



# Electrical, Echocardiographic and Coronary Artery Characteristics of Right Ventricular Infarction: Experience of the Cardiology Department of the CHU Mohammed VI Marrakech

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

**Introduction:** Coronary heart disease is the main cause of morbidity and mortality worldwide. Right ventricular (RV) infarction is often difficult to diagnose and has a poor prognosis due to rhythmic and hemodynamic complications.

**Objective:** The study of electrical, ultrasonographic, and coronarographic features of the VD Infarction.

**Materials and Methods:** Retrospective study of patients hospitalized in the Cardiology Department of the Mohammed VI University Hospital in Marrakech over a period of 24 months for MDI extended to the RV.

**Results:** 120 patients were hospitalized during this period for MI with extension to the VD. Atypical

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clinical presentation was noted in 10% of cases. Clinical examination on admission revealed signs of right heart failure in 18% of cases, including 6% complicated by cardiogenic shock. Thrombolysis was performed in 10% of the patients, 67% of them successfully. The ECG found an isolated extension to the V3R leads in 76% of the cases and in association with a V4R overshoot in 45% of the cases, conduction disorders were noted in 28% of the cases, presented essentially by first degree auriculoventricular block. Echocardiography showed impaired LV function in 82% of cases, and longitudinal systolic dysfunction of the LV in 65%. Coronary angiography was performed in 91% of the cases, half of which underwent coronary angioplasty. The combination of both CD and IVA damage was found in 40% of the cases, and damage to the middle DC was the most common in almost half of the cases. The most frequent complications were rhythmic and conductive disorders in 38% of cases, and the evolution was fatal in 8% of cases.

**Conclusion:** Involvement of the RV during MI is characterized by a very critical initial phase, once overcome, the overall prognosis becomes favorable in the long term.

*Keywords:* Infarction; right ventricle; right bypass; right coronary; therapeutic management.

## ABREVIATIONS

RV : Right Ventricular  
TAPSE : Tricuspid Annular Plane Systolic Excursion  
CX : Circumflex Artery  
CD : Right Coronary  
IVA : Anterior Ventricular Interior  
FA : Atrial Fibrillation  
FV : Ventricular Fibrillation  
ESV : Extra Ventricular Systole  
ESSV : Supra Ventricular Extra Systole  
LV : Left Ventricular  
BAV : Atrioventricular Block  
BBG : Left Branch Block  
ASA : Antero Septo Apical

## 1. INTRODUCTION

Right ventricular infarction (RV MI) is a non-rare entity, complicating 40-50% of inferior myocardial infarctions, with higher hospital morbidity and mortality related to hemodynamic and rhythmic complications. The culprit lesion is often an occlusion of the right coronary artery. However, the DV is relatively resistant to infarction and recovers even after prolonged occlusion, as well as the diagnosis of ischemic damage to the DV is often based on the presence of right clinical signs and/or electrical signs in the right leads [1].

The aim of this work is to study the electrical, ultrasonographic, and coronary artery characteristics of MDI with DV extension, as well as its complications and therapeutic modalities.

## 2. MATERIALS AND METHODS

This is a retrospective and descriptive monocentric study spread over a period of 24 months,

covering patients hospitalized in the Department of Cardiology and Vascular Diseases at the Mohammed VI Hospital Center of Marrakech between September 2019 and October 2021, for left heart myocardial infarction extended to the right ventricle.

The records of patients hospitalized with the diagnosis of MDI extended to the RV were indexed from the registers and archives of the department.

A descriptive analysis of the study population was performed. Quantitative variables were presented as medians and extremes and qualitative variables as numbers and percentages.

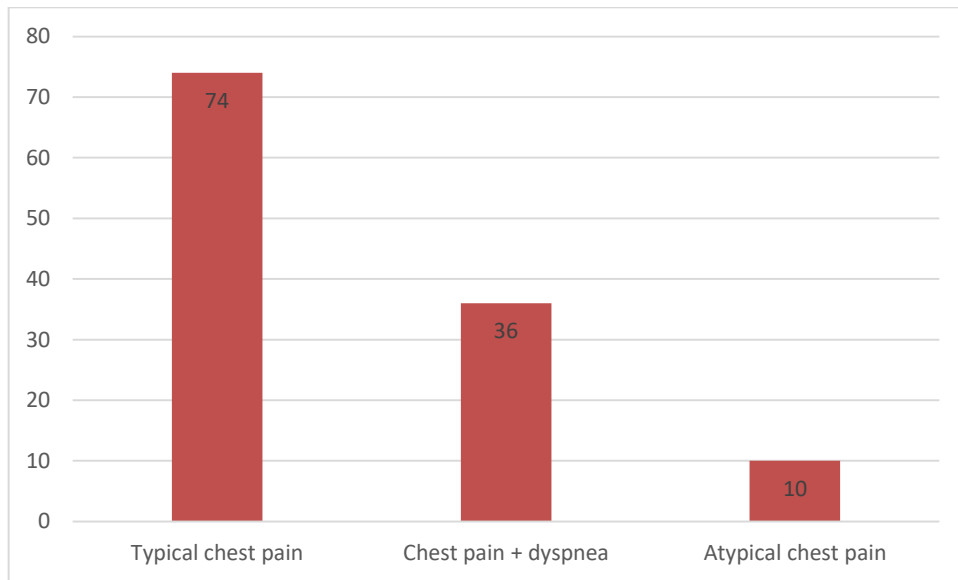
Retrospective analysis of the records does not require patient consent, and this type of work does not require formal submission to an ethics commission.

