



**Subclinical arteriosclerotic change
in type 2 diabetic patients younger
than 50 years of age**


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Introduction

- Type 2 diabetes mellitus (DM) have independent associations with cardiovascular mortality and morbidity
- Diabetic subjects have both thicker and stiffer carotid arteries compared with healthy controls

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- Carotid intima-media thickness (IMT) as an established surrogate marker of early arteriosclerosis, is associated with a higher risk of myocardial infarction and stroke in diabetic patients



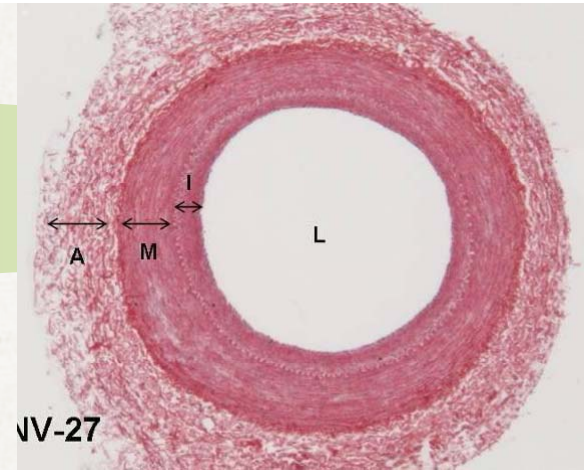
“Arteriosclerosis”

- any hardening (and loss of elasticity) of small arteries and arterioles

“Artherosclerosis”

- hardening of an artery specifically due to an atheromatous plaque.
- most common form of arteriosclerosis

Arteriosclerosis



↑ **Vascular intimal thickness**

Migration and matrix production by VSMC

↑ **Vascular stiffness**


↓ **Elastin fragmentation**

↑ **Collagen production by VSMC**

Altered growth factor regulation

Vascular functional changes

NO production

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- The detection of more subtle change of arteriosclerosis before the progression of IMT would benefit for screening patients at higher risk for atherosclerotic cardiovascular (CV) disease

Objective

To determine whether the presence of type 2 diabetes is associated with arteriosclerotic change in patients aged under 50 years with normal IMT

Method

- **Study population :**

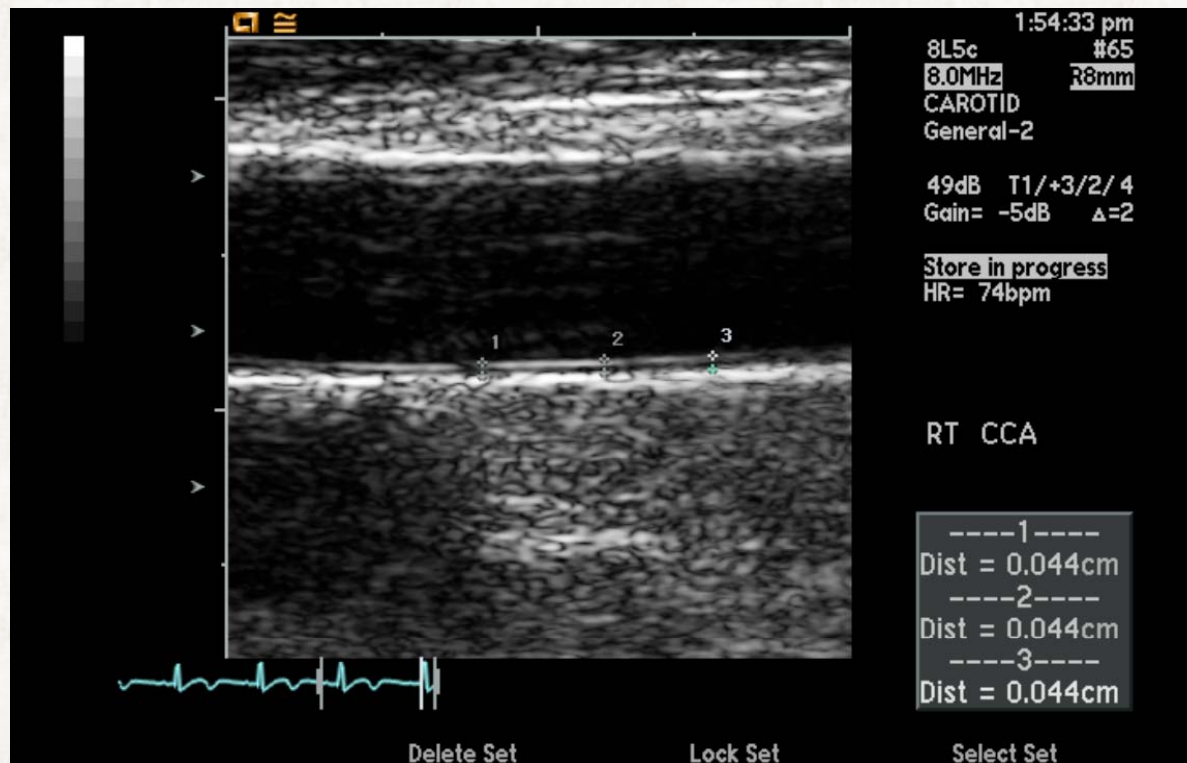
1> DM (n = 51) - asymptomatic patients aged under 50 years without history of hypertension, CKD

