

COMPUTATIONAL FLUID DYNAMIC STUDY CONFIRMS THAT THE DEGREE OF STENOSIS TRIGGERING RUPTURE OF PLAQUES CAUSING ACUTE CORONARY SYNDROME

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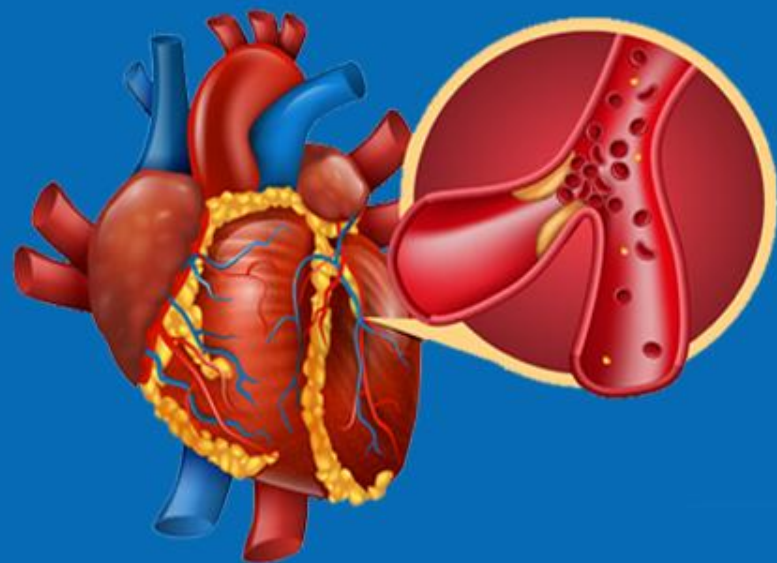
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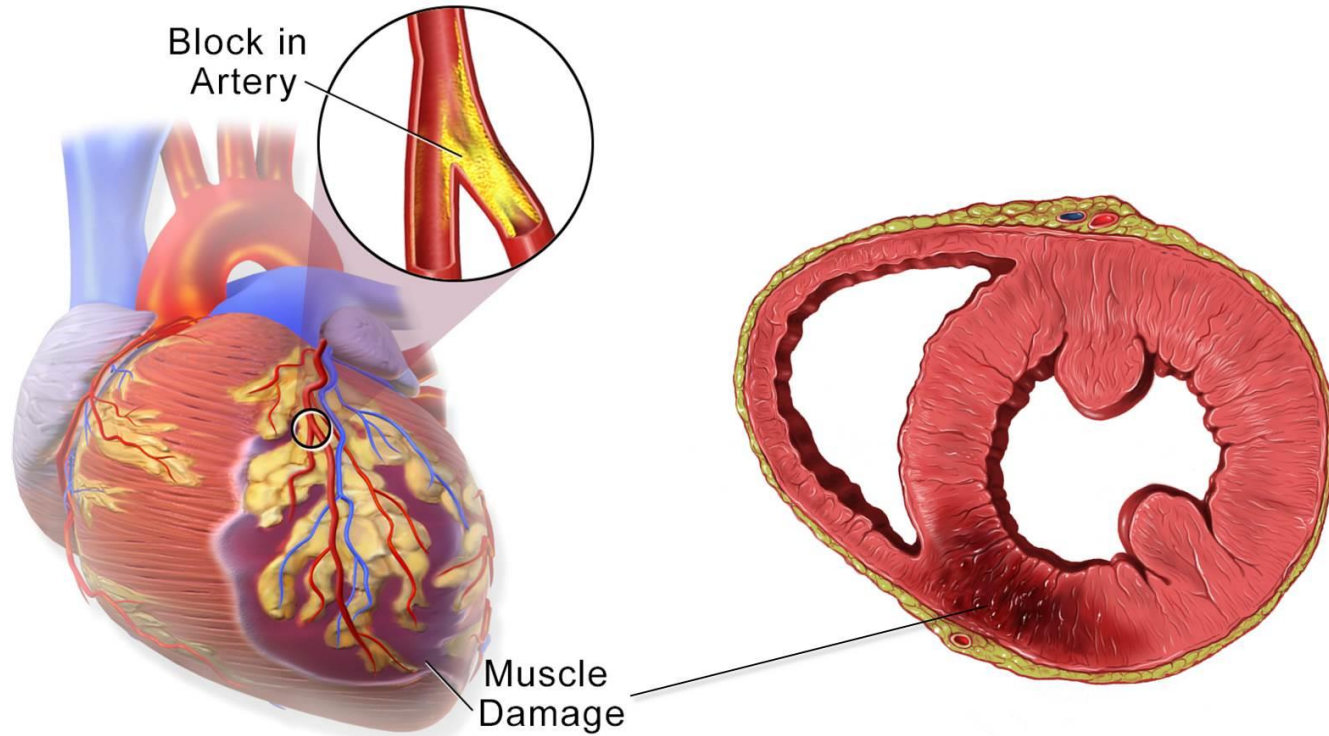
4. Rovigo General Hospital, Rovigo, Rovigo, Italy;