However, in order to respect medical secrecy, anonymity has been maintained in the exploitation forms, with oral consent from the patients.

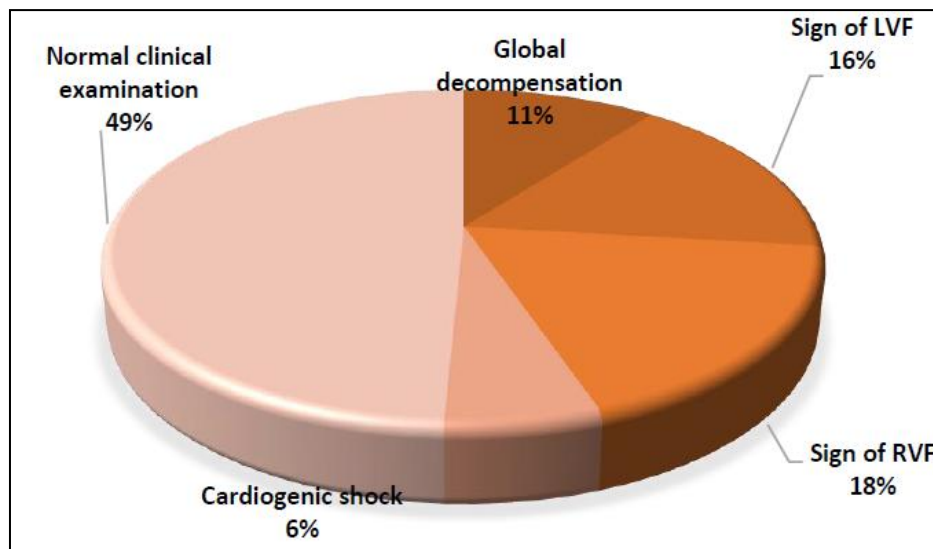
## 3. RESULTS

120 patients were hospitalized during this period for MI with extension to the VD. The mean age of our patients was 63 years, with extremes ranging from 40 to 80 years. The peak frequency was between 60 and 70 years, with a sex ratio that was equal to 2.33.

In our series, more than 75% of the patients had a high cardiovascular risk. Atypical clinical presentation was noted in 10% of cases (Fig. 1).



**Fig. 1. Distribution according to initial symptomatology**



**Fig. 2. Distribution according to physical signs**

Clinical examination on admission found signs of right heart failure in 18% of cases, of which 6% were complicated by cardiogenic shock (Fig. 2). Thrombolysis was performed in 10% of the patients, 67% of them successfully.

The ECG found an isolated extension to the V3R leads in 76% of the cases and in association with a V4R overshoot in 45% of the cases, conduction disorders were noted in 28% of the cases, presented essentially by first degree auriculoventricular block (Table 1).

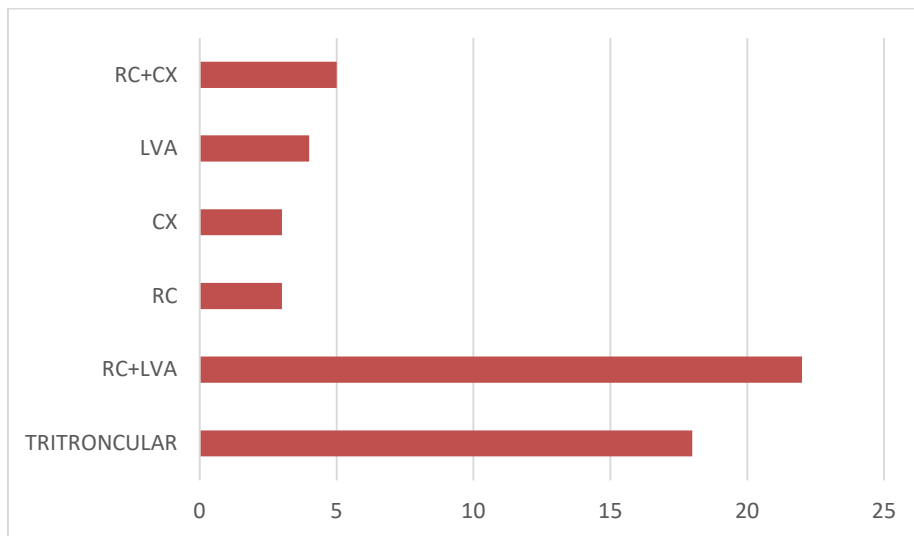
Echocardiography showed impaired LV function in 82% of cases, and longitudinal systolic

dysfunction of the VD in 65% based on the TAPSE found <17 in 40% of patients and S'VD <9.5 noted in 45% of cases. Other abnormalities were found on TTE to note; LV abnormalities in 22% of cases, dilatation of the IVC (30%), apical thrombus and pericardial effusion (8%).