2> **Controls (n = 38)** - age-, sex- matched

Carotid ultrasonogram

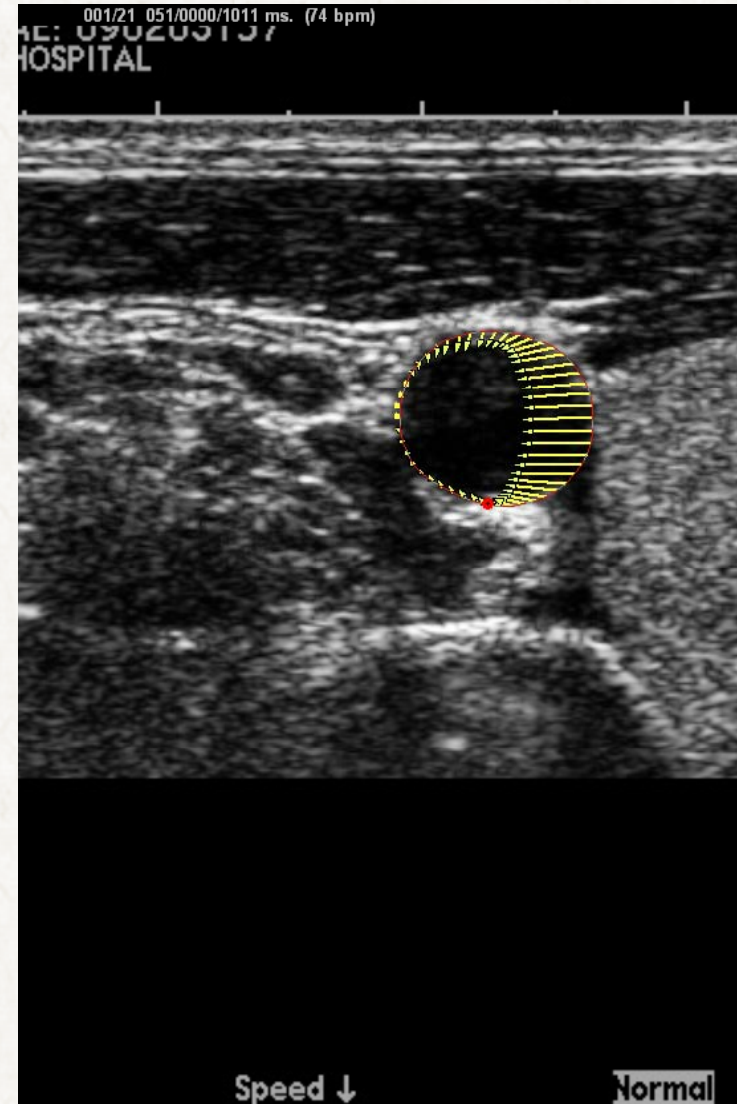
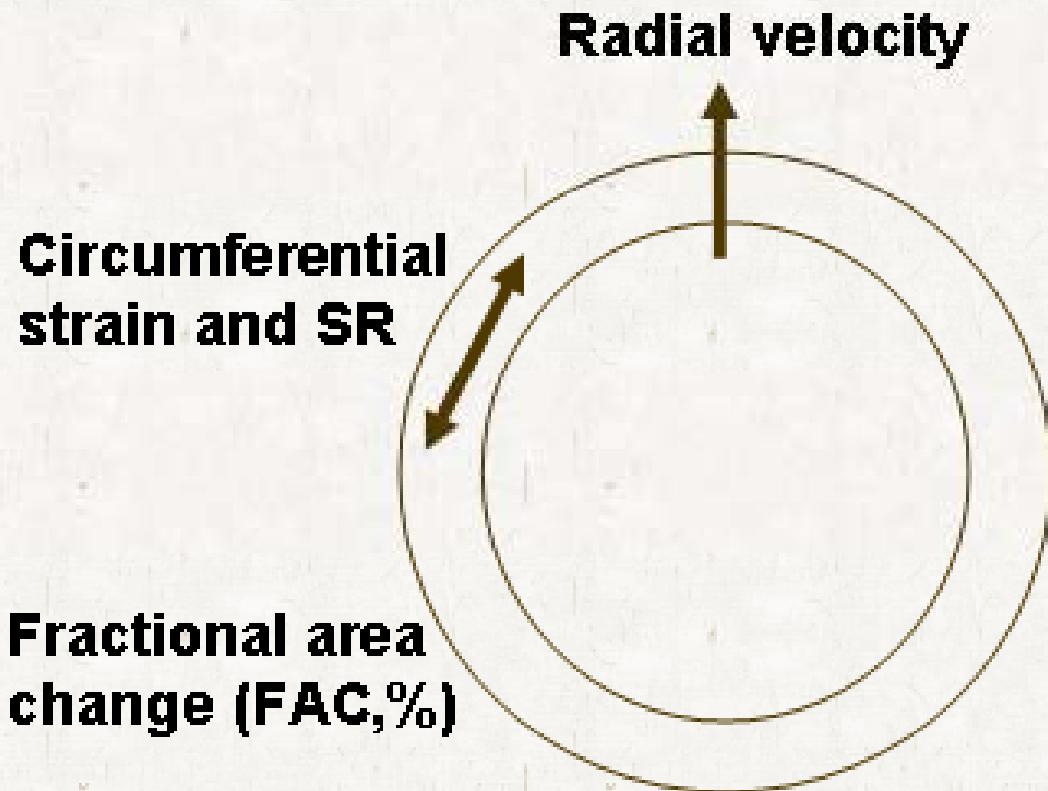
• Measurement

