ORIGINAL ARTICLE

Tunisia's Heartbeat : Pioneering Isotopic Techniques in Cardiac Viability Among Resource Challenges

Au cœur de la Tunisie : Des techniques isotopiques innovantes pour l'évaluation de la viabilité myocardique dans un contexte de ressources limitées

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Abstract

Introduction: In Tunisia, where healthcare resources are often limited, nuclear imaging techniques are revolutionizing cardiac care. They provide critical information on myocardial perfusion, contractile function, and metabolic processes, transforming the ischemic heart disease management. **Aim:** This study explores the essential role of isotopic examinations in assessing myocardial viability and evaluates their impact on therapeutic decision-making.
Methods: A prospective descriptive and analytical study was conducted on 40 patients for whom myocardial viability studies were indicated. All patients underwent isotopic examinations and coronary angiographies performed between January 2022 and June 2023.
Results: Myocardial viability scintigraphy (MVS) showed that 62.5% of myocardial territories were non-viable, while 37.5% were hibernating. These results perfectly matched those obtained by 18FDG PET-CT. MVS proved to be a highly reliable tool that significantly influenced therapeutic decisions. Revascularization was indicated in 40% of patients with viable myocardium, while medical treatment was prescribed for all patients with non-viable myocardium. During a follow-up period, a significant improvement in left ventricular ejection fraction (LVEF) was observed in the group of patients with hibernating myocardium treated with revascularization compared to those treated medically (p=0.02). Additionally, non-viable group had a higher mortality rate (12%) compared to viable group (6.7%). Survival rates were better in the group with viable lesions (93% vs 85%). **Conclusions**: This is the first prospective study conducted in Tunisia assessing the contribution of isotopic examinations in evaluating myocardial viability. The diagnostic value of MVS is comparable to metabolic imaging. Furthermore, nuclear imaging techniques can influence therapeutic management and provide information on long-term prognosis.
Key words: Myocardial scintigraphy, PET-CT, 18FDG, viability, ischemic heart disease, revascularization.

Résumé

Problématique et intérêt : Au cœur de la Tunisie, où les ressources sanitaires sont souvent limitées, les techniques d'imagerie nucléaire telles que la scintigraphie de perfusion myocardique au MIBI et le PET au 18FDG révolutionnent la prise en charge cardiaque. Ces méthodes avancées fournissent des informations essentielles sur la perfusion myocardique, la fonction contractile et les processus métaboliques, transformant ainsi le paysage de la prise en charge de la cardiopathie ischémique.
Objectifs : Cette recherche explore le rôle primordial des explorations isotopiques dans l'évaluation de la viabilité myocardique et analyse leur impact majeur sur la prise de décision thérapeutique et le pronostic des patients. En mettant en lumière les défis et opportunités spécifiques rencontrés en Tunisie, cette étude souligne le potentiel transformateur de ces techniques dans l'élaboration de stratégies thérapeutiques personnalisées et l'amélioration du pronostic à moyen terme dans un contexte de ressources limitées.
Méthodes : Il s'agit d'une étude prospective, descriptive et analytique menée auprès de 40 patients pour lesquels une étude de viabilité myocardique était indiquée. Tous les patients ont bénéficié d'explorations isotopiques et de coronarographies réalisées dans les services de médecine nucléaire et de cardiologie du CHU Sahloul de Sousse sur une période de 18 mois, entre janvier 2022 et juin 2023.
Résultats : La scintigraphie de viabilité myocardique a conclu à 62,5 % de territoires myocardiques non viables contre 37,5 % de territoires myocardiques hibernants. Ces résultats concordaient parfaitement avec ceux obtenus par le PET-CT au 18FDG, permettant de conclure que la valeur diagnostique de la scintigraphie de viabilité myocardique est comparable à celle de l'imagerie métabolique. La scintigraphie myocardique s'est révélée être un outil hautement fiable influençant de manière significative la décision thérapeutique. En effet, sur la base des résultats fournis, une revascularisation a été indiquée chez 40 % des patients présentant un myocarde viable, tandis qu'un traitement médical a été adopté pour tous les patients présentant un myocarde non viable. Lors d'un suivi de 13,3 ± 2,8 mois, une amélioration significative de la FEVG a été observée dans le groupe de patients ayant un myocarde hibernant traité par revascularisation, comparativement à ceux traités médicalement (p = 0,02). Par ailleurs, le groupe non viable présentait un taux de mortalité plus élevé (12 %) que le groupe viable (6,7 %). Les taux de survie étaient donc meilleurs chez les patients présentant des lésions viables (93 % contre 85 %).
Conclusion : Notre étude représente la première étude prospective menée en Tunisie ayant évalué la contribution des explorations isotopiques et comparé leurs résultats dans l'évaluation de la viabilité myocardique. Elle conduit à la conclusion que la valeur diagnostique de la scintigraphie de viabilité myocardique est comparable à celle de l'imagerie métabolique. De plus, cette étude démontre que les techniques d'imagerie nucléaire peuvent influencer la prise en charge thérapeutique et fournir des indications sur le pronostic à long terme, notamment en prédisant l'amélioration ou l'absence d'amélioration de la fraction d'éjection ventriculaire gauche (FEVG).
Mots-clés : Scintigraphie myocardique, PET-CT, 18FDG, viabilité, cardiopathie ischémique, revascularisation.

