Review Article

Broken heart syndrome (TAKO-TSUBO), an underestimated entity

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Abstract :

Tako-tsubo Syndrome is a cardiomyopathy that may mimick acute coronary syndrome , in the absence of significant coronary lesions, characterized by contractile dysfunction often localized in the apical region of the left ventricle, its pathophysiology remains uncertain and its treatment remains empirical ; It concerns especially elderly women exposed to intense physical or usually psychic stress; the evolution is usually benign with ad integrum restoration of left ventricular function, however serious complications can occur such as cardiogenic shock or malignant arrhythmia requiring treatment heavy load in intensive care unit .

We present a focus on this pathology, through two observations of divergent evolution

Introduction:

Tako-Tsubo syndrome (TTS) was first described in 1990 by Japanese cardiologists.

Defined by reversible myocardial astonishment, most often occurring after stress, mimicking acute coronary syndrome

It is now considered a cardiomyopathy [1] and is defined by reversible myocardial astonishment, most often occurring after stress [1,2]. Over 100 names have been proposed, the most common of which are apical ballooning, broken heart syndrome and stress cardiomyopathy. However, we must standardize these names and keep only the name Tako-Tsubo cardiomyopathy [3].

Takotsubo syndrome gained international notoriety among researchers and physicians when Wittstein et al published their findings in the New England Journal of Medicine in 2005. Since then, TTS has gained more frequent recognition around the world but still remains an underestimated and often misdiagnosed disorder. [5.6].

Hikaru Sato was the first in 1990 to describe Tako-Tsubo syndrome (TTS) by reporting in a Japanese medical journal a series of 5 cases of patients presenting with chest pain with electrocardiographic changes typical of a myocardial infarction but with normal coronary angiography and atypical wall kinetics disturbances on echocardiography. For several years, this syndrome was considered to affect Asians specifically, until the first French and American teams published their first cases in Caucasian patients in the late 1990s [5].

TTS takes its name from the octopus traps once used in Japan, the shape of which is reminiscent of the ventriculographic aspect of the left ventricle in systole due to the kinetic disturbances typically encountered in this disease (FIGURE 1).

Epidemiology :

It is estimated that Takotsubo syndrome accounts for approximately 1–3% [7] of all patients with suspected STEMI and 5–6% of women [8]. The 2008 nationwide inpatient sample discharge records using the International Classification of Diseases revealed that TTS accounts for 0.02% of hospitalizations in the United States [9].

The rate of TTS recurrence is estimated at 1.8% per patient-year [10,11].

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According to the published literature, around 90% of TTS patients are women, on average between 67 and 70 years old and around 80% are over 50 years old (Figure 2) [12]. Women over 55 have a five times higher risk of developing TTS than women under 55 and a ten times higher risk than men (TABLE 1). With increasing awareness of TTS. TTS has also been described in children20,21, the youngest TTS patient reported being a premature newborn born at the 28th week of gestation [12,13].

Current data on racial differences is inconsistent and large-scale studies are lacking. However, it has been reported that TTS appears to be rare in African Americans and Hispanics, while most of the cases reported in the United States have been Caucasians [14,15]. Additionally, patients of African American descent have been reported to have more hospital complications such as respiratory failure, stroke, and require mechanical ventilation more frequently than Caucasians and Hispanics [15 , 16].

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Pathophysiology:

Mechanisms of TTS

The precise pathophysiological mechanisms of TTS are not yet fully understood.

Several studies have shown the central role of the sympathetic nervous system which, through an emotional trigger, physical or combined, releases an excess of catecholamines causing myocardial kinetics disturbances [5,8].

The mechanism by which catecholamines cause these contraction abnormalities is not clearly understood at this time. Several hypotheses are the subject of research: epicardial coronary spasm, microcirculatory dysfunction, toxicity of catecholamines on cardiomyocytes, activation and inhibition of cardiomyocytic survival pathways.

Triggers

Many emotional and physical triggers have been identified as contributing to the onset of TTS. They are summarized in Figure 2 (FIGURE 2).

Predisposing factors

The triggers described above can potentially affect any individual during their lifetime. However, only a portion of patients exposed to such events will develop TTS. Some will even present it several times. This finding supports the existence of risk factors predisposing to the onset of TTS (FIGURE 3).

The clear epidemiological preponderance of women of postmenopausal age suggests an hormonal influence in the genesis of a TTS. estrogen has been shown to influence vasomotor tone by regulating endothelial production of NO. They are also capable of attenuating vasoconstriction associated with catecholamines (FIGURE 4).

The existence of genetic support for TTS is also suspected due to the existence of cases grouped within the same family.

Finally, a significant prevalence of psychiatric and / or neurological disorders has been identified within the cohorts of patients with TTS.

Diagnostic:

International diagnostic criteria for TTS (interTAK criteria) (FIGURE 5)

1. Transient left ventricular dysfunction (hypokinesia, akinesia or dyskinesia) with apical balloonization or median, basal or focal kinetic disturbances. Right ventricular involvement may be associated. These transient wall kinetics disorders generally go beyond a territory of vascular systematization; however, rare cases may exist with involvement of an arterial territory (focal TTS).

2. An emotional, physical, or combined trigger may precede the onset of TTS.

3. Neurological disorders (subarachnoid hemorrhages, stroke, TIA, etc.) or pheochromocytoma may be triggers for TTS.

4. ECG changes are present (ST segment elevation or depression, T wave inversion, QTc prolongation). However, there are cases without ECG modification.

5. Cardiac biomarkers (troponin and CK) are moderately increased.

Significant elevation of BNP is common.

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6. Significant coronary artery disease does not contradict TTS.

7. There is no argument for myocarditis.

8. Women after menopause are mainly affected.

Clinical cases:

Observation 1:

79-year-old patient, followed for depression under treatment, admitted for a picture of prolonged anginal pain at rest, associated with dyspnea on exertion, occurring one hour after the announcement of the death of a loved one

Admission examination found a hemodynamically stable patient, arterial pressure (BP) of 136/76 mmHg, heart rate (HR) of 98 bpm, with no sign of heart failure.

The ECG performed in the emergency room showed an ST segment shift at the circumferential level (FIGURE 6)

Us troponin on admission to the intensive care unit is 7980 pg / ml.

Admission echocardiography revealed broad apical akinesia, with hyperkinesias of the basal segments, with moderate alteration of the ejection fraction to 43% in Simpson biplane, without notable valve disease (FIGURE 7).

The patient's calculated Intertak score was 60 points <70, so coronary angiography was performed within 24 hours with no noticeable feature of the coronary network, with a typical apical balloon appearance on venticulography (FIGURE 8).

The patient was put on ACE inhibitors, beta blockers (BB), and pain medication.

The echocardiographic check performed on discharge noted a clear regression of the apical kinetics disorders, with recovery of LVEF.