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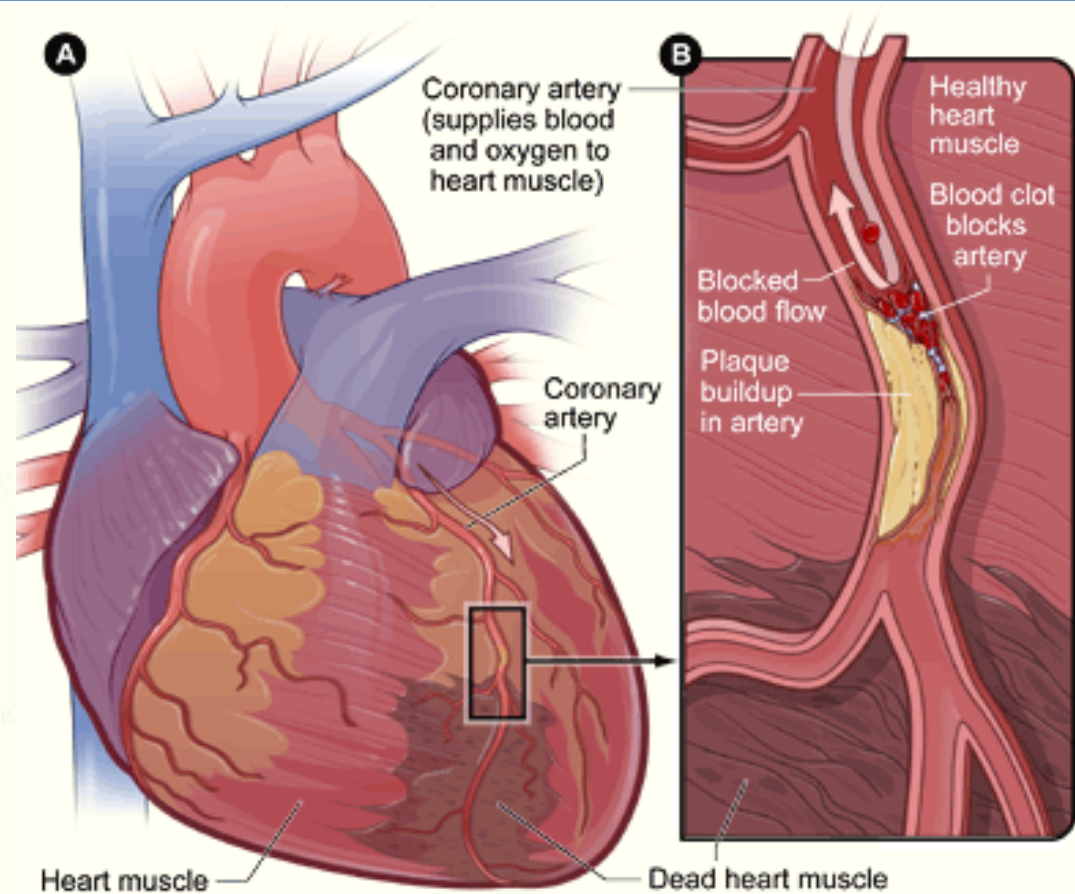
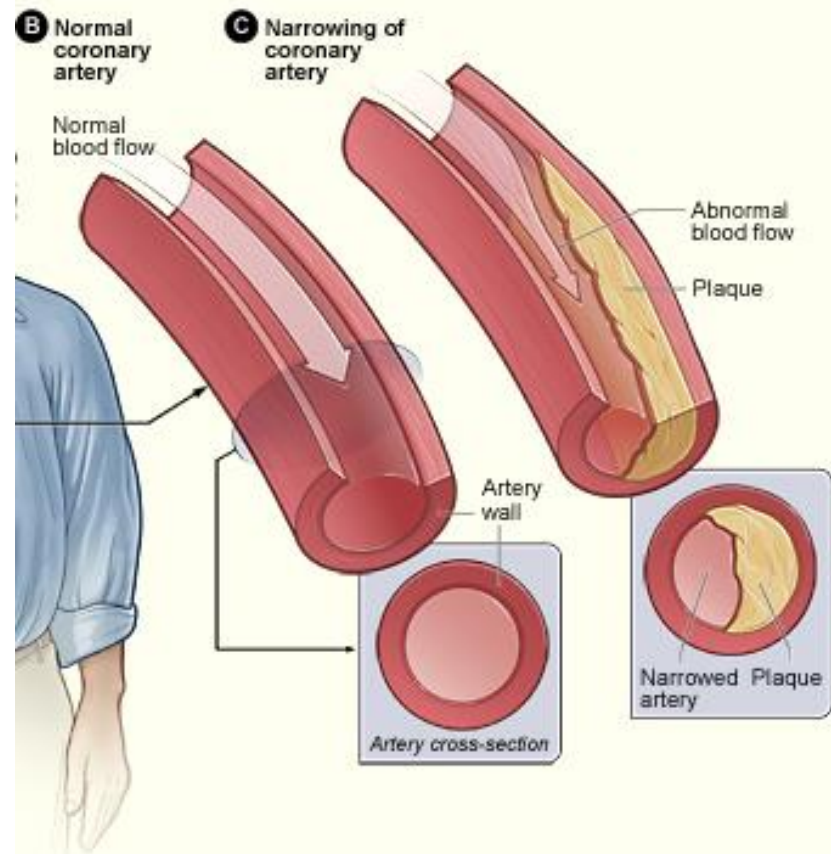
Presenter: Nguyen Thuy Dan Anh