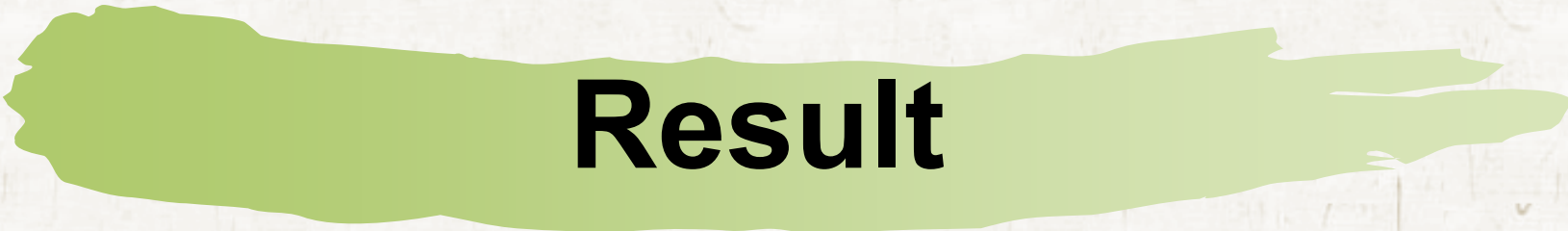
1) IMT (intima-media thickness, mm)



Velocity vector imaging (VVI)

Measurement





Result

	Control (n = 38)	DM (n = 51)	p-value
Age (yr)	41 ± 8.5	40 ± 6.5	0.35
Male (%)	16 (41)	30 (59)	0.10
BMI (kg/m²)	23.5 ± 2.0	24.9 ± 3.4	0.16
Smoking (%)	10 (25)	23 (45)	0.11
Systolic BP (mmHg)	114 ± 11	123 ± 12	0.05
Diastolic BP (mmHg)	67 ± 9	72 ± 10	0.09
HR (bpm)	71 ± 12	71 ± 11	0.95
DM Treatment (%)			
Diet Tx	-	4 (8)	
OHA	-	39 (76)	
Insulin	-	8 (16)	
DM duration (yr)	-	7.0 ± 5.4	
HbA1c	-	8.4 ± 2.1	