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THE IMPORTANT POINTS OF THIS OBSERVATION:

• The menopausal forms are the most affected by TTS

• An emotional factor is often present, the functional signs are often exacerbated

• A coronary angiography is almost systematic before concluding with a TTS

• A favorable recovery is often obtained within 48-72h

Observation 2:

We report the case of an 89-year-old hypertensive patient who presented to the emergency room for anginal chest pain that arose in an emotional context of shock and sadness after an assault.

The examination on admission: found an angina patient, eupneic at rest, with BP at 130/78 mmHg and HR at 103 bpm, without signs of heart failure.

The ECG found negative T waves in the circumference, cardiac markers were high (troponin 635 ng / ml, CPK at 210 U / I, NT-proBNP 23,400 Pg / ml) (FIGURE 9)

Transthoracic echocardiography found great apical akinesia with basal hyperkinesia, an ejection fraction altered to 30% (FIGURE 10), moderate mitral insufficiency the semi-urgent coronary angiography performed did not show coronary lesions, the ventriculography shows an appearance typical of apical ballooning (FIGURE 11).

The evolution was marked by the occurrence of conduction and atrial rhythm disorders (paroxysmal fibrillation, sinoatrial block) with electrical modification such as an elevation of the ST segment and the rapid installation of a table. of acute heart failure and cardiogenic shock within 24 hours of admission, a control coronary angiogram revealed the same initial appearance (FIGURE 12).

After stabilization, and withdrawal of vasopressor drugs, a cardiac MRI

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performed five days later shows an early subendocardial perfusion defect, with apical thrombus, late contrast enhancement of subendocardial ischemia in the median infero-lateral segment of the LV, without enhancement of the apical akinetic segments (FIGURE 13)

The patient was put on treatment for heart failure: ACEI, BB and loop diuretic depletion.

Psychological management was offered to the patient, as well as telemetry monitoring.

Ultrasound control performed 4 days later showed a rapidly favorable evolution, the LVEF was re-evaluated at 52%.

We concluded to Sd of tako-tsubo complicated by: supraventricular arrhythmia, heart failure, cardiogenic shock, apical thrombus and possibly embolic MI.

THE IMPORTANT POINTS OF THIS OBSERVATION:

• Complicated forms are often underdiagnosed

• The use of multimodal cardiac imaging, such as cardiac MRI, increases the diagnostic potential

- TTS and embolic IDM overlap is possible

• The management must be etiological, as well as psychological

• Treatments such as diuretics and BB are often to be avoided in the early phase in cases of complicated TTS, for risk of obstruction by basal hyperkinesias

Therapeutic management

It is interesting to calculate in case of suspicion of TTS the intertak score, a score which was developed from the population included in the international intertak register to help distinguish between ACS and STT in the acute phase, it includes 7 items, for which we assign a number of points which, once added together, allow us to estimate a probability of STT (FIGURE 14)

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The expert consensus has defined an algorithm for the management of patients suspected of having a STT, this algorithm indicates the performance of an urgent coronary angiography in the event of an elevation of the ST segment, in the opposite case, we could calculate the 'interTAK score, if the score> 70, coronary angiography is indicated, on the other hand, if <70, cardiac imaging, with recourse to cardiac CT can be proposed if a typical appearance is found (FIGURE 15,16 and 17).

Complications

Although TTS is generally considered a mild disease, observations show that rates of cardiogenic shock and death are comparable to patients with ACS treated according to current guidelines [16].

Hemodynamic complications and electrical instability during the acute phase put patients at risk for serious in-hospital adverse events that occur in approximately one-fifth of patients with TTS, complications ranked by international consensus in order of frequency (FIGURE 18). This substantial incidence of complications requires close monitoring and early intervention in unstable TTS patients with risk stratification at diagnosis [17,18].

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Conclusion

Tako-Tsubo cardiomyopathy is defined by pathognomonic left ventricular systolic dysfunction when treatment is very early. Stress is found in the majority of cases (70 to 85%). Thus, to develop Tako-Tsubo cardiomyopathy, a triggering factor, however small or trivial, is necessary. However, two patients with the same stress will not both develop this disease. There is, therefore, a personal susceptibility, probably multifactorial.

The complicated forms very often mimic an acute coronary sydrome, especially in the embolic form as we objected to the second observation, a specific treatment has been proposed by international consensus.

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FIGURES

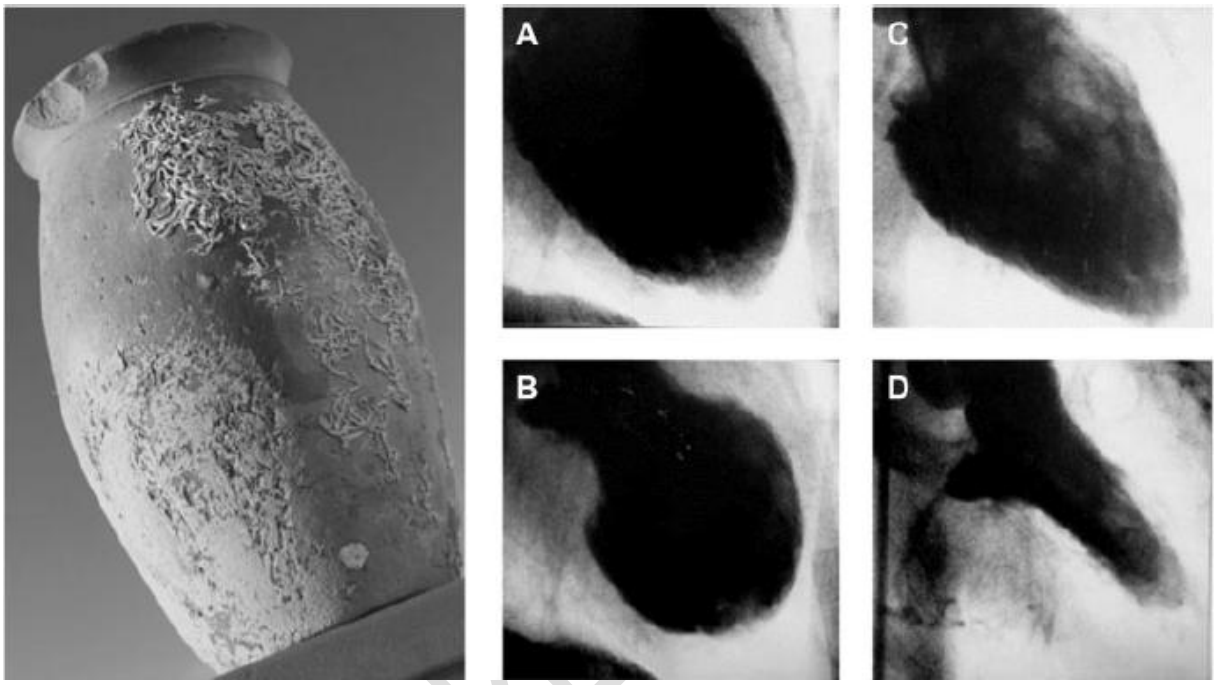

FIGURE 1 : Japanese octopus traps with a shape reminiscent of the ventriculographic aspect of the left ventricle in systole.

