3rd International Conference on
Cardiology (Hybrid Event)
November 30- December 01, 2023 | Dubai, UAE
Theme: Exploring New Research and Frontiers in Cardiology Care

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The value of 2D strain in predicting the severity of coronary artery disease in patients with NSTEMI and unstable angina

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Introduction

- 2D stain longitudinal strain is a non-invasive and sensitive parameter of myocardial function.
- Abnormalities can be detected at rest in patients with significant coronary lesions. However, its correlation with the severity of coronary lesions remains to be established.
- The use of 2D strain in the identification and risk stratification of coronary artery disease has good reproducibility and accuracy. Several studies have reported good sensitivity of 2D strain imaging at rest for early detection of coronary artery disease and prediction of its severity, even in the absence of abnormal segmental kinetics and normal left ventricular ejection fraction (LVEF) at baseline.

The aim of the study

- Our aim in this study was to evaluate the ability of strain to predict the severity of coronary artery disease in patients with NSTEMI and unstable angina, by assessing correlations with established prognostic parameters, and to predict culprit and occluded coronary arteries (CA) from regional strain (SLR).
- Secondly, to prove that, in the absence of an alteration in LVEF, the resting LMS made it possible to distinguish tri-tuncular and left main tunc damage from mono-truncular or bi-truncular damage.

Materials and methods

- We conducted a prospective, longitudinal, evaluative study between January 2023 and May 2023 in the cardiology department of the Ibn Rochd Hospital- Morocco .
- In this study, we compared data from 30 patients, 23 patients with NSTEMI and 7 patients with unstable angina.
- We then performed a global and regional longitudinalł2D strain and coronary angiography, which enabled us to classify our patients into 3 groups:

➢ Group of 13 patients with tri-truncular lesions

➢ group of 5 patients called the left main trunc stenosis group (defined on coronary angiography by a significant lesion ≥ 50% of the left main trunc) and

➢ Group of 12 patients with significant (≥ 70%) mono- or bi-truncular lesions of the other major epicardial arteries, known as the "control" group.

The value of 2D strain in predicting the severitý of coronary artery disease in patients with NSTEMI and unstable angina.

Total participants

- ✓ 23 Patients with NSTEMI
- ✓ And 7 patients with instable angina

le strain Global et Regional + coronarography

Severe coronary lesions

Tree vessels (13 patients)

LMT (5 patients)

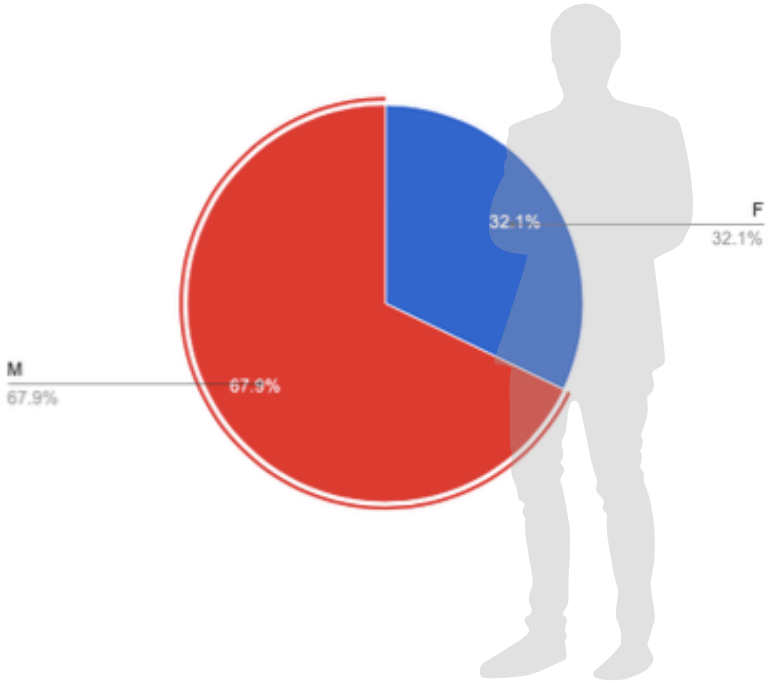
Control groupe (12 patients)

(mono-bitroncular)

LMT : left main trunc

POPULATION OF THE STUDY

- The study participants were predominantly male, with a rate of 67.9% (n/N=19/30), compared with 28% (n/N=11/30) who were female.
- The average age of the participants was 62 years, with extremes ranging from 81 years.