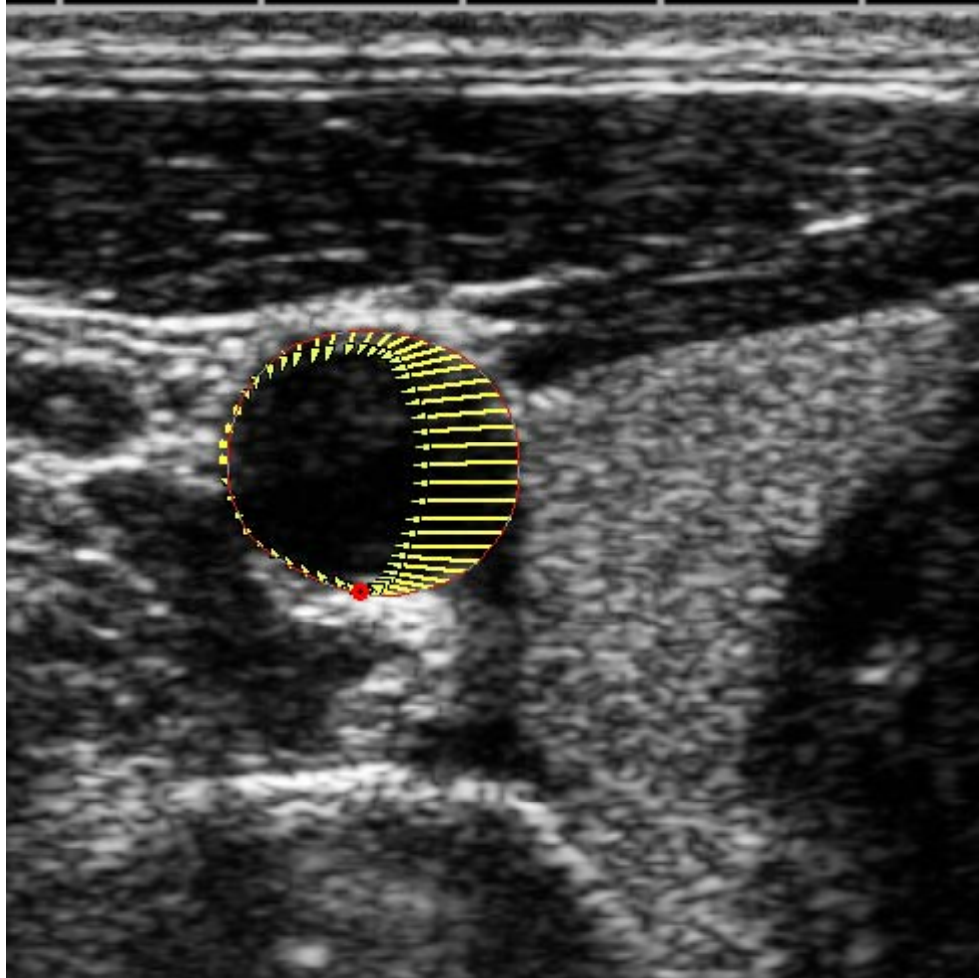
IMT and aortic stiffness

	Control (n=38)	DM (n=51)	p value
IMT (mm), average	0.69 ± 0.13	0.69 ± 0.09	0.97
FAC (%)	10.2 ± 3.5	7.4 ± 3.0	0.002
Radial velocity (mm/s)	0.7 ± 0.4	0.4 ± 0.4	0.05
Circumferential strain (%)	2.8 ± 1.6	1.7 ± 1.1	0.01
Circumferential strain rate (1/s)	0.17 ± 0.10	0.10 ± 0.09	0.01

Normal

BP 110/60 HR 74

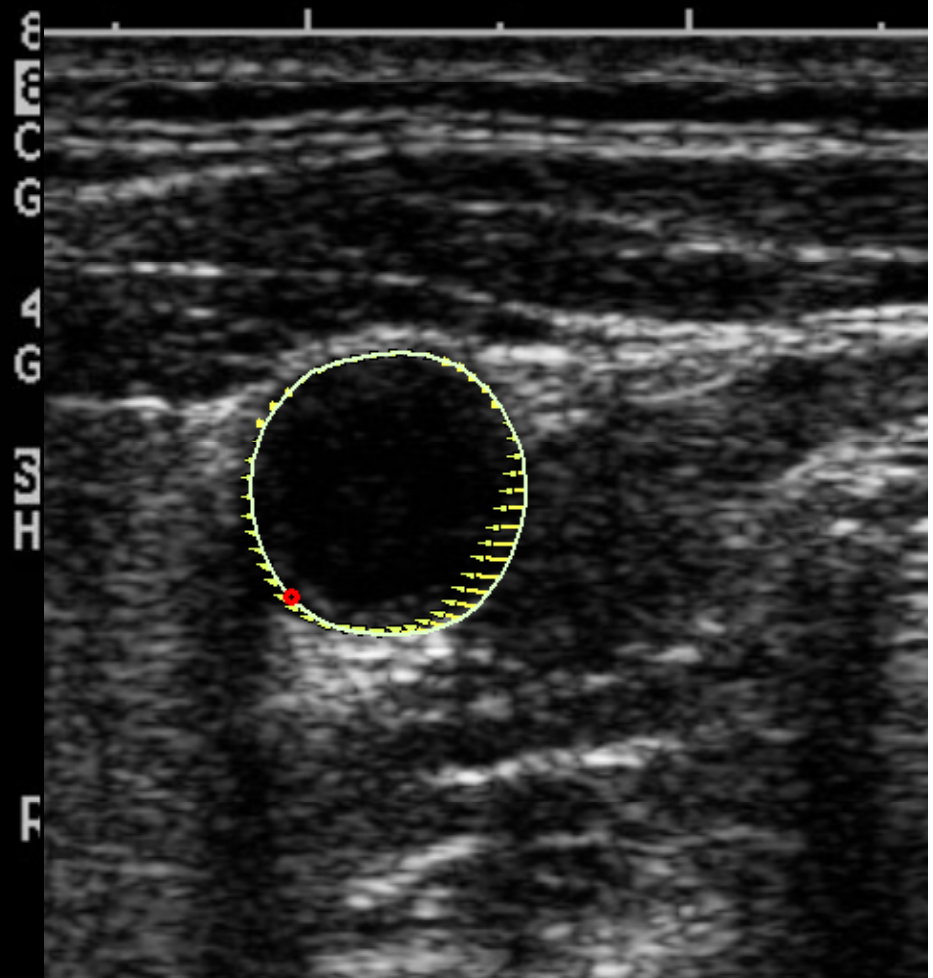
1 ms. (74 bpm)



DM

BP 130/70 HR 64

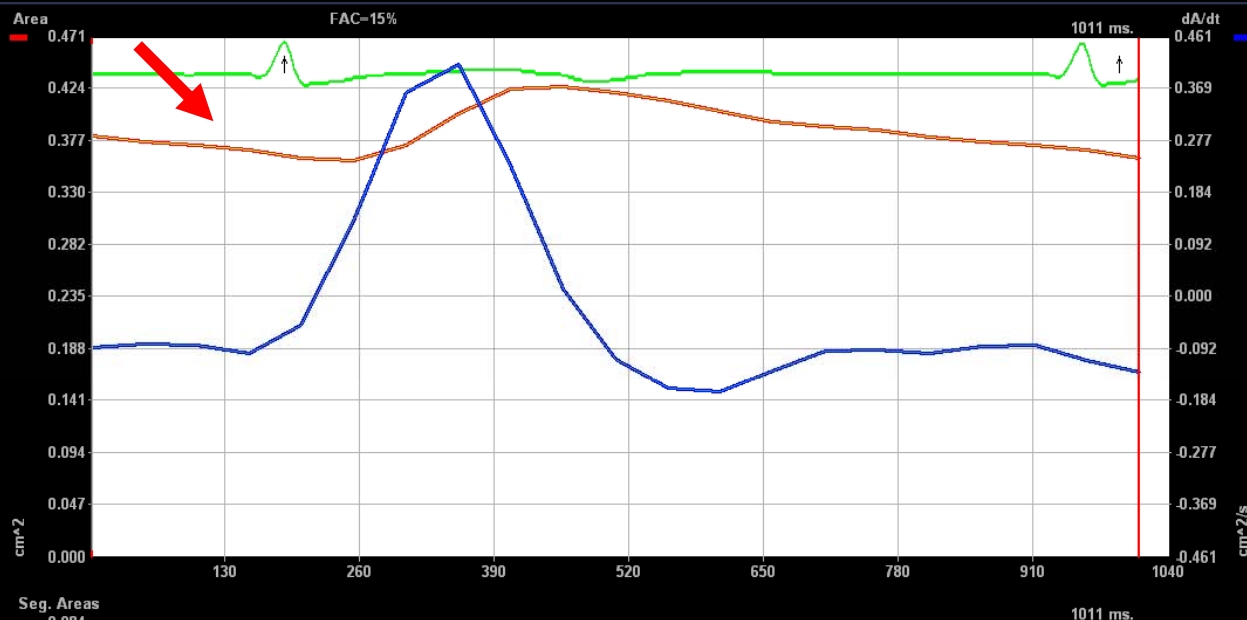
20 ms. (64 bpm)



