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Impact of direct oral anticoagulant therapy on intraventricular thrombus evaluated with cardiac magnetic resonance imaging

Marine Boulanger

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UNIVERSITE DE MONTPELLIER
FACULTE DE MEDECINE MONTPELLIER-NIMES

THESE

Pour obtenir le titre de
DOCTEUR EN MEDECINE

Présentée et soutenue publiquement
Par
Marine BOULANGER

le 12/10/2021

**Impact of direct oral anticoagulant therapy on
intraventricular thrombus evaluated with cardiac
magnetic resonance imaging**

Directeur de thèse : Docteur Pierre ROBERT

JURY

Président : Madame le Professeur Florence LECLERCQ

Assesseurs : Monsieur le Docteur Benoit LATTUCA
Monsieur le Docteur Pierre ROBERT
Monsieur le Docteur Benoit AZAIS

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A mon frère, pour les bonnes parties de jeux du dimanche après-midi au milieu de cours d'histoire et de charabia physique passionnant.

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Abstract

BACKGROUND: Left ventricular thrombus (LVT) observed in cardiomyopathy is associated with risks for systemic embolism, morbidity and mortality. Right ventricular thrombus (RVT) is rare but with potential risk of acute pulmonary embolism. Current first-line therapy of intraventricular thrombus (IVT) is vitamin K antagonists (VKA) but with numerous limits regarding efficacy and safety.

OBJECTIVE: The purpose of this study was to evaluate the efficacy of direct oral anticoagulants (DOA) therapy on IVT resolution with cardiac magnetic resonance (CMR) evaluation.

METHODS: From June 2018 to September 2021, we included patients with IVT diagnosis on transthoracic echography, CMR and/or Computed Tomography (CT) scan and treated with DOA in Montpellier and Nîmes University Hospital. Patients with CMR contra-indications or treated with VKA were excluded. The primary end point was the resolution of IVT on CMR at 6 months follow up and secondary end point included mortality, thromboembolic and bleeding events during the same follow-up.

RESULTS: Thirty-four patients with a mean age of 58 ± 16 years and a majority of male (n=30, 88.2%) were enrolled including 32 LVT and 2 RVT. Ischemic cardiomyopathy was the most common aetiology (n = 30, 88.2%) with mainly patients admitted for anterior STEMI (n=20, 58.8%). RVT was found exclusively in dilated cardiomyopathy with biventricular dysfunction. Patients were treated with apixaban (55.9%), dabigatran (32.4%) or rivaroxaban (11.7%). Antiplatelet therapy was used in 88.2% of the population. IVT resolution was observed at follow-up CMR in 25 (73.5%) patients, 23 (71.9%) LVT and

all RVT. Stroke occurred in one patient (2.9%) and severe bleeding (BARC \geq 3) in one patient (2.9%) at 6 months follow-up.

CONCLUSION: In this prospective, observational and multicenter pilot study, DOA therapy was associated with IVT resolution in 73.5% of patients with serious events observed in 5.8% of patients. The preliminary results suggests that DOA are effective in treating IVT with few ischemic and bleeding events. Larger observational data and randomized studies with comparison with VKA will be required to confirm these results.

KEY WORDS: intraventricular thrombus, direct oral anticoagulants, vitamin K antagonists, echocardiography, cardiac magnetic resonance

Abbreviations

AF = atrial fibrillation

BARC = Bleeding Academic Research Consortium

CMR = cardiac magnetic resonance

CT = computed tomography

DOA = direct oral anticoagulants

INR = international normalized ratio

IVT = intraventricular thrombus

LVEF = left ventricular ejection fraction

LVT = left ventricular thrombus

MACE = major adverse cardiovascular events

PCI = primary percutaneous coronary intervention

RVT = right ventricular thrombus

STEMI = ST elevation myocardial infarction

TTE = transthoracic echography

VKA = vitamin K antagonists

VTE = venous thromboembolism

Background:

Left ventricular thrombus (LVT) is a common complication of cardiomyopathy with systolic dysfunction or of ST-elevation myocardial infarction (STEMI), particularly anterior, and is associated with substantial risks of systemic embolism, morbidity and mortality (1).