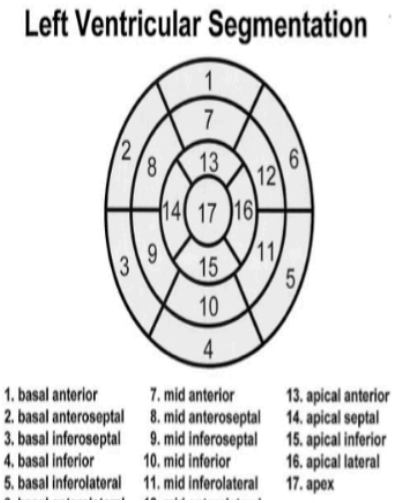
inclusion and exclusion criteria

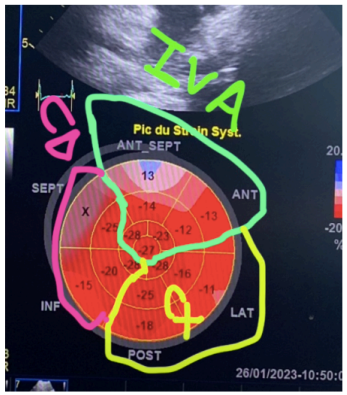
- INCLUSION CRITERIA :
- Normal LVEF
- Unstable angina
- NSTEMI

- EXCLUSION CRITERIA :
- History of MI, PCI or (CABG), STEMI syndrome, SCC LVEF < 50%.
- congestive heart failure, haemodynamic instability, Significant intercurrent pathologies that may interfere with the strain study We excluded from the "control" group the association of tight stenoses of the proximal IVA and proximal CX that could lead to confusion on the pathophysiological level with those of the LMT.

HOW THE STUDY WAS CONDUCTED

- ETT was performed on admission using a general electric ViVid S60N, equipped with a 2.5-5 MHz transducer and an M5s matrix probe under electrocardiographic recording.
- acquisitions were made in 2D loops and using colour and spectral Doppler data and apical incidences (4, 2, and 3 cavity slices). Using standard echocardiography, we studied segmental parietal kinetics based on the standard segmentation established by the latest recommendations of American and European learned societies into 17 segments.





: La segmentation du 2D strain selon le modèle à 17 segments,

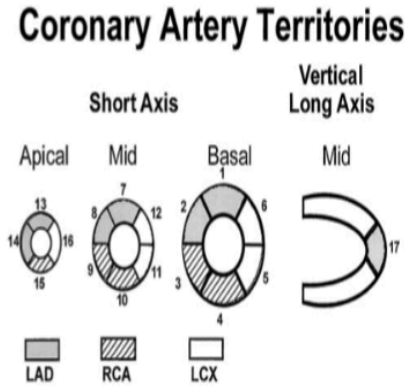
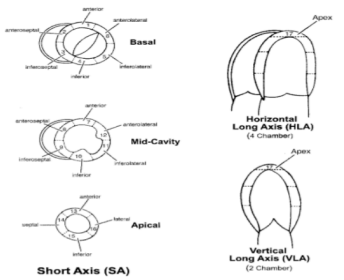


Figure 5. Assignment of the 17 myocardial segments to the territories of the left anterior descending (LAD), right coronary artery (RCA), and the left circumflex coronary artery (LCX). Modified from reference 5.

are assigned to the left anterior descending coronary artery distribution. Segments 3, 4, 9, 10, and 15 are assigned to the right coronary artery when it is dominant. Segments 5, 6, 11,



Results

Tableau 1 : Données générales de la population d'étude.