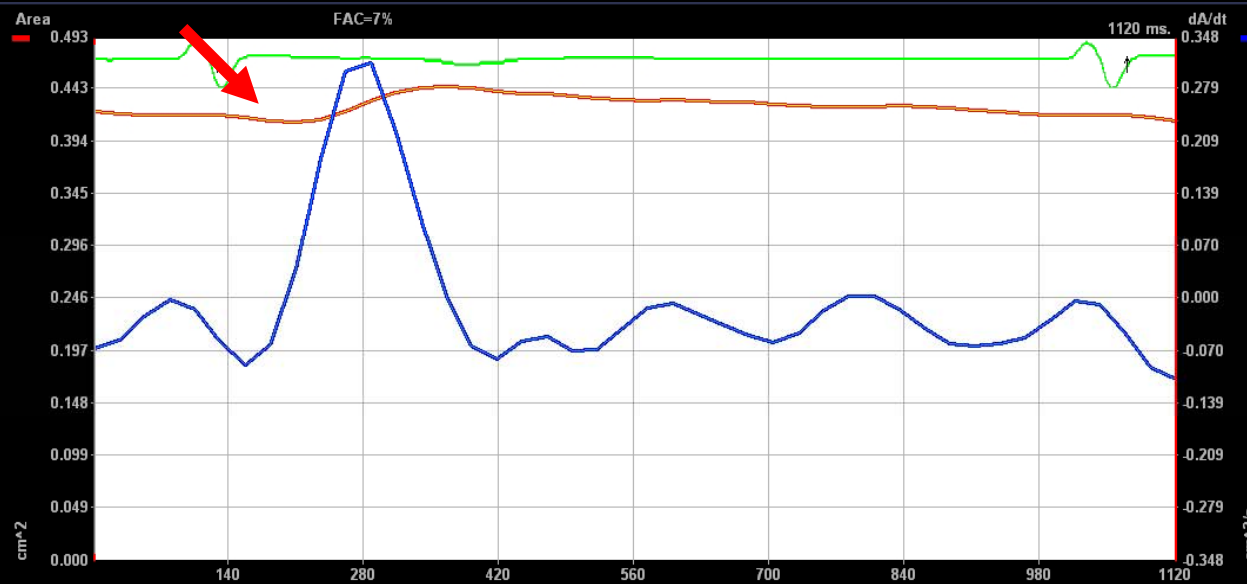
Fractional area change (FAC, %)