Right ventricular thrombus (RVT) is rare but with potential risk of acute pulmonary embolism. While the incidence of LVT after acute myocardial infarction declined related to improvement of reperfusion strategies, they were increasingly observed in chronic ischemic or non-ischemic cardiomyopathy (2).

Current guidelines recommend the use of vitamin K antagonists (VKA) for up to 6 months in case of LVT after acute myocardial infarction but with a low level of evidence (3,4).

Conversely, no specific recommendations regarding duration of anticoagulant therapy are available for LVT complicating chronic dilated cardiomyopathy (5). Several case reports or meta-analysis of case reports of successful resolution of LVT with direct oral anticoagulants (DOA) were reported (6–8). A recent meta-analysis including 6 retrospective studies enrolling 837 patients showed that DOA and VKA have similar efficacy and safety in treating LVT, prompting the inference that DOA are the possible alternatives of VKA in LVT therapy (9). However, a multicenter, retrospective study showed a higher risk of systemic embolism events with DOA compared with warfarin (10). No randomized or large prospective study comparing DOA and VKA is currently available.

Warfarin is limited by the need for frequent international normalized ratio (INR) monitoring with narrow therapeutic range, multiple drug interactions or food restrictions. Time in therapeutic range (TTR) is used to calculate the percentage of time a patient on VKA spent in the therapeutic range using the INR. In European recommendation, VKA are considered effective and relatively safe when TTR is above 70% (11). In a systematic review of studies measuring anticoagulation control, the percentage of TTR was

63.5% (12). Conversely, DOA do not require monitoring, have proved their non-inferiority to warfarin in the prevention of thromboembolism in patients with non-valvular atrial fibrillation (AF) and demonstrated important decrease of cerebral bleedings compared to VKA in AF in randomized trials (13).

Regarding intraventricular thrombus (IVT) imaging, transthoracic echography (TTE) and cardiac magnetic resonance (CMR) are commonly used. TTE uses morphological identification, CMR can identify IVT based on its morphology and avascular tissue characteristics (14,15). TTE is more accessible and is usually the first test used for IVT screening in cardiomyopathy and after acute myocardial infarction however lower sensitivity of TTE was reported compared to CMR imaging (14).

The primary objective of our study was to evaluate the efficacy of DOA therapy on IVT resolution with CMR evaluation.

Methods

Study design and population

The study was a prospective, observational and multicenter pilot study conducted in Montpellier and Nîmes University Hospitals from June 2018 to September 2021.

All patients with ischemic or non-ischemic cardiomyopathy with diagnosis of IVT on TTE, CMR or CT scan were screened and those treated with DOA (full or low dose) were included. Patients with CMR contra-indications, treated with VKA or low-molecular weight heparin were excluded.

The patients' baseline characteristics include the age and gender, cardiovascular risk factors, the past medical history of ischemic event, atrial fibrillation, or stroke, the long-term use of antiplatelet or anticoagulation therapy (*Table 1*).

Ethics regulation

All patients were given full information. We obtained oral consent from the patients, specifying that the management was not modified by the protocol, including the follow-up by CMR.

The study was conducted according to the declaration of Helsinki principles and approved by local ethics committee (International review board number: IRB-MTP_2021_04 -2021 00778).

TTE and MRI assessment

Patients with IVT on TTE, CMR or CT scan were screened for the study.

Left ventricular thrombus (LVT) was defined on TTE with or without contrast as an echo dense mass in the left ventricular cavity with margins distinct from ventricular endocardium and distinguishable from papillary muscles, chordae, trabeculations, or

technical artifact that was seen clearly throughout the cardiac cycle in at least two different echocardiographic views. Additionally, this mass had to be contiguous with the endocardium in an area of abnormal wall motion. The thrombus size was measured with the largest 2-dimensional area available on the index echocardiogram. Echocardiographic data included the location, the morphologic characteristics and mobility of thrombus. Left ventricular aneurysm was defined as an akinetic or dyskinetic bulge interrupting the normal ventricular contour during diastole and systole.