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Introduction

Cardiovascular diseases, particularly ischemic heart disease(IHD), are the leading cause of mortality and morbidity globally (1,2) . In Tunisia, the challenges are exacerbated by limited resources, which require innovative approaches for diagnosis and treatment. IHD compromises blood flow to the heart, often leading to myocardial infarction and chronic heart failure (3) . An accurate assessment of myocardial viability is crucial for tailoring therapeutic strategies, improving patient outcomes, and optimizing healthcare resources (4,5) . Pioneering techniques such as positron emission tomography (PET) and single-photon emission computed tomography (SPECT) have revolutionized the detection and quantification of viable myocardium. In resources-limited settings, these advanced imaging tools provide critical insight into myocardial function and guide revascularization strategies, medical therapy, and other treatment modalities (6) . In Tunisia, our team embarked on a groundbreaking journey to implement and refine these isotopic techniques despite significant resource constraints. This study represents a landmark effort to bridge the gap between technological potential and practical application, demonstrating that even in low-resource environments, innovative approaches can yield substantial benefits for patient care.

Methods

Patient selection

This is a prospective monocentric study of about 40 patients with descriptive and analytical objectives conducted in the Departments of Nuclear Medicine and Cardiology at Sahloul University Hospital in Sousse, Tunisia, for a period of 18 months from January 2022 to June 2023. Patients included are those who were admitted to viability Cardiology Department with CAD and ischemic RWM abnormalities, for whom a viability myocardial scintigraphy was prescribed during the study period to guide therapeutic decision-making. Only 10 patients underwent ^{18}FDG PET-CT: Age < 65 years with an ejection fraction (EF) < 35% and nonviable lesions (visualized on viability scintigraphy) to identify the hibernating myocardium and consequently provide them with an additional opportunity for revascularization.

Functional evaluation

Before scintigraphy studies and under stable clinical conditions, LVEF was assessed by two-dimensional echocardiography using a Vivid9 cardiac ultrasound machine and determined using the Simpson method (in 2- and four-chamber views).

^{99m}Tc-sestamibi SPECT

The ^{99m}Tc-sestamibi dose was 666 MBq (18 mCi). Our patients underwent myocardial scintigraphy for:

- Viability only (nitrate)
- Viability + rest (Baseline/Nitrate)
- Stress + viability (Stress/Nitrate)
- Stress + rest + viability (Stress / baseline / sodium)

For the Nitrate enhanced study, patients received 10 mg of isosorbide dinitrate sublingually. 15 minutes later, ^{99m}Tc-sestamibi was injected. Imaging was performed 1 h after injection. SPECT acquisition was performed with patients in the supine position using a double-headed rotating gamma camera with a high-resolution and parallel-holed collimator. The tomographic reconstruction was performed using iterative reconstruction with flash 3D (number of iterations =8, subsets =4).