BACKGROUND



BACKGROUND



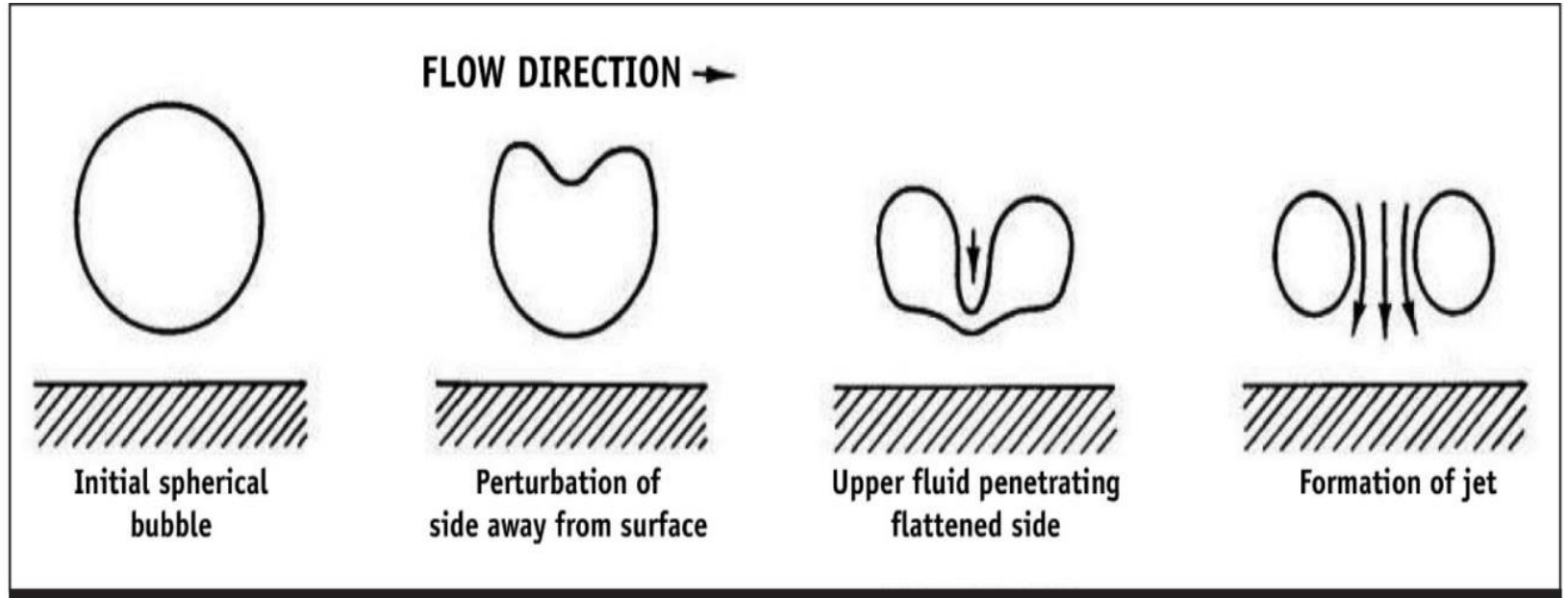
HYPOTHESIS

Acute myocardial infarction (AMI) was believed to occur in mild to moderate coronary lesion. The question is: **At which degree of stenosis begin the process of development of AMI?**

MECHANISM

Based on common hydraulic principle and practice, a new mechanism of **cavitation** (air bubble formation and rupture) in the coronary arteries was suspected to **trigger plaque rupture and start AMI.**

MECHANISM



METHODS

- A virtual 3D model of the left anterior descending artery (LAD) was reconstructed, based on the intravascular ultrasound of 30 patients.
 - By computational fluid dynamic (CFD) study:
 - The turbulent features
 - The vapor pressure
 - The static pressure
- of the coronary blood flow were simulated in a straight vessel model with both eccentric and concentric plaque => causing an incremental degree of stenosis from 25% to 75%.