Thrombus was identified on CMR as left ventricular mass with post-contrast inversion-recovery characteristics consistent with avascular tissue. Thrombus appeared as a low signal intensity mass surrounded by high-signal intensity structures such as intracavitary blood and/or hyper enhanced myocardial infarction. 3D acquisition was used, when possible, otherwise 2D protocol with 3 sequential slices.

Left ventricular ejection fraction were assessed on both imaging modalities.

Right ventricular thrombus was analyzed in the same way as left ventricular thrombus.

Primary endpoint

The primary endpoint was IVT resolution on CMR imaging at 6 months follow up.

The resolution of IVT corresponds to a complete disappearance of IVT on follow-up CMR.

Secondary endpoints

Secondary endpoints included IVT reduction on CMR, comparison between TTE and CMR imaging for IVT resolution, major ischemic (stroke, myocardial infarction, systemic embolism), major bleedings (BARC ≥ 3) and death during follow-up.

Reduction of IVT correspond to a regression of IVT largest diameter of 30% or more to eliminate a measurement variation. If any doubt, a review by a second radiologist was performed.

Data assessment and follow-up

Data were assessed from medical records and follow-up was performed by cardiologist and radiologist from both centers. Patients were contacted by telephone for ischemic and bleeding events.

Statistical analysis

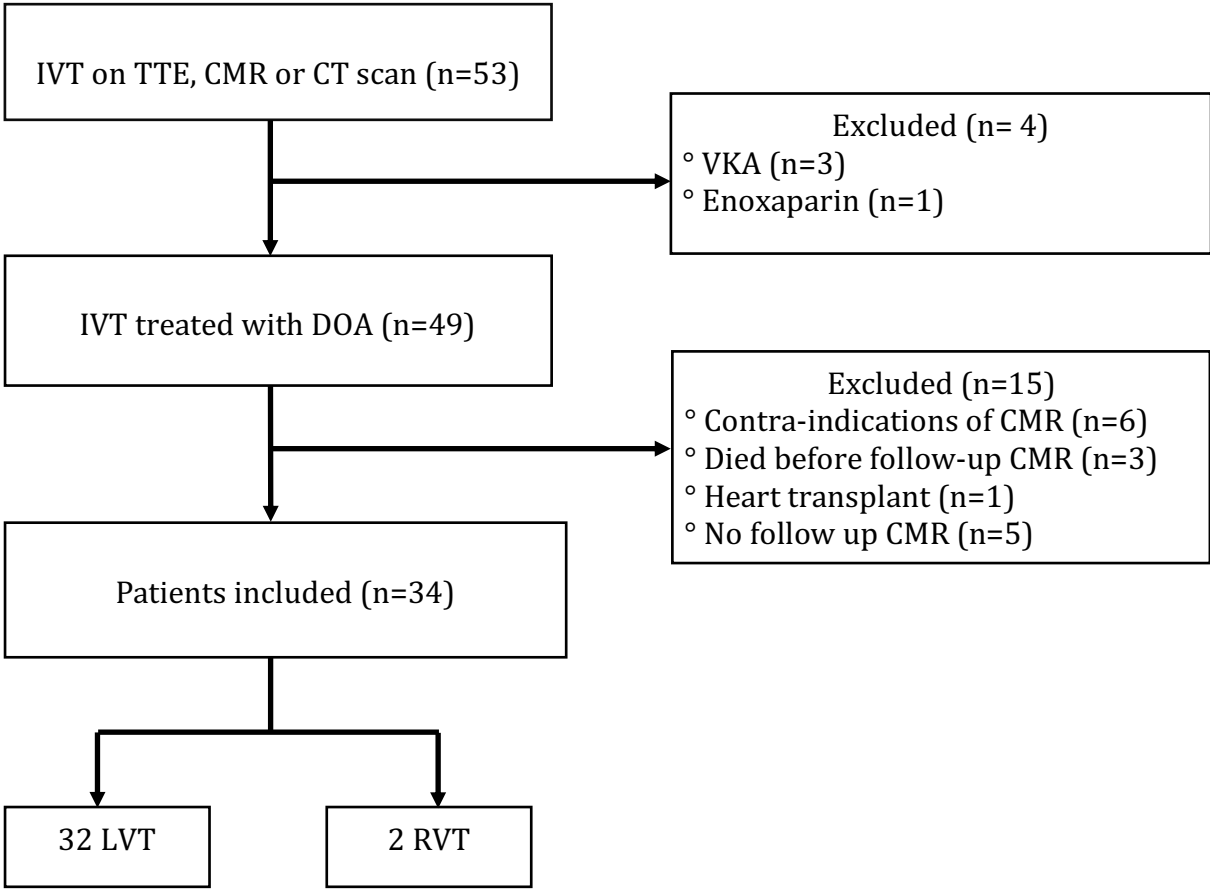
Values are reported as mean \pm SD or median (interquartile range) for continuous variables and as number (%) of patients for categorical variables. A Kappa statistic was calculated to measure the agreement between follow-up TTE and CMR for IVT detection.