	Tri-tronculaire	TCG	Groupe contrôle	
			Bi-tronculaire	Mono-tronculaire
Participants (n/N)	13	5	4/12	8/12
NSTEMI	10	5	3	5
Angor instable	3	0	1	3
Sexratio (M/F)	8/5	5/0	1/3	5/3
Age moyen	61.3	63.2	62	60
Diabète	6	2	0	2
HTA	8	4	3	6
Tabac	2	3	1	2
Dyslipidémie	2	3	1	2
Antécédent d'angor stable	2	1	2	2

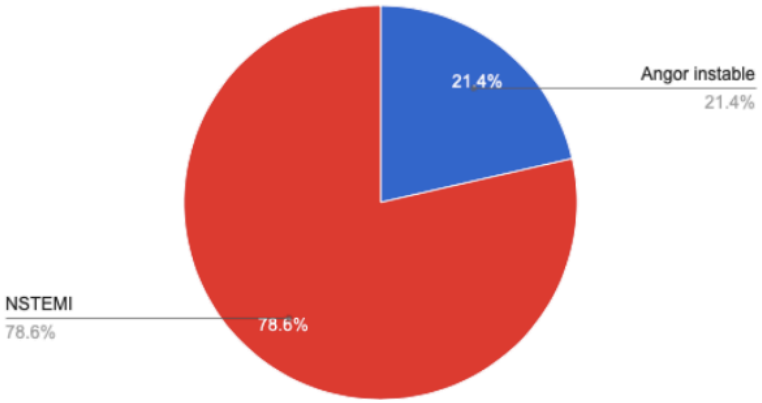


Figure n°1 : La présentation clinique des participants

	Tri-troncular	LMT :	Controle Groupe	
			Bi-troncular	Mono-troncular
Participants (n/N)	13/30	5/30	4/30	8/30
NSTEMI	10	5	3	5
Instable angina	3	0	1	3
GLS Average %	-15.9	-16.63 %	-22	-24.3
WMSI global n/N	6/17	7.7/17	4/17	2/17
RLS LAD %	-14.6	-14.1	-27.5	-25
WMSI LAD n/N	2.6/7	3.2/7	1.5/7	0.4/7
RLS CX%	-14.8	-15.32	-20	-28.5
WMSI CX n/N	2.3/5	2.4/5	0.75/5	0.2
RLS RCA %	-18.7	-22	-21	-27
WMSI RCA n/N	1/5	1/5	2.5/5	1.2/5

Résultats

GLS : Global longitudinal strain
RLS : Regional longitudinal strain
The Number of global segments is 17
The Number of IVA segments is 7
The Number of CX and CD segments is 5

Discussion

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Review > BMC Med Imaging. 2015 Jul 25;15:25. doi: 10.1186/s12880-015-0067-y.

Diagnostic accuracy of left ventricular longitudinal function by speckle tracking echocardiography to predict significant coronary artery stenosis. A systematic review

Ingvild Billehaug Norum [1 2], Vidar Ruddox [3 4], Thor Edvardsen [5 6], Jan Erik Otterstad [7]

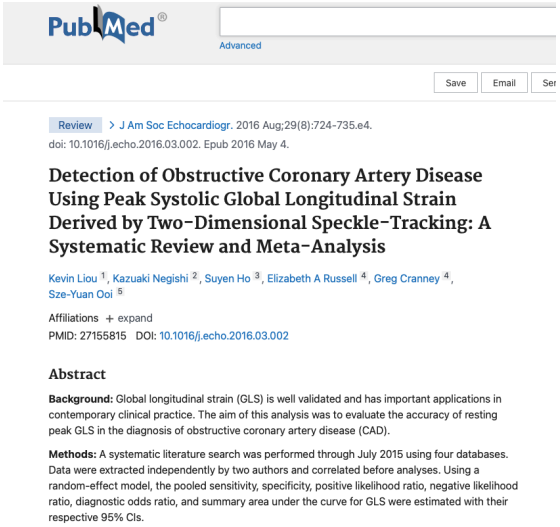
Affiliations + expand

PMID: 26204938 PMCID: PMC4513709 DOI: 10.1186/s12880-015-0067-y

Free PMC article

Abstract

Background: Patients evaluated for acute and chronic chest pain comprise a large, heterogeneous group that often provides diagnostic challenges. Although speckle tracking echocardiography (STE) has proved to have diagnostic value in acute coronary syndrome it is not commonly incorporated in everyday practice. The purpose of the present systematic review was to assess the diagnostic accuracy of left ventricular (LV) longitudinal function by STE to predict significant coronary artery stenosis (CAD+) or not (CAD-) verified by coronary angiography in patients with chest pain suspected to be of cardiac ischemic origin.