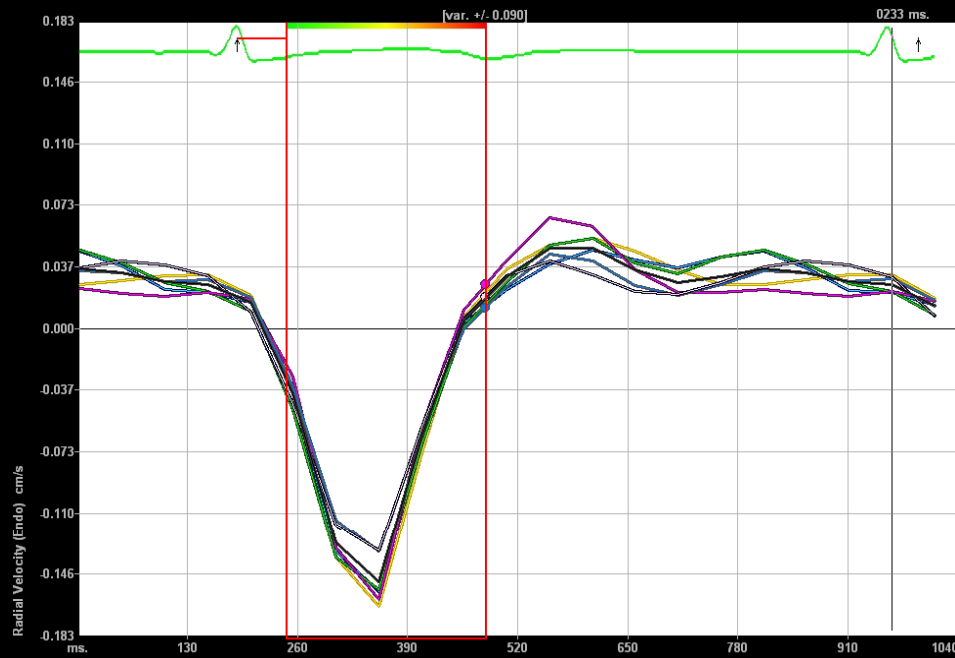
Normal
FAC = 15%



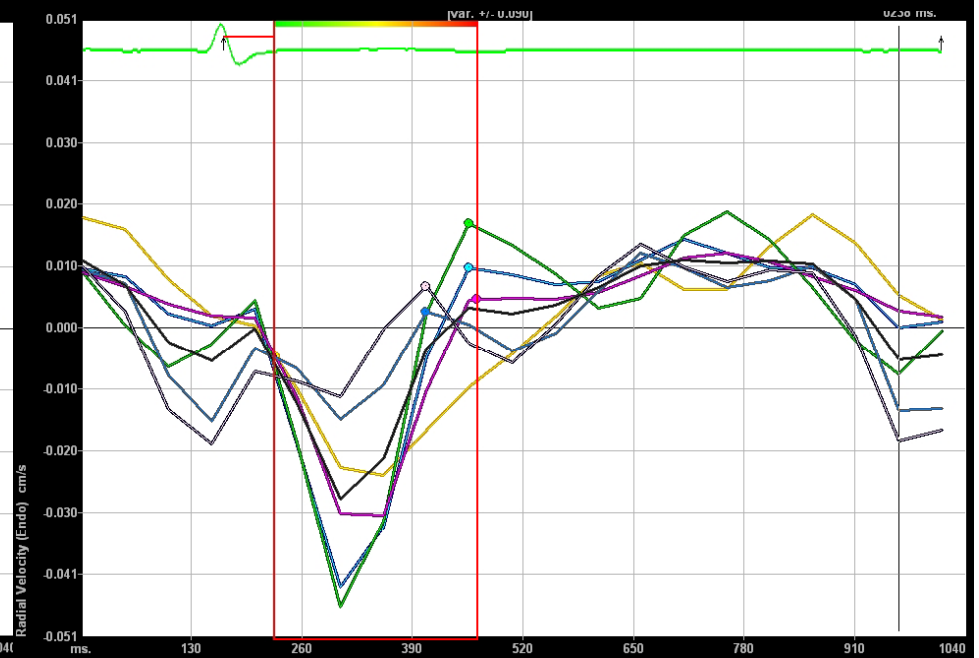
DM
FAC = 7%



Radial velocity (cm/s)