Results

Characteristics of the patients

Of the 53 patients with the diagnosis of IVT during the study, 34 were finally included in this analysis with 32 LVT and 2 RVT (Figure 1).

Figure 1: Flow Chart



Baseline characteristics of the patients with IVT treated with DOA are shown in Table 1.

Among the patients included, there were 30 (88.2%) men and mean age was 58 ± 16 years.

Regarding cardiovascular risk factors, there were 4 (11.8%) patients with diabetes (1 (2.9%) with diabetes type 2 and 3 (8.8%) with diabetes type 1), 5 (14.7%) had hypertension, 16 (47.1%) were active smokers, median BMI was 24 kg/m² (22-27).

Ischemic cardiomyopathy was the most common aetiology (n=30, 88.2%) with mainly patients admitted for anterior STEMI (n=20, 58.8%) when the IVT was diagnosed. 62.5% of patients with LVT had anterior STEMI. Eight (23.5%) patients had anterior chronic infarction (more than a week) and 2 (5.9%) patients had ischemic disease without infarction (multivessel coronary artery disease with left ventricular dysfunction). The 2 patients with RVT had a dilated cardiomyopathy with biventricular dysfunction. 1 patient had endomyocardial fibrosis due to Churg and Strauss disease. In 5 patients, IVT was diagnosed following an initial presentation of stroke.

Table 1: Baseline characteristics of patients

Age, yrs	58 ± 16
Male	30 (88.2)
Body mass index, kg/m²	24 (22-27)
Active smoking	16 (47.1)
Hypertension	5 (14.7)
Diabetes	4 (11.8)
Creatinine clearance, ml/min	83 (77-97)
Prior atrial fibrillation	0 (0)
Prior stroke	
- initial presentation of stroke	5 (14.7)
- former stroke	1 (2.9)
Prior major bleeding	1 (2.9)
Previous antiplatelet therapy	
- Aspirin	7 (20.6)
- Clopidogrel	1 (2.9)
- Ticagrelor	2 (5.9)

Previous anticoagulant therapy	
- VKA	0 (0)
- DOA	3 (8.8)
Type of cardiomyopathy	
- Ischemic cardiomyopathy	30 (88.2)
Anterior STEMI	20 (58.8)
Anterior chronic infarction	8 (23.5)
Ischemic disease without infarction	2 (5.9)
- Dilated cardiomyopathy	3 (8.8)
- Endomyocardial fibrosis	1 (2.9)
Values are n, mean ± SD, n (%), median (interquartile range)	

TTE and CMR characteristics

There were 25 IVT diagnosed on TTE. Left ventricular ejection fraction (LVEF) was moderately impaired with mean LVEF of $39.5 \pm 11.9\%$. Akinesia of apical segments was the most frequent left ventricular wall motion abnormality (67.6%). Apical IVT was predominant (96%). IVT was mobile in 6 (24.0%) patients and calcified in 1 (4.0%) patient. Contrast TTE has been used 3 times to assist IVT diagnosis. The baseline echocardiographic characteristics are shown in *Table 2*.