^{18}FDG PET

The protocol used follows the guidelines for the American Society of Nuclear Imaging (7) . The patients fasted for at least 6 hours before the test and then received a glucose load to improve the uptake of FDG by the myocardium. Blood glucose levels were checked:
- If fasting glucose > 2.5 g/L : No additional glucose was administered.
- If fasting glucose < 2.5 g/L and the patient was diabetic: 25-50 g of glucose was administered orally, with glucose monitoring.
- If fasting glucose < 2.5 g/L and the patient was non-diabetic: 50 to 100 g of glucose were administered orally.

The carbohydrate load was administered 60 minutes prior to FDG injection, followed by intravenous insulin if needed (Table 1). IV insulin was recommended to maximize the absorption of FDG by the myocardium. FDG was injected at a dose of 3 MBq/kg.

Table 1. Guidelines for blood glucose maintenance (e.g., after oral glucose administration)

BG at 45-90 minutes after administration	Possible restorative measure
130-140 mg/dL (7.22-7.78 mmol/L)	1U regular insulin IV*
140-160 mg/dL (7.78-8.89 mmol/L)	2U regular insulin IV
160-180 mg/dL (8.89-10 mmol/L)	3U regular insulin IV
180-200 mg/dL (10-11.11 mmol/L)	5U regular insulin IV
>200 mg/dL - (>11.11 mmol/L)	Notify physician

BG at 45-90 minutes after administration, Possible restorative measure
BG = blood glucose
IV = intravenous
U = unit
*Optional, may consider if total amount of insulin administered is low.
*Data Analysis : Nuclear Data and Viability definition

Data analysis

For each imaging modality, an identical 17-segment model was used dividing the LV (8) into six basal, six midventricular, four distal segments, and the apex. We opted for a semiquantitative 5-point scoring system. This system allows for a reproducible and objective semiquantitative assessment of the severity and extent of defects. Points are assigned to each segment in direct proportion to the perceived counting density of the segment.

- Normal perfusion : 0
- Mild hypoperfusion - not definitively abnormal : 1
- Moderate hypoperfusion - definitely abnormal : 2
- Severe hypoperfusion : 3
- Absence of uptake : 4

For patients who underwent cardiac 18FDG PET, we compared the FDG uptake to the uptake of the perfusion radiotracer uptake in SPECT (Sestamibi) . Several situations within the altered myocardium:
-Normal FDG uptake associated with normal perfusion.
-Normal or increased FDG uptake associated with hypoperfusion 'mismatch', reflecting a viable or hibernating myocardium.
-Decreased FDG uptake parallel to hypoperfusion match, representing irreversibly damaged myocardium.

Follow up assessment

We divided our 40 patients into viable and nonviable groups based on scintigraphic results, then further categorized them into revascularization or medical treatment subgroups. After 12 months, we assessed changes in global left ventricular EF using echocardiography and monitored cardiac events such as acute coronary syndromes and presentation of heart failure. The patients were contacted by phone and reported their subjective judgment of anginal symptoms according to the classification of the Canadian Cardiovascular Society (CCS) classification(9) and heart failure symptoms according to the New York Heart Association (NYHA)(10). The hospital records were reviewed if further admissions were reported. The study protocol was approved by our institution's Ethics Committee and informed consent was obtained from each patient.

Results

Patient baseline data

Forty patients (30 men, mean age 62.73 ± 6.8 years) were recruited. Table II summarizes their characteristics, including 50% active smokers and 57.5% with a family history of coronary disease. Among them, 75% had a history of ischemic heart disease; 22 underwent angioplasty. Chest pain prompted 42.5% of consultations. Table III outlines the findings : 55% had negative T waves, 42.5% had necrosis Q waves. The mean LVEF was 40.95 ± 12.57%, with 27 patients showing a reduced LVEF. Thirty-six had segmental kinetic abnormalities on echocardiography. Triple vessel disease occurred in 57.1% of cases, with LAD stenosis/occlusion in 55%.