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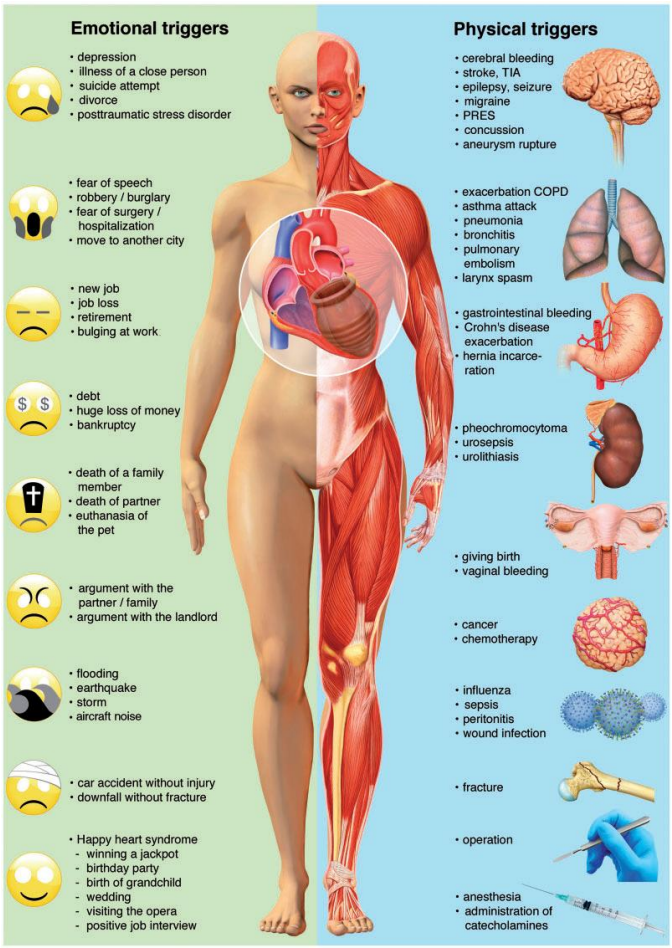

FIGURE 2 : Emotional and physical triggers.

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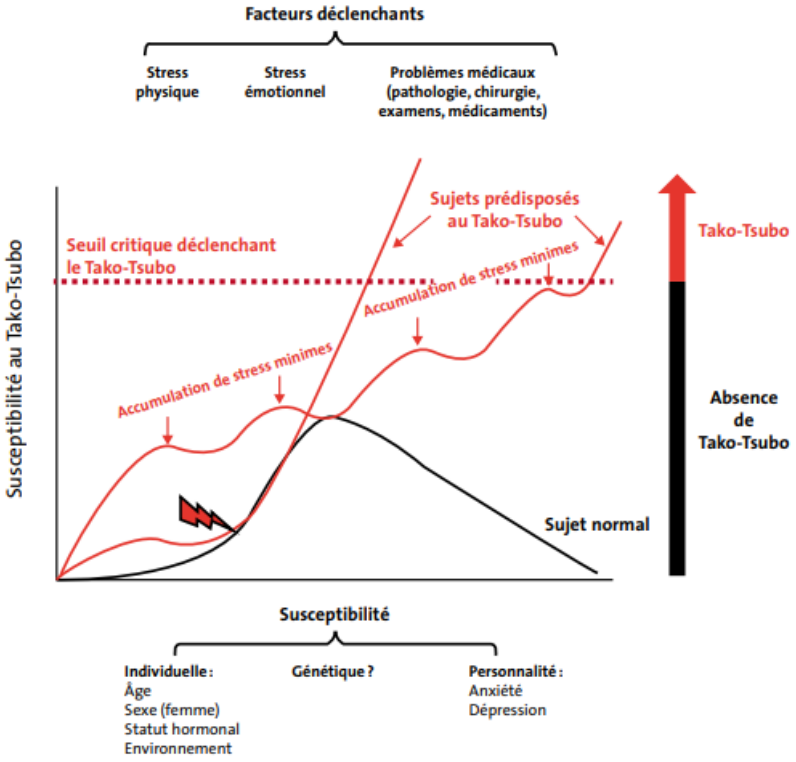

FIGURE 3 : Representation of the interactions between stress and individual susceptibility to Tako-Tsubo cardiomyopathy.

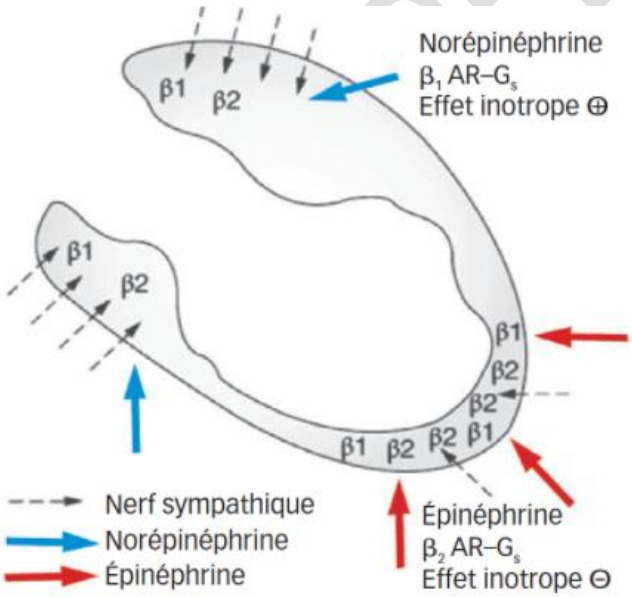

FIGURE 4 : Schematic representation of localized differences in response to large doses of catecholamine, explaining cardiomyopathy.

Table I International Takotsubo Diagnostic Criteria (InterTAK Diagnostic Criteria)

1.	Patients show transient[a] left ventricular dysfunction (hypokinesia, akinesia, or dyskinesia) presenting as apical ballooning or midventricular, basal, or focal wall motion abnormalities. Right ventricular involvement can be present. Besides these regional wall motion patterns, transitions between all types can exist. The regional wall motion abnormality usually extends beyond a single epicardial vascular distribution; however, rare cases can exist where the regional wall motion abnormality is present in the subtended myocardial territory of a single coronary artery (focal TTS).[b]
2.	An emotional, physical, or combined trigger can precede the takotsubo syndrome event, but this is not obligatory.
3.	Neurologic disorders (e.g. subarachnoid haemorrhage, stroke/transient ischaemic attack, or seizures) as well as pheochromocytoma may serve as triggers for takotsubo syndrome.
4.	New ECG abnormalities are present (ST-segment elevation, ST-segment depression, T-wave inversion, and QTc prolongation); however, rare cases exist without any ECG changes.
5.	Levels of cardiac biomarkers (troponin and creatine kinase) are moderately elevated in most cases; significant elevation of brain natriuretic peptide is common.
6.	Significant coronary artery disease is not a contradiction in takotsubo syndrome.
7.	Patients have no evidence of infectious myocarditis.[b]
8.	Postmenopausal women are predominantly affected.