Twenty-two CMR were performed to confirm the presence of IVT seen in TTE or to search for IVT in patients at risk. There were 20 (95.2%) apical left ventricular thrombus and 1 (4.8%) right ventricular thrombus. LVEF was more altered than TTE with mean LVEF of $33.9 \pm 13.4\%$. Apical hypokinesia was the most frequent left ventricular motion abnormality (40.9%). The baseline CMR characteristics are shown in *Table 3*.

1 right ventricular thrombus was diagnosed on CT scan.

Table 2 : Baseline Echocardiographic characteristics

TTE	34
Patients with IVT	25 (73.5)
Left ventricular ejection fraction, %	39.5 ± 11.9
Left ventricular wall motion	
- Apical akinesia	23 (67.6)
- Apical hypokinesia	3 (8.8)
- Global hypokinesia	4 (11.8)
Left ventricular aneurysm	4 (11.8)
Ventricular thrombus	
- Largest diameter, mm	26.5 (20-33)
- Apical thrombus	24 (96)
- Mobile thrombus	6 (24)
- Calcified thrombus	1 (4)
Contrast TTE	3 (8.8)
Right ventricular dysfunction	4 (11.8)
Values are n, n (%), mean ± SD, median (interquartile range)	

Table 3: Baseline Cardiac Magnetic Resonance characteristics

CMR	22
Patients with IVT	21 (95.5)
Left ventricular ejection fraction, %	33.9 ± 13.4
Left ventricular wall motion	
- Apical akinesia	8 (36.4)
- Apical hypokinesia	9 (40.9)
- Global hypokinesia	4 (18.2)
- Apical Dyskinesia	1 (4.5)
Left ventricular aneurysm	7 (31.8)
Ventricular thrombus	
- Largest diameter, mm	11 (8-18)
- Apical left ventricular thrombus	20 (95.2)
- Right ventricular thrombus	1 (4.8)
Values are n, n (%), mean ± SD, median (interquartile range)	

Treatment of IVT

Four (11.8%) patients were treated with DOA therapy alone: 2 patients with apixaban 5mg twice daily, 1 patient with dabigatran 150mg twice daily and 1 patient with dabigatran 110mg twice daily. Most patients (16 patients, 47.1%) were treated with anticoagulation together with aspirin and clopidogrel. The most common DOA prescribed was apixaban 5mg twice a day with 14 patients (41.2%) (*Table 4*).

Table 4: Anticoagulation and antiplatelet therapy

Anticoagulation only	4 (11.8)
Anticoagulation + antiplatelet	
- DOA + aspirin	9 (26.5)
- DOA + clopidogrel	3 (8.8)
Anticoagulation + dual antiplatelet therapy	
- DOA + aspirin + clopidogrel	16 (47.1)
- DOA + aspirin + ticagrelor	1 (2.9)
- DOA + aspirin + prasugrel	1 (2.9)
Anticoagulation type	
- Apixaban 2,5mg x2	5 (14.7)
- Apixaban 5mg x2	14 (41.2)
- Rivaroxaban 15mg	3 (8.8)
- Rivaroxaban 20mg	1 (2.9)
- Dabigatran 110mg x2	7 (20.6)
- Dabigatran 150mg x2	4 (11.8)
Values are n (%)	

Thrombus resolution and reduction

IVT resolution was observed in 25 (73.5%) patients with a median time between IVT diagnosis (on TTE, CMR or CT scan) and follow-up CMR of 99 days (interquartile range: 79 to 196 days). The resolution occurred in all RVT and 23 (71.9%) LVT.