Scintigraphic results

For three patients, viability scintigraphy showed homogeneous perfusion with indirect signs of LV dysfunction (increased uptake in the right ventricular and dilation of the LV) due to balanced triple vessel disease. Thirty-seven patients had abnormal viability scintigraphy (hibernating or nonviable territory). Out of a total of 680 segments studied: 480 were strictly normal (70.6%), 123 segments (18.1%) were deemed nonviable, and 77 segments (11.3%) were considered hibernating territory.

Table 2. Demographic and Clinical Characteristics of the Study Population.

Population	**N= 40**
Age (year)	62,73 [±6,8] [50-76]
Gender (M/F)	30/10
Cardiovascular risk factors:	
Tobacco use	20(50%)
Diabetes	22(55%)
HTA	21(52,5%)
Dyslipidemia	12(30%)
Coronary hereditary	23(57,5%)
Obesity	14(35%)
Medical history :	
Ischemic heart disease	30 (75%)
Revascularization	23 (57,5%)
Angioplasty	22(55%)
Coronary Artery Bypass Grafting (CABG)	1(2,5%)
Heart failure:	5(12,5%)
- Impaired LVEF	4(10%)
- Preserved LVEF	1(2,5%)
Reasons for consultation :	
Chest pain	17(42,5%)
- CCS I	1(6,9%)
- CCS II	9(53%)
- CCS III	4(23,5%)
- CCS IV	3(17,6%)
Dyspnea	6 (15%)
- NYHA I	0
- NYHA II	3(50%)
- NYHA III	2(33,3%)
- NYHA IV	1(16,7%)
Chest pain+Dyspnea	13(32,5%)
Diagnostic retenu :	
Stable angina	14(35%)
NSTEMI	9(22%)
STEMI	7(17%)
Heart failure	5(13%)
STEMI complicated by ventricular fibrillation (VF)	3(8%)

Positron emission tomography (PET) Imaging

Ten patients underwent PET examinations. Of the 170 segments studied, 126 (74.1%) were viable and 44 (25.9%) were non-viable.

Comparison of myocardial viability study by SPECT and PET

- Overall concordance: The overall concordance between the PET and SPECT results is presented in Table IV. Out of the 170 segments examined, we identified 103 segments as normal, 14 as viable, and 42 as nonviable using both techniques, totaling 159 out of 170 segments with a similarity percentage of 93.5%. Four segments were classified as nonviable by SPECT but viable by PET, while only two segments were classified as viable by SPECT but non-viable by PET.
- Segment-by-segment concordance: Concordantly non-viable segments were mainly located in the apical cap with a kappa index between 0.8 and 1 for the apex, antero-apical, septo-apical and infero-basal

and infero-latero-basal (k=0.8, p<0.001) , reflecting a high proportion of apical infarcts among the patients included in the study.

• Segment-wise discordance: Of the 6 discordant segments, SPECT underestimated viability in 4 segments (based on PET), while overestimation occurred in 2 segments. Viable segments by SPECT were mainly in the basal part of the septal wall, while nonviable segments typically involved the antero-septal and lateral walls, including the apical lateral, mid-anterolateral, and mid inferolateral segments.

Table 3. Supplementary Examination Data

ECG :	
Sinus rhythm	39(97,5%)
Q waves	17(42,5%)
- Anterior	4 (10%)
- Inferior	8(20%)
- Lateral	5(12,5%)
Negative T waves	22(55%)
- Anterior	8(20%)
- Inferior	7(17,5%)
- Lateral	7(17 ,5%)
ETT :	
LVEF	
- Average (%)	40,95±12,57
- Reduced	27(67,5%)
Kinetic abnormalities	
- Akinesia	18(45%)
- Hypokinesia	32(80%)
- Dyskinesia	2(5,5%)
Coronary angiography:	29(72,5%)
- Triple vessel disease	16(57,1%)
- Double vessel disease	6(21,4)
- Single vessel disease	6(21,4)
Territoire :	
- Left anterior descending artery (LAD)	22(55%)
- Right coronary artery (RCA)	14(32,5%)
- Left circumflex artery (LCX)	12(30%)

Table 4. Distribution of normal, viable, and non-viable segments according to viability criteria of PET and SPECT.