[a]Wall motion abnormalities may remain for a prolonged period of time or documentation of recovery may not be possible. For example, death before evidence of recovery is captured.
[b]Cardiac magnetic resonance imaging is recommended to exclude infectious myocarditis and diagnosis confirmation of takotsubo syndrome.

FIGURE 5 : International diagnostic criteria for TTS (interTAK criteria)

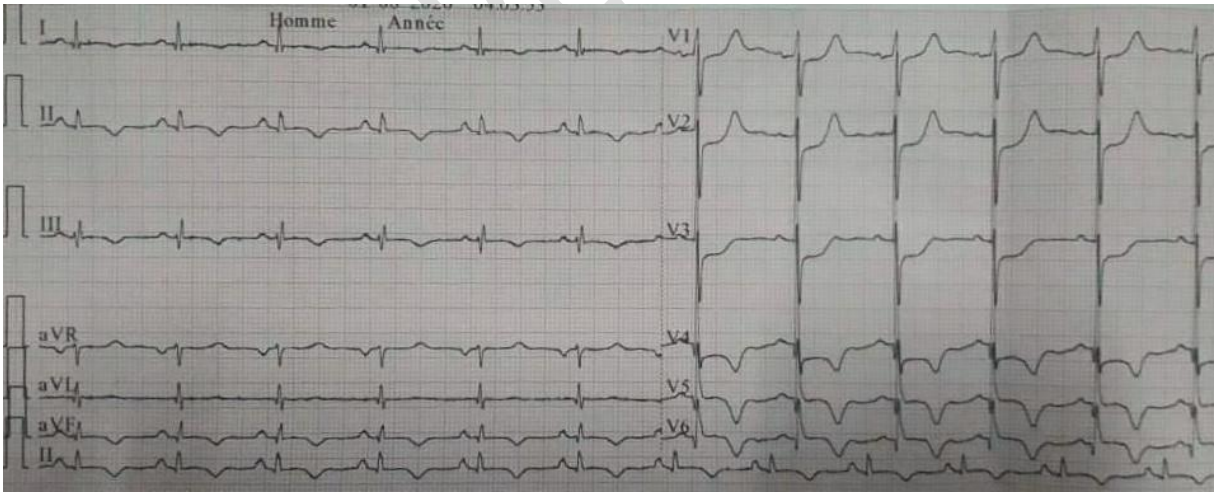

FIGURE 6: ECG on admission showing an under-shift of the ST segment at the circumferential level

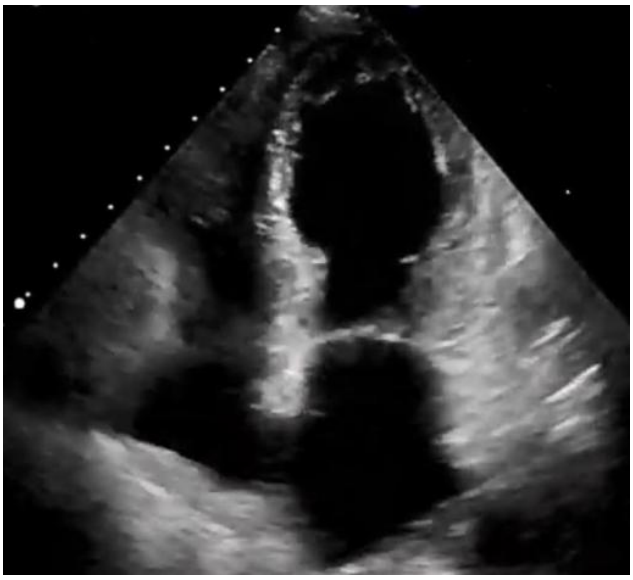

FIGURE 7 : Echocardiography with wide apical akinesia

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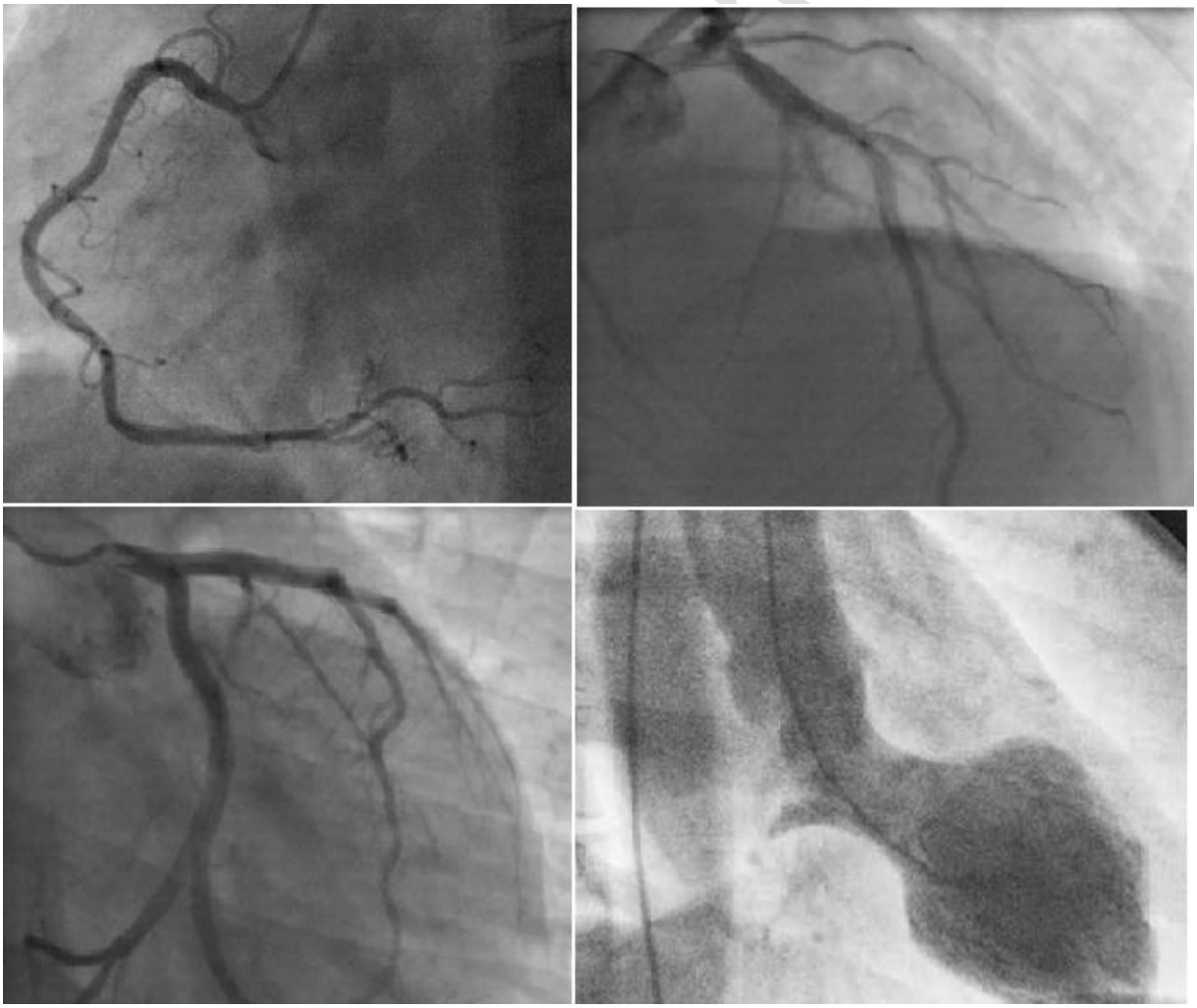

