increased activity of C-reactive protein (CRP) and proinflammatory cytokines
Endothelial dysfunction	Hyperglycaemia, insulin resistance, and free fatty acid production decrease nitric oxide (NO) bioavailability [36,37]. Hyperglycaemia worsens endothelial nitric oxide synthase (eNOS) function [36,37].
Platelets' dysfunction	Upregulation of P-selectin, GP Ib receptor and GP IIb/IIIa receptor [12,38] Activation of protein kinase C (PKC) and decrease in NO production [12] Enhanced platelet adhesion and aggregation [12]
Coagulation	Upregulation of VIIa factor and tissue factor, downregulation of antithrombin III, protein S, and protein C [39–41] Hypercoagulability—according to the mechanisms elucidated above
Rheology	Elevated blood viscosity [12] Elevated fibrinogen production [12]
VSCMs	Promotion of the atherogenic phenotype of VSMCs through the increased production of reactive oxygen species, upregulation of PKC, advanced glycation end product receptors and nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB) [12] Impaired synthesis of collagen (plaque instability) [12] Increased activity of MMPs [42] Increased activity of angiotensin II and endothelin-1 (vasoconstriction) [12,43]

Int. J. Environ. Res. Public Health 2021, 18, 11970

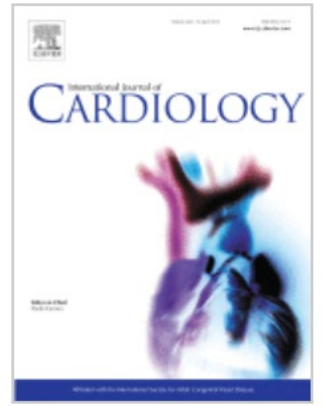
The association between DM and ISR is extensively documented, due to various mechanisms leading to endothelial dysfunction, subsequent neointimal hyperplasia, and late neoatherosclerosis



International Journal of Cardiology, Volume 404, 131922

SOLACI SOCIME'25 MEXICO CITY

Impact of diabetes mellitus on clinical outcomes after first episode in-stent restenosis PCI: Results from a large registry



Mount Sinai database 2015-2021

Inclusion:

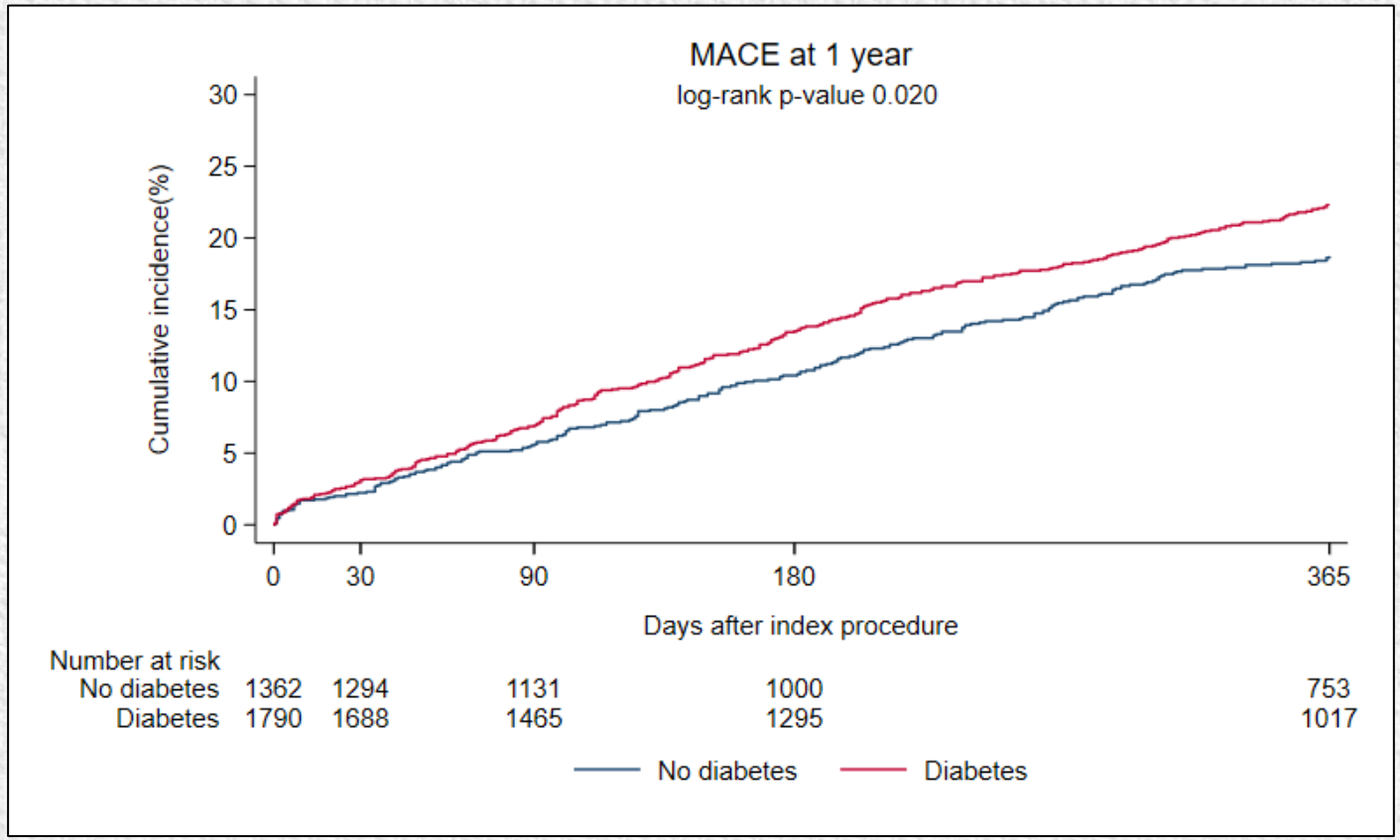
- PCI for first episode ISR
- Single layer of stent

The primary endpoint of the study was a composite of major adverse events (MACE); all-cause death, spontaneous myocardial infarction, and target lesion revascularisation at 1-year follow up after PCI.

	Overall n = 3,156	Diabetes n = 1,791	No diabetes n=1,362	p-value
Age (years)	67.1±10.7	66.4±10.1	68.0±11.3	<.001
Female	28.9±5.6	29.3±5.9	28.4±5.3	<.001
Presentation - Stable angina - Unstable angina - STEMI	 1718 (54.5%) 828 (26.3%) 24 (0.8%)	 971 (54.2%) 456 (25.5%) 12 (0.7%)	 747 (54.8%) 372 (27.3%) 12 (0.9%)	 0.725 0.242 0.499
Anemia	1363 (45.2%)	937 (54.3%)	426 (32.9%)	<.001
PAD	420 (13.3%)	284 (15.9%)	136 (10.0%)	<.001
CKD	953 (30.2%)	629 (35.1%)	324 (23.8%)	<.001
Atrial fibrillation	295 (9.4%)	151 (8.4%)	4 (10.6%)	0.041
Insulin dependent	772 (43.1%)	772 (43.1%)	-	-
Prior CABG	713 (22.6%)	460 (25.7%)	253 (18.6%)	<.001

Int J Cardiol. 2024 Apr 15:401:131856.

Results – MACE at 1 year



MACE

349 (22.4%) vs. 219 (18.7%).