SPECT	**PET**			**Total**
	Normal	**Mismatch**	**Match**	
Normal	103	0	0	103
Viable	3	14	2	19
Non viable	2	4	42	48
Total	108	18	44	170

Therapeutic Decision and Patient Follow-up

• Therapeutic Decision: Among the 15 patients with hibernating territories: 9 patients were placed on medical treatment and 6 patients underwent coronary angioplasty revascularization. All patients with non-viable lesions (25) received medical treatment.

- Patient Follow-Up: The average duration of follow-up was 13.3±2.8 months after myocardial viability. For clinical Follow-Up in Patients Undergoing Myocardial Revascularization After Viability Test, after 12 months, 80% of the patients were in the CCS I/II and NYHA I/II classes, and 83% reported improved or stable heart failure symptoms. Only one patient was readmitted for ST+ ACS and received emergency coronary revascularization. There were no cardiac deaths in this group. For the follow-up in patients placed on Medical Treatment After Myocardial Viability Testing, nine patients reported improvement or stability of their symptoms (transition from NYHA/CCS 3 to 2 or 1 at 6 months) . Only one patient was readmitted after 3 months for ST-TROP+ ACS. A cardiac death was reported. For the clinical Follow-Up in Patients with Non-Viable Lesions Treated Medically, eighteen patients reported an improvement or stability in their heart failure symptoms. Two patients reported worsening of dyspnea: transition from NYHA and CCS scores of 2 to 3 after the sixth month. Major cardiac events occurred in 20% of this subgroup. Two patients were readmitted: The first was readmitted three times (at 3 months, 6 months, and 1 year) for heart failure, and the second one was readmitted after 1 year for ST+ ACS. Three deaths were reported: First, he died after 6 months of ST + ACS complicated by ventricular fibrillation, the second patient after 10 months from ST+ ACS, and the third, he died after one year from heart failure.

Viability and survival

There is a difference in the occurrence of cardiac events during follow-up between the nonviable group (n=5) and the viable group (n=3), but it is not statistically significant (p=0.4). Similarly, within the viable group, there is a difference in the rate of occurrence of events between those treated medically (33.3%) versus those treated with revascularization procedures (16.7%), but it is not statistically significant (p=0.4). The non-viable group had a higher death rate (12%) compared to the viable group (6.7%), but this difference was not statistically significant (p=0.6).

Viability and functional status of Patients (NYHA/CCS Scores)

The comparison of the functional status of patients with medically treated viable lesions and those with revascularized viable lesions between baseline and 12 months of follow-up is shown in Table V.

Table 5. Comparison of NYHA and CCS Scores at Baseline and 12 Months of Follow-Up Between Two Treatment Groups.

Viable, Revascularized		**Viable, Medically Treated**		**P value**
NYHA/CCS		NYHA/CCS		0,3
Baseline	12 mois	Baseline	12 mois	
2,33 ±1,03	1,6 ±0,89	2,44 ±1,13	1,20± 0,44	

Viability and LVEF

- Comparison of LVEF between the viable and nonviable groups: The mean LVEF at 12 months of follow-up in the group of patients with viable lesions is (51.23±11.3%), while that in the group of patients with non-viable lesions is (46±9.7%); (p=0.08).
- Compare LVEF between two treatment groups (viable revascularized versus viable medically treated): The average LVEF at 12 months of viable follow-up in the group of revascularized patients is (57.5±5%), while that in the group of medically treated viable patients treated medically is (46.43±13.1%). This difference in meaning is statistically significant (p=0.02).