FIGURE 8 : A normal coronary angiography, with typical appearance of apical balloonization on venticulography

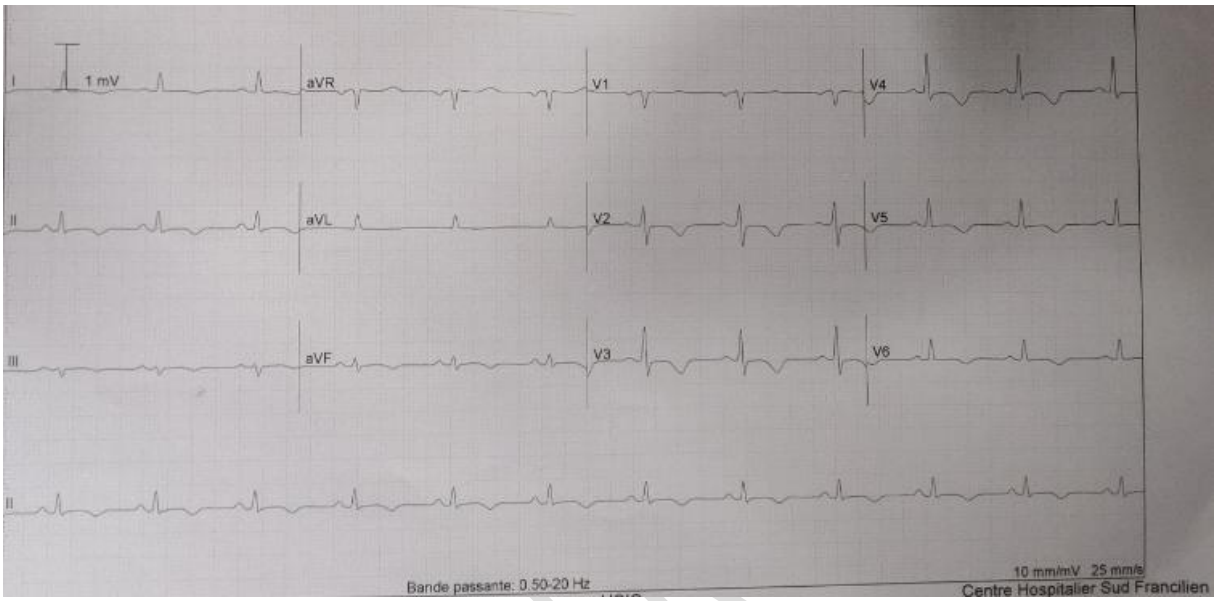

FIGURE 9 : The ECG found negative T waves circumferentially

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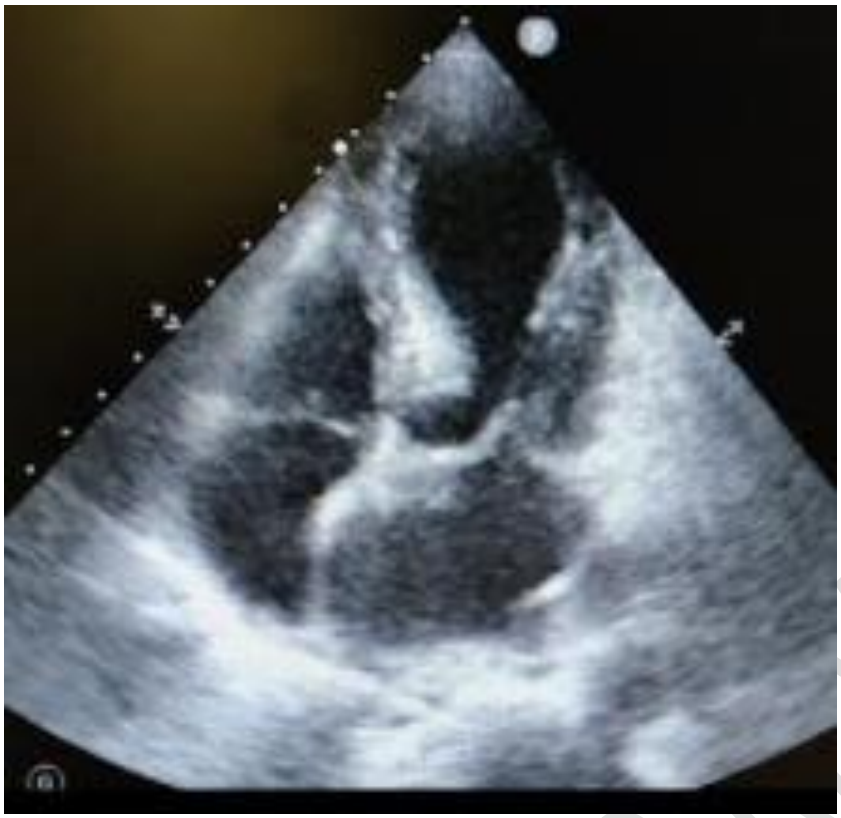