In the 9 patients with persistent IVT, 6 patients have a time between diagnosis and follow-up CMR less than 6 months.

Among 7 patients with residual IVT who underwent initial and follow-up CMR, IVT reduction was observed in 4 (57.1%) patients.

CMR vs TTE for detection of IVT

Twenty-seven patients had both follow-up TTE and CMR. IVT disappeared in 18 patients in both tests. In 4 patients, CMR revealed the presence of IVT when it was absent on TTE and 2 patients had IVT on TTE and not on CMR. Kappa statistic for IVT detection was 0.36 which corresponds to a poor agreement.

Cardiovascular events and bleeding

One patient had an ischemic stroke one day following apixaban introduction. Anticoagulant therapy was changed for dabigatran. There was no death or myocardial infarction during the follow-up. Major bleeding (BARC ≥ 3) occurred in 1 (2.9%) patient for whom a transfusion was necessary because of occult bleeding. This patient was treated with apixaban 5mg twice a day associated with aspirin.

Ischemic and bleeding events were not available in 4 patients.

Discussion

IVT resolution was observed at follow-up CMR in 73.5% of patients treated with DOA with rare adverse events (5.8%), one patient presented an ischemic stroke and one patient severe bleeding (BARC ≥ 3).

Incidence of LVT from acute myocardial infarction and infarct size have decreased since the introduction of primary percutaneous coronary intervention (PCI) and early reperfusion.

In Driesman et al. (16), the incidence of early LVT after acute anterior myocardial infarction was 15.2% in the era of PCI as opposed to 40% and 28% in the prethrombolytic and thrombolytic eras. Le May et al. (17) found a lower rates with 2.9%. Isolated RVT is rare, most are present with LVT and have been described in association with hypercoagulability states, autoimmune diseases, dilated cardiomyopathy, inferior myocardial infarction and arrhythmogenic right ventricular cardiomyopathy. RVT data are very limited with most case reports (18,19). Despite the few number of patients with RVT in our study, we had resolution of all RVT.

Current guidelines recommend the use of VKA to treat LVT but several case reports of successful resolution of LVT with DOA were reported (6–8). A retrospective observational study found a similar efficacy between VKA and DOA in LVT resolution with 71.5% of resolution with VKA and 70.6% with DOA (20). An observational prospective study of a large cohort of patients found that LVT resolution was better and earlier in the DOA group compared to patients treated with VKA (81% vs 63%) (21). DOA were the first line therapy in our center when IVT was detected, while VKA were reserved to contra-indications of DOA. Use of VKA is declining in favor of DOA regarding numerous limits including the narrow therapeutic index, a slow onset of action, the need for constant monitoring or several drugs' interactions and foods restrictions. The role of DOA for stroke prevention in

AF has been established in randomized studies and registries: rivaroxaban was noninferior to VKA and apixaban was superior to VKA in the prevention of stroke or systemic embolism (22,23). Current guidelines recommend DOA in preference to VKA in this case (Class I; Level of Evidence A) (11). DOA are also used in treatment of acute venous thromboembolism (VTE), prevention of recurrent VTE and prophylaxis in major orthopedic surgery. When the medications were release, the main issue was the lack of reversal agent but there is a specific antidote to dabigatran called idarucizumab (Praxbind®) since 2015 and andexanet alpha (Ondexxya®), an antidote for factor Xa inhibitors apixaban and rivaroxaban, has a conditional marketing authorisation in the European Union since 2019.

European guidelines recommend 6 months of treatment after LVT diagnosis but this strategy was empirical (4). In our study, 6 of 9 patients with residual IVT had a follow-up CMR less than 6months after diagnosis. We can assume that IVT could have disappeared if CMR had been performed at 6 months.

The diagnosis of IVT can be performed by TTE or CMR. TTE was the main test used for IVT detection due to its great accessibility, most CMR were performed to confirm the presence of IVT seen on TTE. Weinsaft et al. (14) reported that noncontrast TTE has a sensitivity of 35%, specificity of 98%, a positive predictive value of 67% and a negative predictive value of 94% when using Delayed Enhancement CMR as the reference for LVT diagnosis. This could explain the small number of patients in our study, IVT would probably have been higher if CMR had been performed systematically in all patients with anterior myocardial infarction.