Discussion

Identifying ischemia compromised regions allows not only the detection of principally reversible myocardial dysfunction but also the identification of patients with a high risk of cardiac events and those who will benefit the most from coronary revascularization. As a result, the use of nitrate-enhanced myocardial imaging has provided a significant prognostic value in patients with coronary artery disease and left ventricular dysfunction, regardless of the study protocols employed. These findings are consistent with those presented in a meta-analysis conducted by Allman et al. involving 24 studies published between 1992 and 1999 and comprising 3,088 patients(11). Follow-up lasted 25 ± 10 months. Revascularization was performed in 35% of the patients, while 65% received medical treatment; 42% showed viability on imaging, 12% of the 3088 patients died. Among those with viability, the annual mortality rate was 16% with medical treatment and 3.2% with revascularization, indicating a reduction in risk of 79.6%. Without viability, annual mortality rates were similar (6.2% with medical treatment, 7.7% with revascularization) . Viability detection techniques justify their use based on improved survival rates. In the same context, the STICHES study (12,13) was designed to examine the potential benefits of coronary artery bypass grafting in patients with severe left ventricular dysfunction. In this prospective randomized study, 10-year outcomes of patients with severe ischemic LV dysfunction (EF < 35%) were evaluated. They were randomly assigned to receive surgical revascularization plus medical treatment or medical treatment alone. Among the 1,212 patients initially included, surgical revascularization significantly reduced cardiovascular and all-cause mortality (-16%) compared to medical treatment alone (p <0.001). Our study had a follow-up of 13.3 ± 2.8 months, 15% undergoing revascularization and 85% receiving medical treatment. 37.5% had imaging suggestions of myocardial viability. In our 13.3 ± 2.8-month follow-up, 15% underwent revascularization, while 85% received medical treatment. 37.5% showed myocardial viability on imaging. Mortality rates were 6.7% in the viable group and 12% in the nonviable group. Among viable patients, no deaths occurred in the revascularized group, compared to one in the medically treated group. These findings emphasize the importance of identifying viable myocardium for treatment decisions and prognosis, which is consistent with previous research.

Assessing myocardial viability via PET is a unique modality due to its ability to evaluate the metabolic activity of myocardial tissues using intracellular biochemical pathways (14). This method requires coupling myocardial perfusion data with myocardial metabolic assessment using various radioactive tracers (15). Given the limited availability of FDG-PET in most countries and that a substantial proportion of patients with ischemic cardiomyopathy undergo rest/stress Sestamibi SPECT imaging to detect reversible ischemia, it seems necessary to validate the utility of Sestamibi SPECT for the diagnosis of myocardial. Therefore, a study by Kaltoft et al. (16) was carried out to determine the capability of a semiquantitative approach using 99mTc-MIBI SPECT at rest to detect viable myocardium in patients with severe ischemic cardiomyopathy. In this study, NH3/18FDG PET (nitrogen-13 ammonia/fluorodeoxyglucose) was used as the reference method. 15 patients (age 57 ± 7 years; ejection fraction 28 ± 8%), diagnosed with ischemic cardiomyopathy, randomly underwent SPECT and PET imaging. Viability in SPECT was defined as average activity >50% of maximal activity. Viability in PET was defined as a perfusion score >2 and an FDG score >2 (on a five-point scale, 0 = normal, 4 = absent activity). Out of the 440 segments, they found 313 viable segments and 65 nonviable segments according to both techniques. 48 segments were classified as nonviable by SPECT but viable by PET, and 14 were classified as viable by SPECT but non-viable by PET. This resulted in an overall segmental concord of 86%, with a sensitivity of 87% and a specificity of 82%. The positive predictive value was 96% and the negative predictive value 58%. Concordant nonviable segments were mainly located in the apex and apical segments, whereas concordant viable segments were mainly located in the basal segments. Regarding segmental discordance, among the 62 discordant segments, it was observed that SPECT was underestimated (segments viable according to PET but nonviable according to SPECT) in 48 segments, while SPECT overestimated compared to PET (segments non-viable according to PET but viable according to SPECT) in 14 segments. The findings are consistent with those of the referenced study. Out of 170 segments analyzed, we identified 103 as normal, 14 as viable, and 42 as nonviable using both techniques, resulting in 93.5% similarity. Concordant nonviable segments were mainly at the apical cap, showing strong agreement (kappa index between 0.8 and 1), while viable segments were predominantly in the basal segments with a kappa index of 0.8. Sorrentino et al. (17) compared SPECT with tetrofosmin and nitrate with 18FDG PET in 89 patients with severe coronary artery disease and left ventricular dysfunction. They found a 66% event-free survival rate among patients with myocardial viability on SPECT after nitrate administration during a mean follow-up of 29 ± 19 months. Similarly, using PET, the event-free survival rate was 67% among these same patients. Therefore, it can be concluded that the prognostic value of SPECT imaging after nitrate administration is comparable to that of metabolic PET imaging. Pathophysiological considerations support this assertion. Experimental studies have shown that mitochondrial function and sarcolemmal integrity are crucial for the uptake and retention of 99mTc-sestamibi, thus establishing a link between tracer kinetics, preserved myocardial metabolism, and myocyte viability(18,19). Additionally, histopathological studies have shown a good linear correlation between the extent of scintigraphic scar quantified by 99mTc-sestamibi SPECT and the actual pathological scar, both in patients with severe ischemic cardiomyopathy undergoing heart transplantation(20) and in patients with severe stenosis of the left anterior descending artery with segmental kinetic disorders undergoing coronary artery bypass grafting (21,22).While 18FDG PET is still considered the gold standard for myocardial viability assessment, this technique sometimes presents several limitations. The image quality obtained by 18FDG PET may be poor in some patients, especially those with diabetes mellitus(23). Furthermore, the limited availability and high costs associated with 18FDG PET imaging restrict its use in routine clinical practice.