FIGURE 10 : Echocardiography with broad apical akinesia

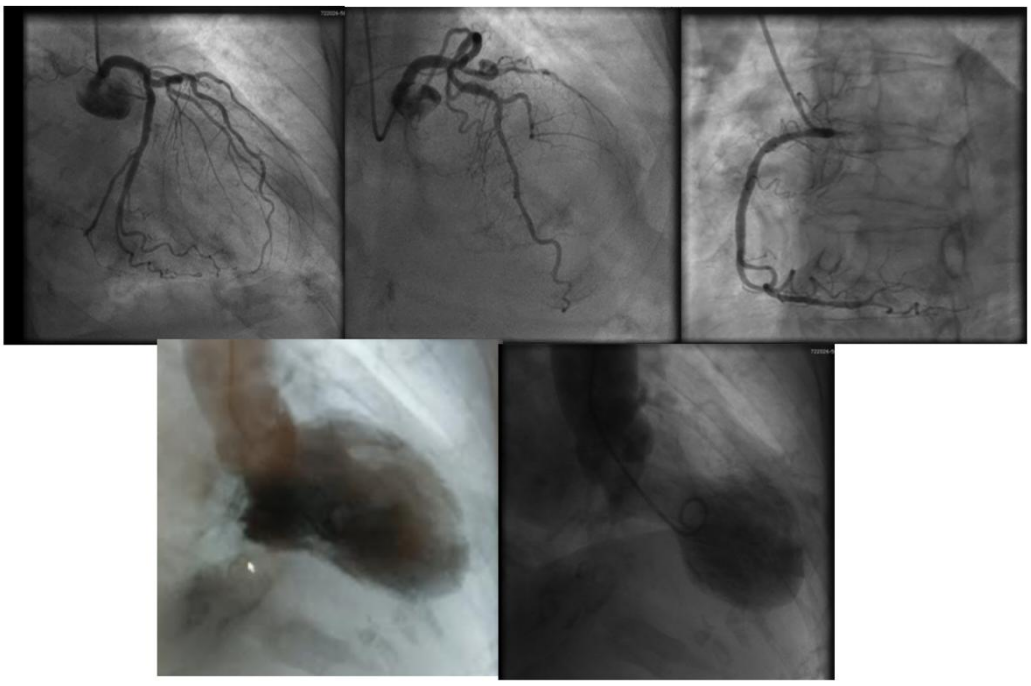

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FIGURE 11 : A coronary angiography without significant lesions, with a typical appearance of apical balloonization

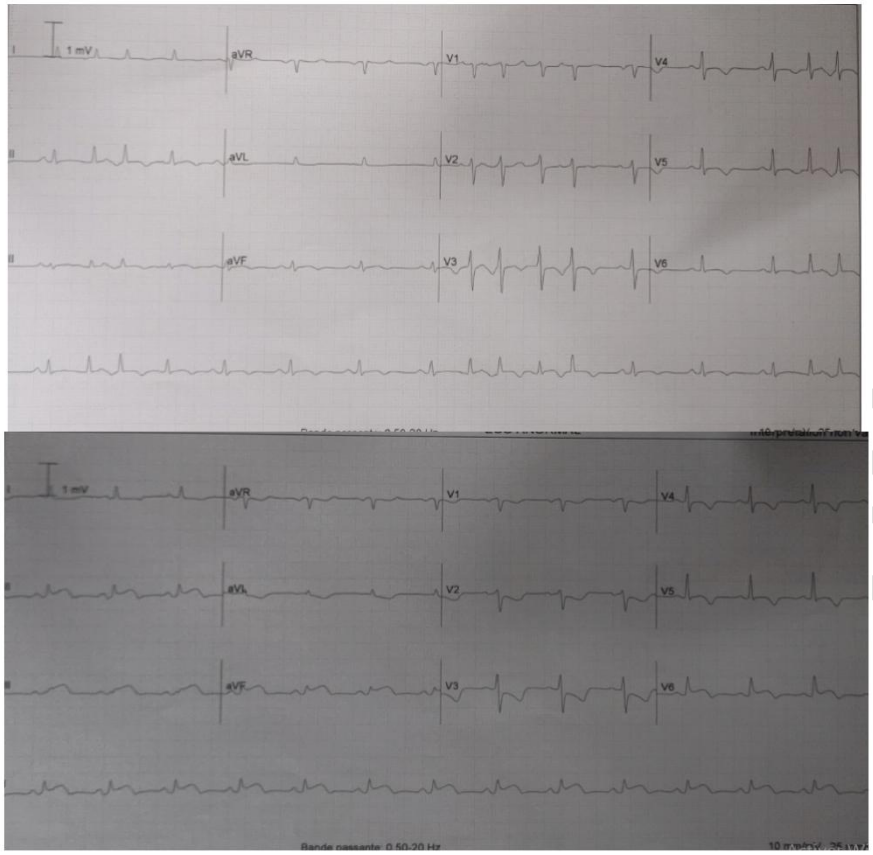

FIGURE 12 : Atrial conduction and rhythm disorders (paroxysmal fibrillation, sinoatrial block) with electrical modification

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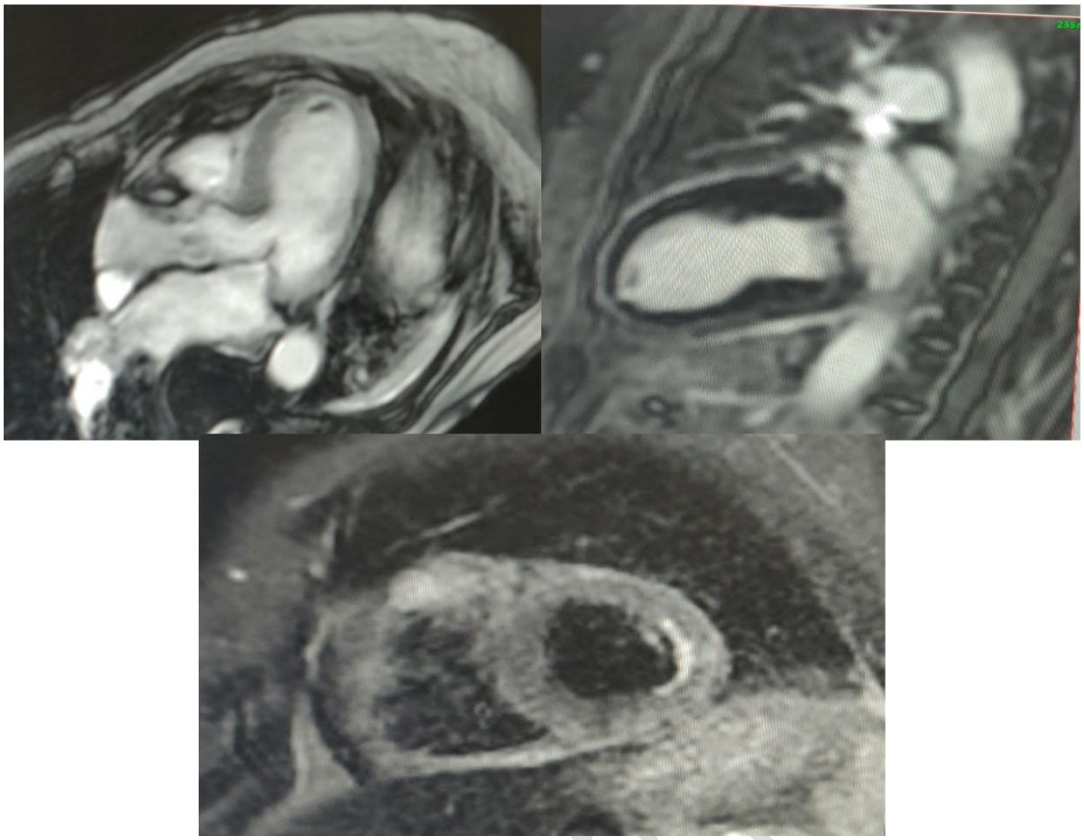

FIGURE 13 : Early perfusion under endocardial inferolateral segment ; late hyper signal T2 subendocardial limited to the Infero-lateral segment of the LV.