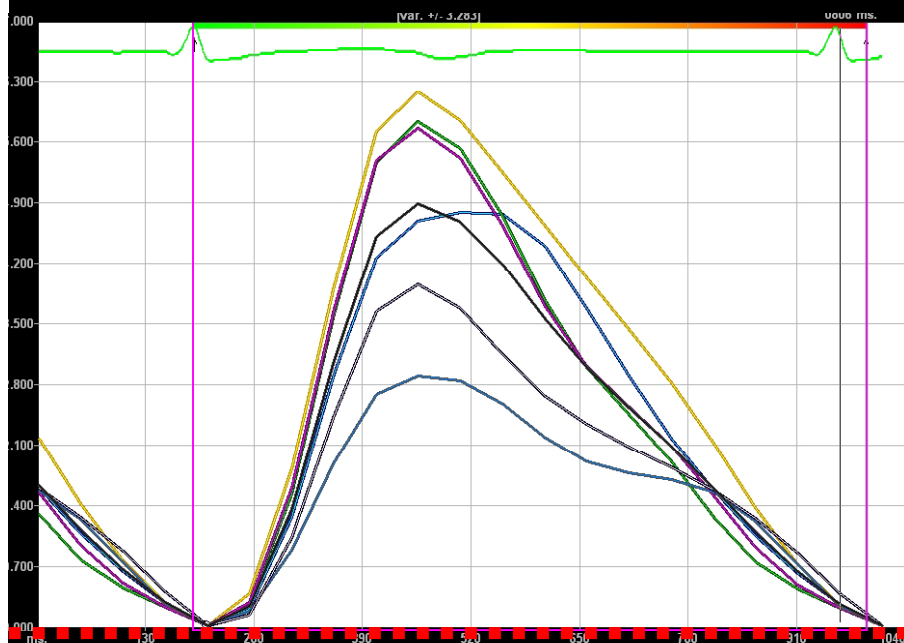


Normal

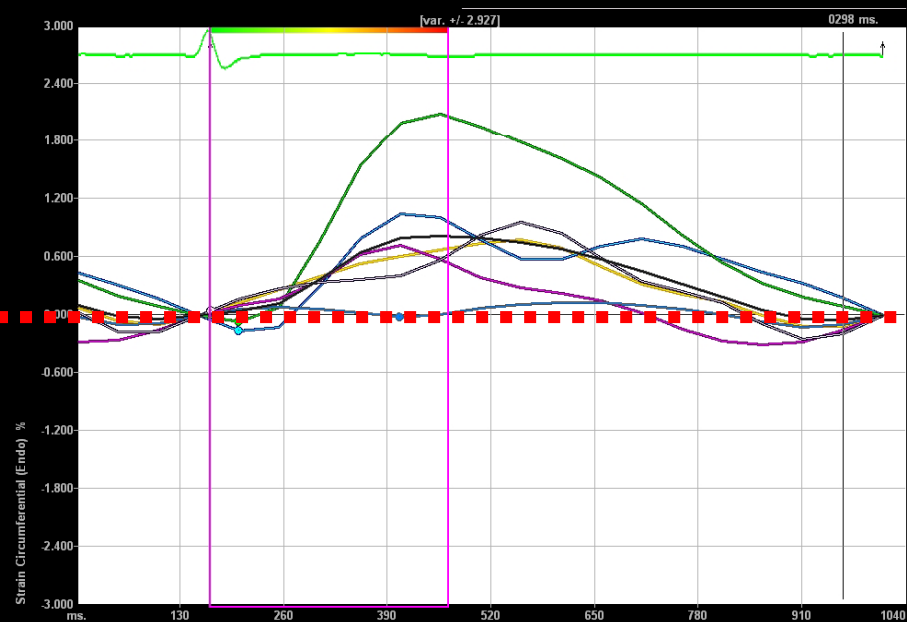


DM

Circumferential strain (%)

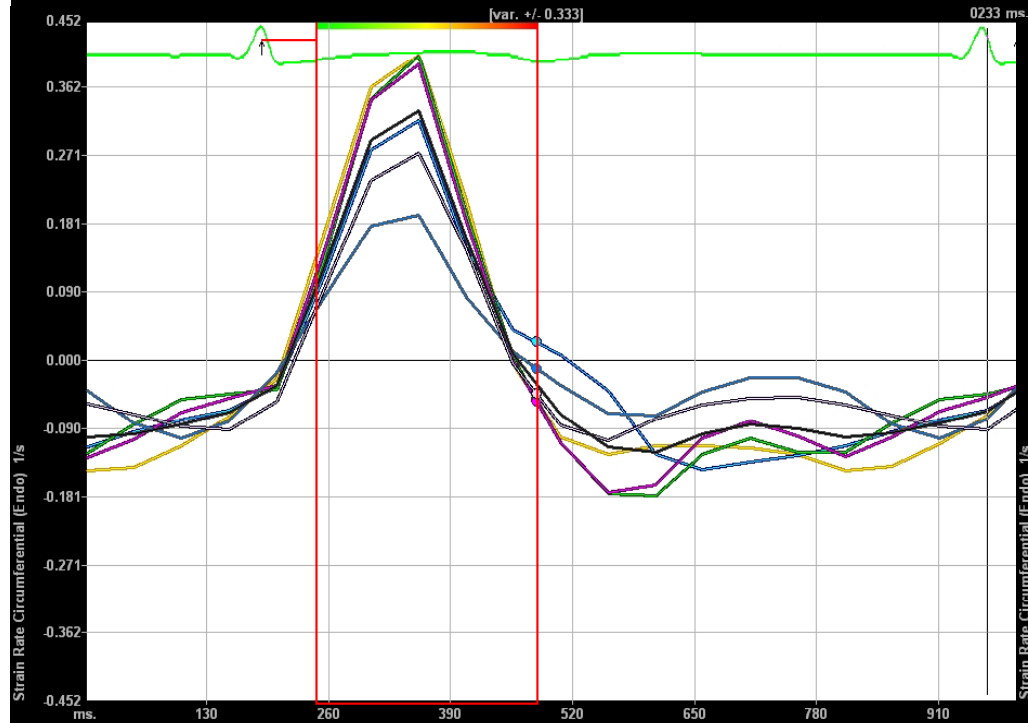


Normal



DM

Circumferential strain rate (1/s)