The agreement between follow-up TTE and CMR for IVT detection was low in our study. Among 27 patients who had both tests, 9 IVT were present including 6 detected on one test but not on the other. This could be explained by insufficient image quality of TTE specially of the apex, the non-systematic use of TTE with contrast or the inter-individual variability

with 4 patients with IVT on CMR and not on TTE or by the long period between the two tests in 2 patients (6 months).

Only 3 TTE with contrast were used to help IVT diagnosis in our study. This may be due to the fact that Sonovue, the ultrasound contrast agent used in our center, was contraindicated in patients with recent acute coronary syndrome or clinically unstable ischemic cardiac disease since 2004 because of 3 cases of adverse events with fatal outcome in patients with underlying severe cardiac disease. Since 2015, the European Medicines Agency removed the contraindications and replaced it with special warnings and precautions for use. Weinsaft et al. (14) showed that contrast TTE improved sensitivity nearly two-fold (64%). Based on these data, contrast TTE could be a good test for IVT screening particularly in patients with anterior myocardial infarction.

Limitations:

This study has several limitations.

This is a pilot study with low number of patients, our objective was to include prospectively about one hundred patients. The number of patients was insufficient to extrapolate our results but they are encouraging regarding both efficacy and safety of DOA for resolution of IVT.

The study gave no information regarding duration of anticoagulation therapy needed after resolution of thrombus. This follow-up of 6 months is relatively short but efficacy of DOA is probably optimal at this end point.

The diagnosis was principally based on echocardiography which has a low sensitivity and CMR and contrast TTE were not routinely used to detect IVT in patients at risk, IVT may be missed.

It was an observational study. Randomized prospective trials are needed to determine the real incidence of IVT with the modern reperfusion strategy of STEMI as effectiveness of DOA compared to VKA for thrombus resolution.

Conclusion

In this prospective pilot, observational and multicenter study, DOA therapy was associated with the complete resolution of the IVT in 73.5% with severe events observed in 5.8% of patients. The preliminary results suggest that DOA are effective in treating IVT with few ischemic and bleeding events.

Larger observational data and randomized studies with comparison with VKA will be required to confirm these results.

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Annexe: Institutional Review Board



Institutional Review Board (I.R.B.) MONTPELLIER UNIVERSITY HOSPITAL

IRB Secretary

Phone : 04.67.33.98.33 / 04.67.33.08.12

IRB Accreditation number : 198711

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MOLINARI Nicolas

Vice President :

JUNG Boris
PANARO Fabrizio

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AMEDRO Pascal
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Research organized and practiced on the human being for the development of biological or medical knowledge known as 'research involving the human person' as defined in Article L. 1121-1 of the Public Health Code are to be reviewed by a committee Protection of Persons (CPP) and can not be reviewed by the IRB.

Project Title :

Effet des anticoagulants oraux directs sur les thrombus intra VG évalués par IRM cardiaque

IRB ID : 202100778

Applicant :

- Responsable de l'étude :
Mme LE PROFESSEUR LECLERCQ FLORENCE (f-leclercq@chu-montpellier.fr)
- Contact pour le droit d'information des patients :
Mme LE PROFESSEUR LECLERCQ FLORENCE (f-leclercq@chu-montpellier.fr)

Organizational Affiliation :

- UNIVERSITY HOSPITAL CENTER OF MONTPELLIER

Opinion of the IRB :

APPROVED

Documents sent to the summary of the IRB for the evaluation :

- Synopsis : 10/03/2021
- Comments :

Approval Number assigned by the IRB : IRB-MTP_2021_04_202100778

MONTPELLIER UNIVERSITY HOSPITAL
191, Avenue du Doyen Gaston GIRAUD
34295 MONTPELLIER CEDEX 5