A

Criteria	Points	Prediction of TTS	OR (95% CI)	P-value
Female sex	25		68 (29.0 - 163.7)	P<0.001
Emotional trigger	24		65 (20.3 - 205.8)	P<0.001
Physical trigger	13		8.7 (4.6 - 17.3)	P<0.001
Absence of ST-segment depression*	12		7.2 (3.1 - 16.8)	P<0.001
Psychiatric disorders	11		7.0 (3.1 - 15.5)	P<0.001
Neurologic disorders	9		4.9 (2.2 - 11.3)	P<0.001
QTc prolongation	6		2.8 (1.3 - 5.7)	P=0.006
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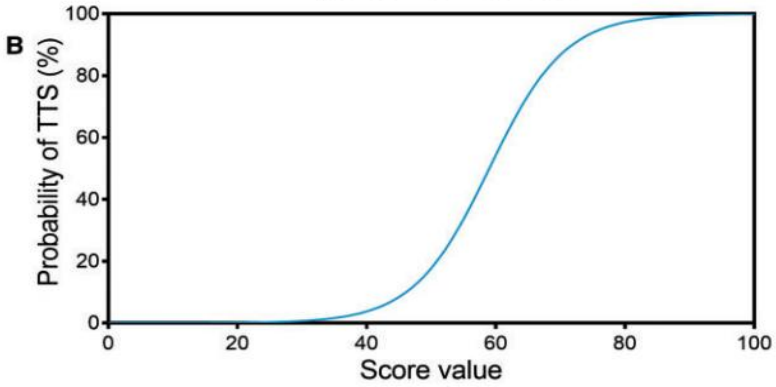

FIGURE 14 : InterTAKSCORE.

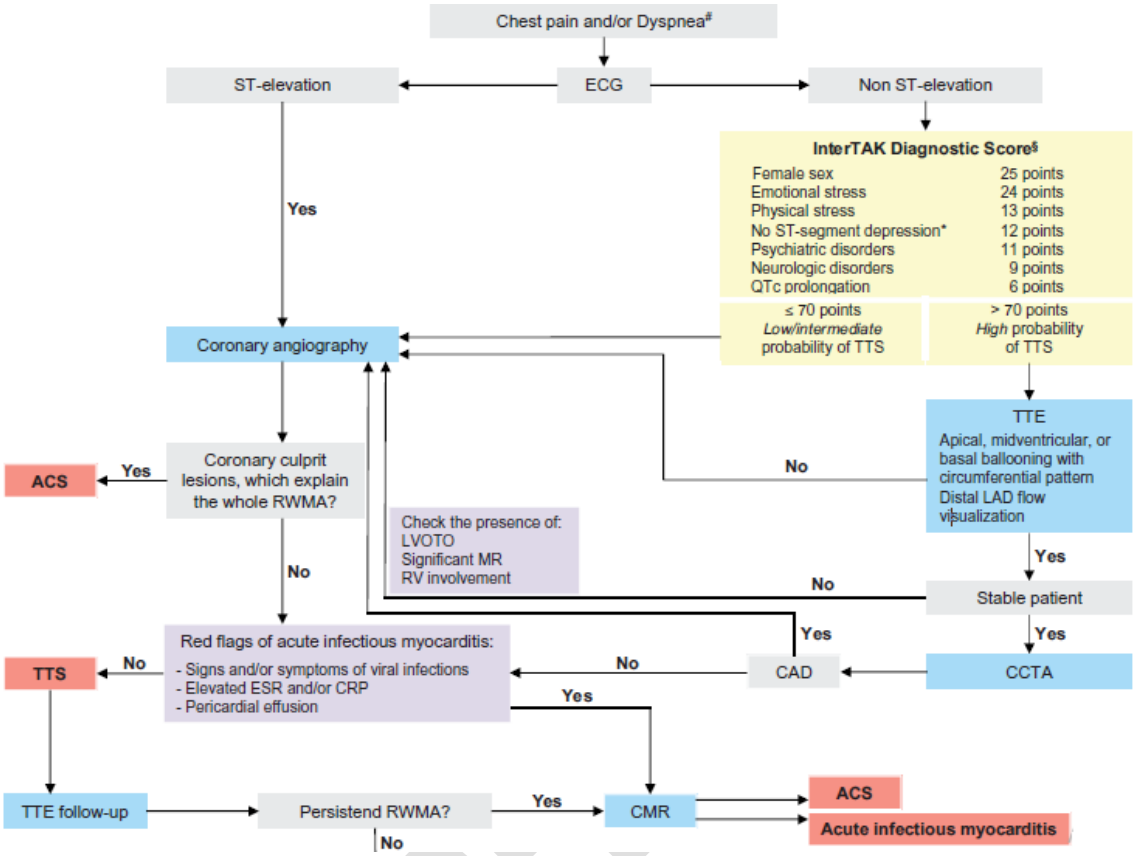

FIGURE 15 : Management algorithm for suspected patients.

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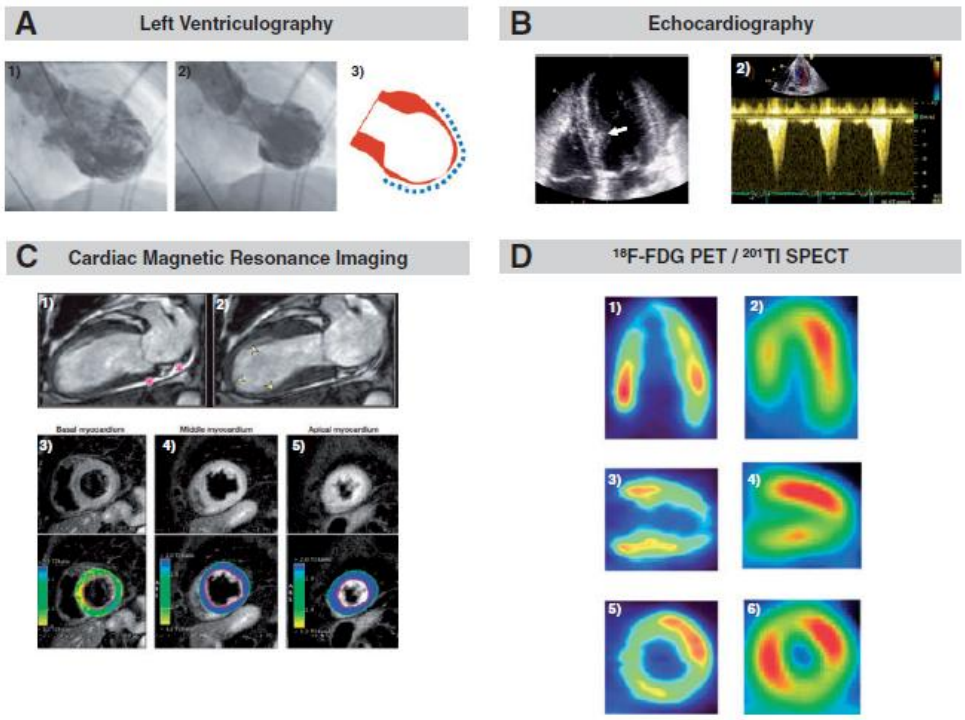