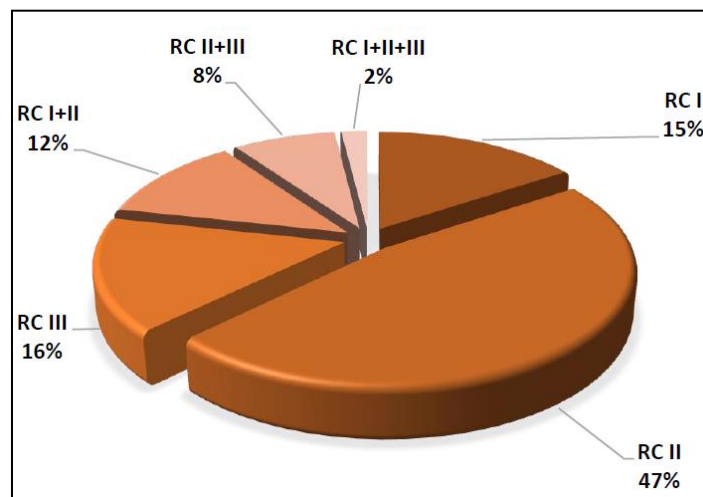
Coronary angiography was performed in 91% of the cases, half of which required coronary angioplasty; the combination of both DC and IVA damage was found in 40% of the cases, and middle DC damage was the most common in almost half of the cases (Figs. 3, 4).

**Table 1. Distribution of patients according to ECG abnormalities**

ECG abnormalities		Number of cases	Percentage
Repolarization disorder : ■ Sus offset in in V3R (80%) ■ Its offset in V4R (41%)	Lower	84	70%
	ASA	4	3%
	Extended anterior	16	13%
	V1, V2, V3	6	5%
	AVR	2	2%
	Circumferential	8	7%
	Rhythm disorder (10%)	FV	2
	FA	4	3%
	ESV	4	3%
	ESSV	2	2%
Conduction disorder (28%)	BBG	2	2%
	HBAG	4	3%
	Bi-fascicular block	4	3%
	BAV first degree	16	13%
	Full BAV	8	7%



**Fig. 3. Anomalies on coronary angiography**



**Fig. 4. The distribution of the segments of the right coronary reaches**

The most frequent complications were rhythmic and conductive disorders in 38% of cases, and the evolution was fatal in 8% of cases.

#### 4. DISCUSSION

RV infarction is a cause of arterial hypotension related to the sudden decrease in right ventricular systolic ejection. Immediate mortality is high in the absence of adequate treatment (filling, deobstruction, etc.). The ST elevation in the right leads considered in several studies [1,2] as the gold standard in the diagnosis of RV infarction is indeed a transient sign that can be absent in half of the patients with RV infarction 10 to 12 hours after the onset of pain [3]. Hence the interest of a careful echocardiographic examination with an accurate assessment of the systolo-diastolic function of the RV.

The study of the systolic function of the RV involves several parameters according to the new recommendations [4], no parameter alone could conclude the stage of the systolic dysfunction of the RV, some parameters are considered as little or not valid as the systolic ejection fraction according to the Simpson method, on the contrary the fraction of shortening of the RV, the analysis of the longitudinal function by the TAPSE or the peak of the S wave velocity in tissue Doppler are the most retained and validated parameters for the determination of the systolic function, it depends in fact on the underlying heart disease to be studied [5-6].

RV infarction occurs primarily on DC occlusion in the setting of inferior myocardial damage, it may also occur due to CX occlusion in patients with predominantly left circulation, and less frequently, associated LAI involvement in cases of anterior RV infarction [7-8].

The best treatment of right ventricular infarction remains, in addition to volume expansion, the earliest deobstruction of the thrombosed artery by medicinal means (although the rate of re-occlusion is higher) or instrumental means (primary angioplasty), which may suffice to regress, rapidly, all the clinical symptomatology and ensure a spectacular improvement of the prognosis [9-10].

Early recognition of RV infarction in patients with acute myocardial infarction is paramount, not only for prognostic purposes, but also to guide specific therapy, in order to avoid treatments that would further reduce right ventricular preload, thus compromising the patient's condition [3].

#### 5. CONCLUSION

The diagnosis of RV infarction can be difficult; the 12-lead ECG remains the main diagnostic tool in the acute setting, but the results may be transient.

The evolution of RV infarction is characterized by a very critical initial phase, dominated by rhythmic and hemodynamic consequences. Once overcome, the overall prognosis becomes favorable in the long term. Revascularization remains the cornerstone in the management of RV infarction.

#### CONSENT AND ETHICAL APPROVAL

It is not applicable.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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