Normal

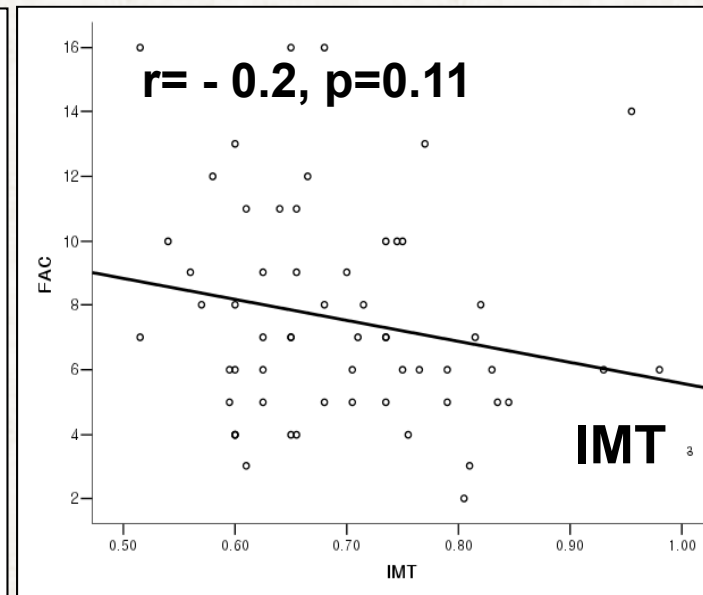
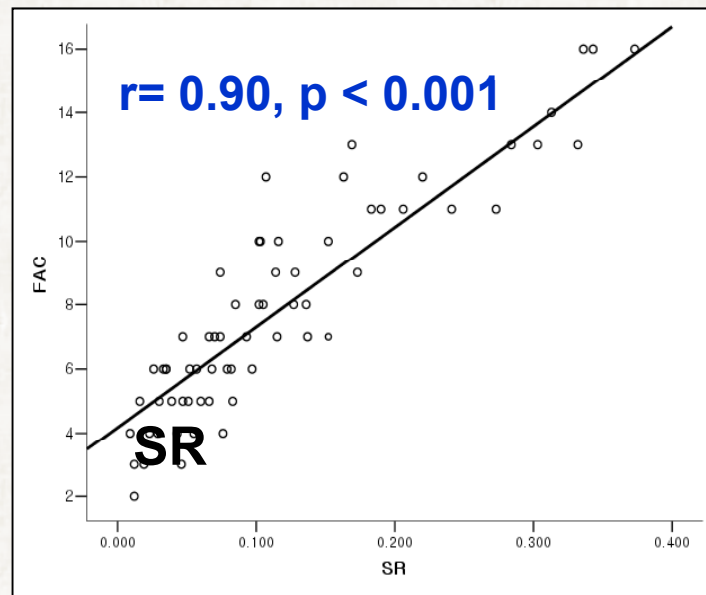
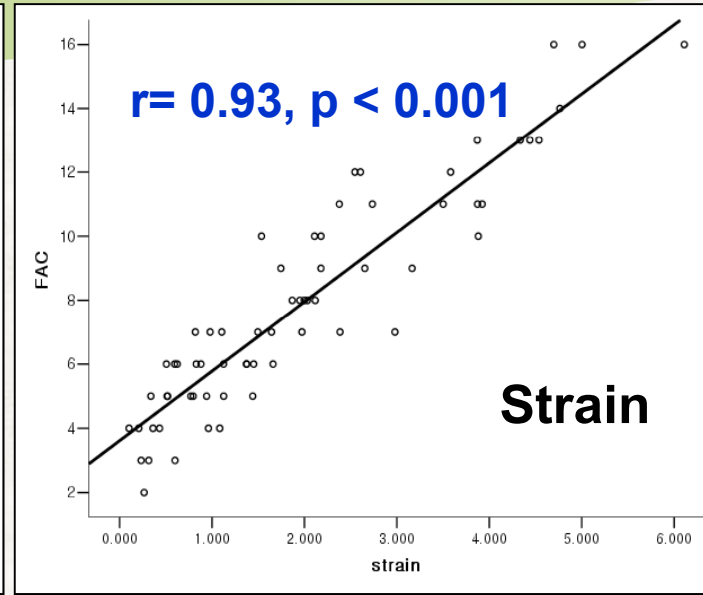
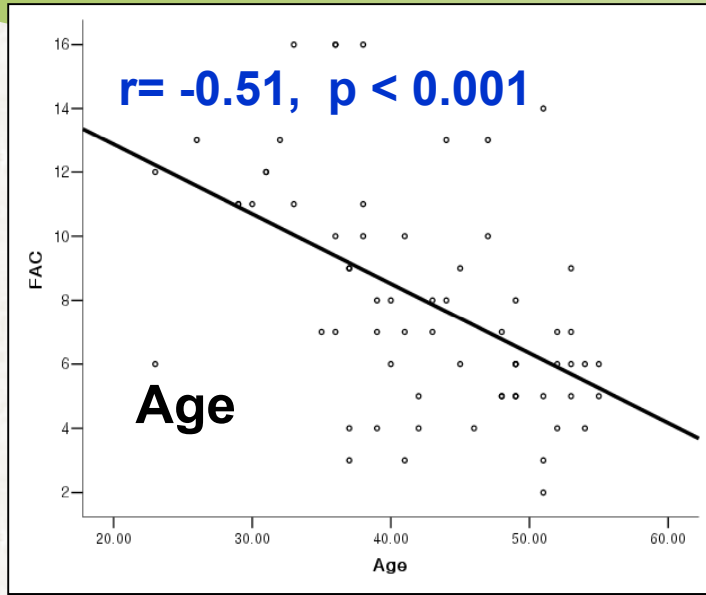


DM

Determinant of aortic stiffness for prediction of diabetic patients

	HR	95% CI	p-value
Systolic BP	0.98	0.91-1.06	0.64
Diastolic BP	1.05	0.99-1.12	0.08
Heart rate	0.95	0.89-1.01	0.13
Smoking	2.11	0.54-8.16	0.27
FAC	0.62	0.46-0.82	0.001
Circumferential strain	1.49	0.49-4.47	0.47
Circumferential SR	0.63	0.05-7.27	0.71

Linear relationships of FAC



Conclusion (1)

- Diabetic patients aged under 50 years with normal IMT even in the absence of hypertension and CAD have a subtle arteriosclerotic change than normal controls
- Increased aortic stiffness in diabetic patients may explain its significant association with CV complications

Conclusion (2)

- Carotid ultrasonogram with VVI provides more elaborate information of aortic elastic properties
- Assessment of aortic stiffness would benefit for screening patients at higher risk for atherosclerotic cardiovascular (CV) disease



경청해 주셔서 감사합니다