FIGURE 16 : Paraclinical diagnostic tools

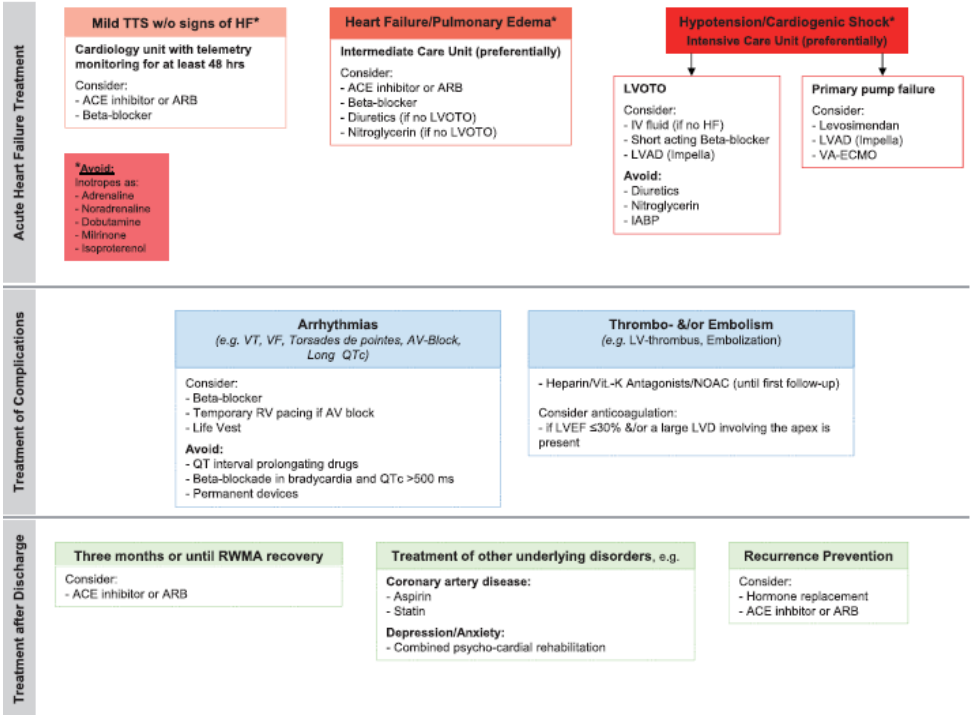

FIGURE 17 : Algorithm for therapeutic management of suspected patients.

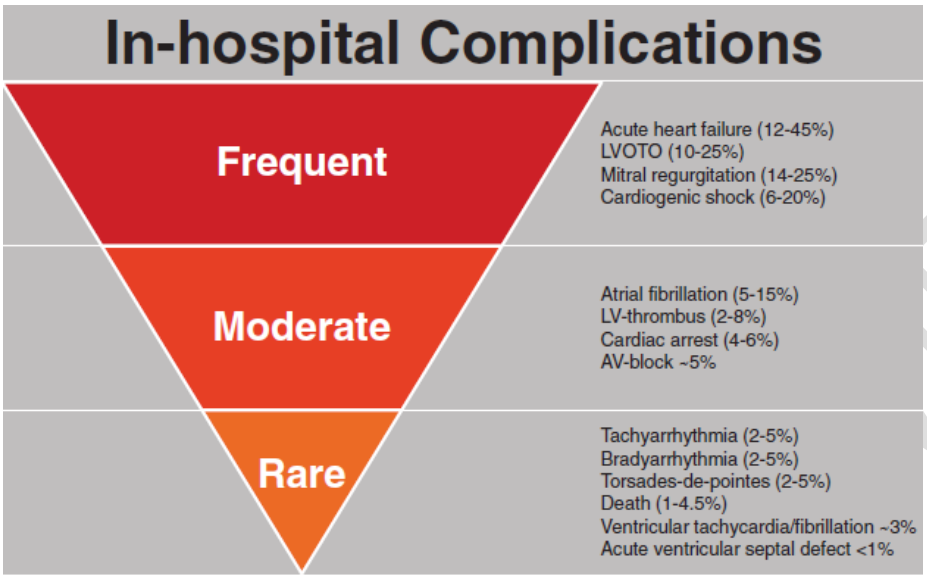

FIGURE 18 : Complications in order of frequency

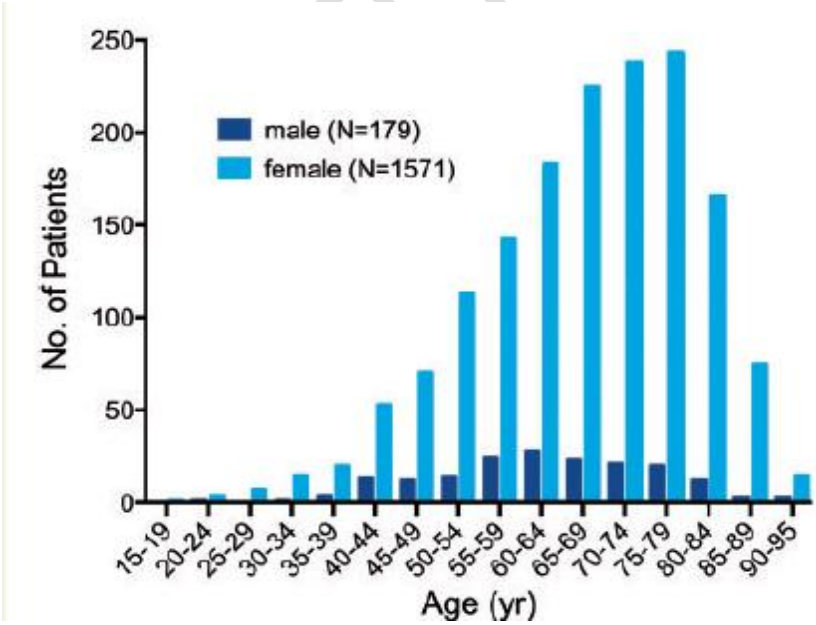

TABLE 1 : Age and sex distribution of patients with takotsubo syndrome.