The beneficial effects of revascularization result from the restoration of blood flow to dysfunctional but viable myocardial regions, leading to a subsequent improvement in regional and global left ventricular function. Over the past decade, the differentiation between viable and nonviable myocardium has garnered significant attention, fostering the development of several new modalities aimed at predicting the recovery of left ventricular function after myocardial revascularization. Pasquet et al.(3) demonstrated that in a group of 43 patients with a viable myocardium, revascularization improved the global ejection fraction of the left ventricle by an average of 13%, a change that could have a significant impact on survival. In contrast, in 30 patients with non-viable myocardium, revascularization did not result in a significant change in global left ventricular function and barely prevented its dilation. Tillisch (24) also showed that the left ventricular ejection fraction increased from 30% ± 11% to 45% ± 14% after revascularization when there were more than two viable segments. Sciagra et al. (25) also reported that in the group of patients showing improvement in left ventricular ejection fraction (LVEF), there was a significantly higher number of viable segments on 99mTc-sestamibi imaging compared to those whose global function remained unchanged. Furthermore, they demonstrated a significant relationship between the increase in LVEF after revascularization and the number of dysfunctional segments exhibiting preserved viability on 99mTc-sestamibi SPECT imaging.

These results are comparable to those found in our study, there was a significant improvement in LVEF at one year of follow-up within the viable group between those who underwent revascularization and those who were medically treated. Specifically, LVEF was significantly higher in the viable revascularized group (57.5±5%) compared to those treated medically treated (46.43±13.1%), with a p-value of 0.02. These findings underscore the importance of identifying a viable myocardium prior to revascularization procedures, as it significantly influences the likelihood of functional improvement and subsequent clinical outcomes. Identifying patients who are most likely to benefit from revascularization based on myocardial viability can optimize treatment strategies and improve patient outcomes.

This study has a couple of notable limitations. First, the sample size of the population is relatively small, which can impact the generalizability of the findings. Second, the study's evaluation and follow-up 13.3±2.8 months is relatively short compared to other studies, which typically have a follow-up period of at least 2 years. This shorter duration may limit the ability to assess long-term outcomes and the durability of interventions. These limitations should be considered when interpreting the results and drawing conclusions from the study.

Conclusion

In Tunisia, where healthcare resources can be limited, isotopic explorations provide a crucial advantage. Our study shows that early detection of perfusion/metabolism mismatch and performing timely revascularization leads to significant improvements in left ventricular ejection fraction (LVEF) and a marked reduction in cardiac events. For Tunisia, where swift and effective treatment is essential, this method highlights the need for prompt intervention to improve patient outcomes amidst resource limitations.

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