HR 1.22 95% CI (1.03 - 1.45), p= 0.020

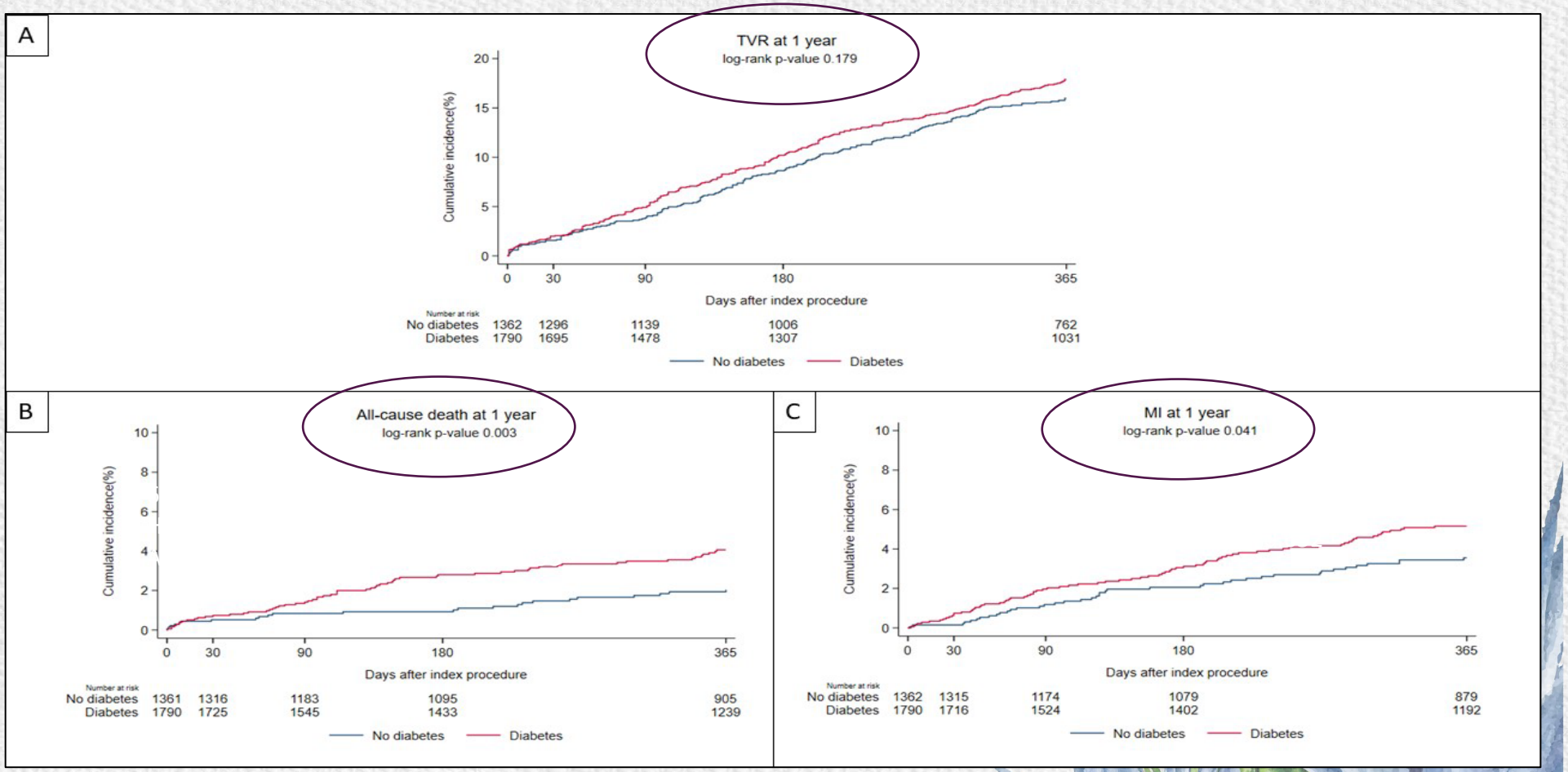
AHR 1.07 (0.90 - 1.29). p=0.444

Int J Cardiol. 2024 Apr 15:401:131856.

Results – TVR, All-cause death and MI at 1-year

- Patients with DM experienced a higher rate of MACE, MI and all-cause death compared to non-diabetics.