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Review > J Am Soc Echocardiogr. 2016 Aug;29(8):724-735.e4.

doi: 10.1016/j.echo.2016.03.002. Epub 2016 May 4.

Detection of Obstructive Coronary Artery Disease Using Peak Systolic Global Longitudinal Strain Derived by Two-Dimensional Speckle-Tracking: A Systematic Review and Meta-Analysis

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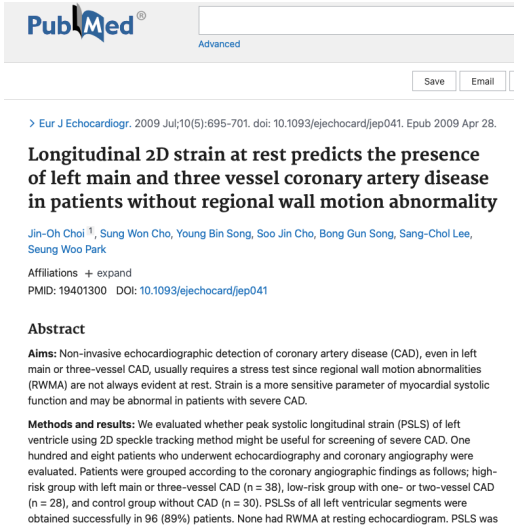
Affiliations + expand

PMID: 27155815 DOI: 10.1016/j.echo.2016.03.002

Abstract

Background: Global longitudinal strain (GLS) is well validated and has important applications in contemporary clinical practice. The aim of this analysis was to evaluate the accuracy of resting peak GLS in the diagnosis of obstructive coronary artery disease (CAD).

Methods: A systematic literature search was performed through July 2015 using four databases. Data were extracted independently by two authors and correlated before analyses. Using a random-effect model, the pooled sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, diagnostic odds ratio, and summary area under the curve for GLS were estimated with their respective 95% CIs.



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> Eur J Echocardiogr. 2009 Jul;10(5):695-701. doi: 10.1093/ejechocard/jep041. Epub 2009 Apr 28.

Longitudinal 2D strain at rest predicts the presence of left main and three vessel coronary artery disease in patients without regional wall motion abnormality

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PMID: 19401300 DOI: 10.1093/ejechocard/jep041

Abstract

Aims: Non-invasive echocardiographic detection of coronary artery disease (CAD), even in left main or three-vessel CAD, usually requires a stress test since regional wall motion abnormalities (RWMA) are not always evident at rest. Strain is a more sensitive parameter of myocardial systolic function and may be abnormal in patients with severe CAD.

Methods and results: We evaluated whether peak systolic longitudinal strain (PSLS) of left ventricle using 2D speckle tracking method might be useful for screening of severe CAD. One hundred and eight patients who underwent echocardiography and coronary angiography were evaluated. Patients were grouped according to the coronary angiographic findings as follows; high-risk group with left main or three-vessel CAD (n = 38), low-risk group with one- or two-vessel CAD (n = 28), and control group without CAD (n = 30). PSLSs of all left ventricular segments were obtained successfully in 96 (89%) patients. None had RWMA at resting echocardiogram. PSLS was

- Several studies have reported the ability of 2D strain for the prediction and assessment of the extent of myocardial ischaemia .A meta-analysis by norum and his group and more recently that by Keven lior his group , having colligatedŁQ0 studies including 1385 patients support the value of resting LMS as an early marker of myocardial ischaemia, predicting intermediate to tight coronary lesions in symptomatic patients.

- Also , More specifically, our results are corroborated by those published by Choi Jo. His group; who evaluated LV LMS in the screening of patients with high-risk coronary artery disease defined by the presence of a TCG lesion or tritronvascular presence of a TCG lesion or tritruncal involvement .

Conclusion

- GLR and SLR are sensitive markers for early detection of myocardial ischaemia and prediction of its severity. A resting GLR threshold of less than -16.13%, despite its subnormal nature, should attract attention and raise suspicion of coronary artery disease with severe tri-truncular or LMT damage, especially when there are concomitant WMSI score abnormalities. This alteration in 2D strain parameters precedes the subjective abnormalities in segmental kinetics, which were often considered normal at rest.