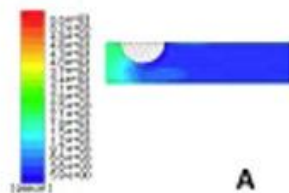
RESULTS

Stenosis 1 (50%)

Stenosis 2 (25%)

Stenosis 3 (Eccentric - 75%)

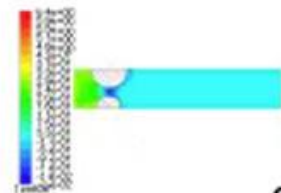
Static Pressure



A

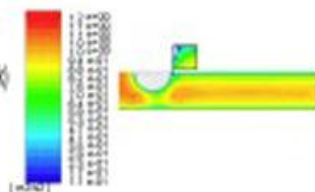


B



C

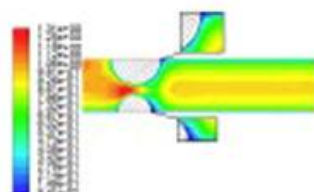
Turbulent Kinetic Energy (K)



D

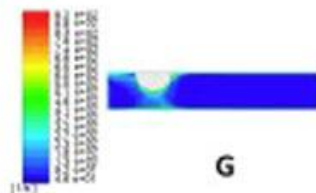


E



F

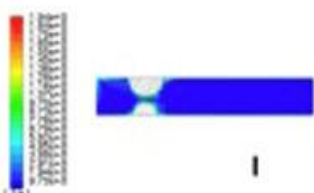
Vorticity Magnitude



G

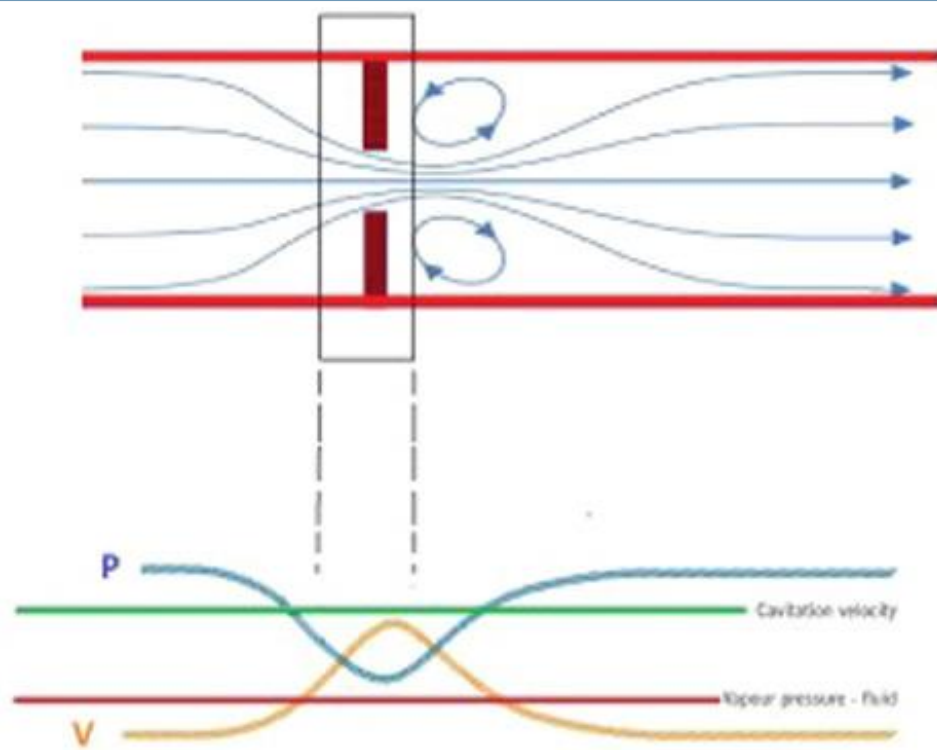


H



I

RESULTS



P: Pressure inside the vessel

V: Velocity

CONCLUSION

Cavitation in coronary vessels occurred when the coronary stenosis **reached the threshold of 75%**. These bubbles explosions eroded the cap, triggered platelet aggregation and started AMI.

THANK YOU FOR YOUR ATTENTION