This notice does not relieve the Study principal investigator of the obligations under the processing of personal datum

SERMENT

- *En présence des Maîtres de cette école, de mes chers condisciples et devant l'effigie d'Hippocrate, je promets et je jure, au nom de l'Être suprême, d'être fidèle aux lois de l'honneur et de la probité dans l'exercice de la médecine.*
- *Je donnerai mes soins gratuits à l'indigent et n'exigerai jamais un salaire au-dessus de mon travail.*
- *Admis (e) dans l'intérieur des maisons, mes yeux ne verront pas ce qui s'y passe, ma langue taira les secrets qui me seront confiés, et mon état ne servira pas à corrompre les mœurs, ni à favoriser le crime.*
- *Respectueux (se) et reconnaissant (e) envers mes Maîtres, je rendrai à leurs enfants l'instruction que j'ai reçue de leurs pères.*
- *Que les hommes m'accordent leur estime si je suis fidèle à mes promesses. Que je sois couvert (e) d'opprobre et méprisé (e) de mes confrères si j'y manque.*

Résumé

INTRODUCTION : Les thrombus intraventriculaires gauches (TVG) sont associés à des risques d'embolies systémiques, de morbidités et de mortalité. Les thrombus intraventriculaires droits (TVD) sont rares mais avec un risque potentiel d'embolie pulmonaire. Le traitement de première intention actuellement correspond aux antagonistes de la vitamine K (AVK), mais ils présentent plusieurs limites en termes d'efficacité et de sécurité.

OBJECTIF : L'objectif de cette étude était d'évaluer l'efficacité des anticoagulants oraux directs (AOD) sur la disparition des thrombus intraventriculaires (TIV) en imagerie par résonance magnétique (IRM).

METHODE : De juin 2018 à septembre 2021, nous avons inclus les patients ayant un diagnostic de TIV en échographie transthoracique (ETT), en IRM ou en tomodensitométrie (TDM) et traités par AOD au centre hospitalier universitaire de Montpellier et de Nîmes. Les patients présentant une contre-indication à l'IRM ou traités par AVK ou héparine de bas poids moléculaire ont été exclus. Le critère de jugement principal était la disparition du TIV en IRM à 6 mois et les critères de jugements secondaires comprenaient la mortalité, les événements thromboemboliques et les événements hémorragiques.

RESULTATS : Trente-quatre patients avec un âge moyen de 58 ± 16 ans et une majorité d'hommes (n=30, 88.2%) ont été inclus dont 32 TVG et 2 TVD. La cardiomyopathie ischémique était l'étiologie la plus fréquente (n = 30, 88.2%) avec principalement des infarctus du myocarde antérieur (n = 20, 58.8%). Les TVD étaient retrouvés uniquement

dans les cardiopathies dilatées avec dysfonction biventriculaire. Les patients étaient traités par apixaban (55,9%), dabigatran (32,4%) ou rivaroxaban (11,7%). Les antiagrégants plaquettaires ont été utilisés chez 88,2 % de la population. La disparition du TIV a été observée chez 25 (73,5 %) patients lors de l'IRM de suivi, 23 (71.9%) TVG et tous les TVD. Un accident vasculaire cérébral est survenu chez un patient (2.9%) et une hémorragie sévère (BARC \geq 3) chez un patient (2.9%) à 6 mois de suivi.

CONCLUSION : Dans cette étude pilote, prospective, observationnelle et multicentrique, le traitement par AOD a été associé à une disparition du TIV chez 73,5% des patients avec des événements graves observés chez 5,8 % des patients. Les résultats préliminaires suggèrent que les AOD sont efficaces pour traiter les TIV avec peu d'événements ischémiques et hémorragiques. La réalisation d'études randomisées avec comparaison entre les AOD et les AVK sont nécessaires pour confirmer ces résultats.

MOTS CLES : thrombus intraventriculaire, anticoagulants oraux directs, anti vitamine K, échocardiographie, imagerie par résonance magnétique