- DM does not appear to be an independent predictor of TVR after ISR-PCI



Int J Cardiol. 2024 Apr 15:401:131856.

Tips to Reduce Adverse Outcomes in DM patients

- **Optimal Glycemic Control**
  - Maintain blood glucose levels within target range to reduce endothelial dysfunction and inflammation.
  - Use antidiabetic medications that have cardiovascular benefits (e.g., SGLT2 inhibitors, GLP-1 receptor agonists).

- **Adequate Dual Antiplatelet Therapy (DAPT)**
  - Ensure adherence to prescribed DAPT (aspirin + P2Y12 inhibitor) for an appropriate duration based on stent type and patient risk profile.
  - Consider longer DAPT in high-risk patients, such as those with diabetes.

- **Choice of Stent**
  - Prefer drug-eluting stents (DES) over bare-metal stents (BMS) due to lower restenosis rates.
  - Use newer-generation DES with biocompatible or biodegradable polymers for better vascular healing.

- **Optimal Stent Deployment**
  - Ensure proper stent sizing and high-pressure deployment to minimize malapposition.
  - Use intravascular imaging (IVUS or OCT) to optimize stent expansion and apposition.

- **Address Concomitant Risk Factors**
  - Manage hypertension, hyperlipidemia, and smoking cessation vigorously.
  - Use statins for lipid control and plaque stabilization.

Tips to Reduce Adverse Outcomes in DM patients

- **Anti-inflammatory Strategies**
  - Consider medications or interventions that reduce vascular inflammation, which contributes to restenosis.

Regular Follow-Up and Monitoring

Schedule early and regular follow-up to detect restenosis or thrombosis signs.
Use non-invasive imaging or stress testing when appropriate.

Lifestyle Modifications

Promote healthy diet, physical activity, weight management, and smoking cessation.

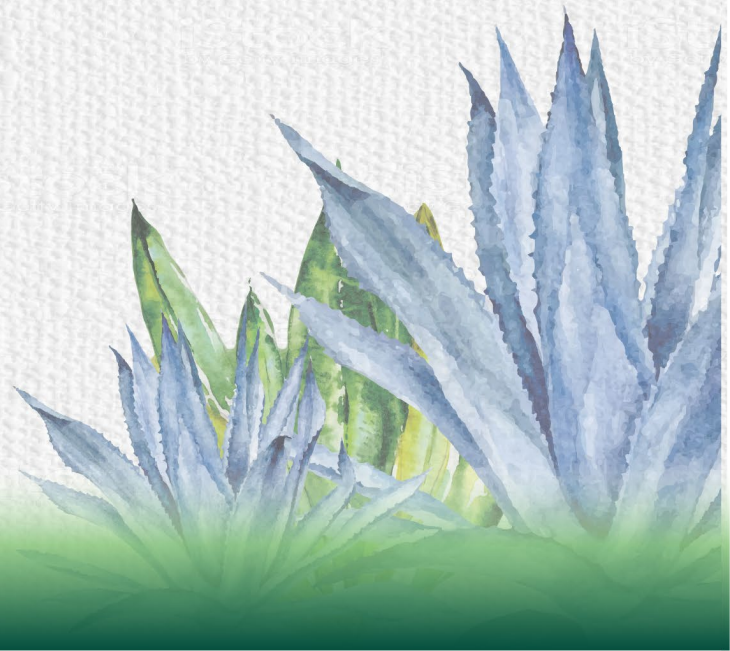
Use of Newer Antiplatelet Agents

In some cases, use potent antiplatelet agents such as ticagrelor or prasugrel, especially in high-risk diabetic patients.

- **Interventional Strategies**
  - Consider drug-coated balloons for certain cases of restenosis.
  - Use rotational atherectomy or other adjunctive therapies for heavily calcified lesions..

SOLACI SOCIME'25
MEXICO CITY

THANK YOU



SOLACI

SOCIME
SOCIEDAD DE CARDIOLOGIA INTERVENCIONISTA DE MEXICO