

Rescue Mechanical Thrombectomy After Failed Thrombolysis in a Pregnant Patient Case Report

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ABSTRACT

Pulmonary thromboembolism in pregnancy is a complication that directly impacts morbidity and mortality, the incidence is conditioned by the prothrombotic state during pregnancy and in the postpartum period, since the most important risk factor in this context is deep vein thrombosis, a condition that exponentially increases the risk of presenting thrombotic events such as pulmonary thromboembolism, in the clinical presentation there are no differences in this context, however it is important to note that to date there are no risk scales where pregnancy is included as part of the factors within a scale, so clinical diagnosis, biochemical and imaging is of vital importance, in order to reduce the potential complications and outcome of this group of patients.

In the diagnostic approach, image diagnosis such as the Transthoracic/Tranesophageal Echocardiogram is of vital importance, with the purpose of searching for etiology. It is worth mentioning that in the group of patients in whom thrombotic events of the ischemic CVD type are evident, within the diagnostic possibilities are atherosclerosis of large vessels, cardioembolism or vasculitis, in turn in the group of patients in whom evidence of thrombotic events such as PE must be ruled out the possibility of structural alterations at the level of right cavities, as well as shunts such as foramen. Patent oval, ASD, once identified, there are various Echocardiographic techniques for the detection of these conditions, such as echocardiogram with air-fluid contrast, through which morphological characteristics are visualized, being important for the assessment of direct risk, in the event of possible complications. short-medium term, such as the risk of presenting cerebrovascular events, is of vital importance when making therapeutic decisions, since once the risk is identified, surgical/percutaneous therapeutic options are available, according to the patient's context.

In the present case, reference is made to a young patient whose main risk factor is Pregnancy 10.5 SDG, and whose initial presentation to the case was pulmonary thromboembolism of main branches, secondary to deep vein thrombosis, in which thrombolysis was performed with rtPA, continuing with data of hemodynamic instability for which invasive treatment was decided by mechanical thrombectomy with an immediate favorable response, in turn presented a second thrombotic event, of the Ischemic cerebrovascular event type in the territory corresponding to the posterior cerebral artery secondary to a patent foramen ovale. with a favorable outcome after timely multidisciplinary treatment.

KEYWORDS: pulmonary thromboembolism, pregnancy, patent foramen ovale, cerebrovascular event, thrombolysis in pregnancy, mechanical thrombectomy.

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INTRODUCTION

Pulmonary thromboembolism (PTE) is considered one of the most common causes of maternal morbidity and mortality, according to data from the World Health Organization, it accounts for 3% of maternal deaths worldwide, with Venous Thromboembolism (VTE) being the most frequent risk factor associated with pregnancy, contributing 10 to 15% of mortality in this sector of the population. 1

Pregnant women experience 10 to 14 VTE events per 10,000 births. The risk of VTE is up to six times higher in pregnant women than in the general population with an absolute risk of up to 12.2 per 10,000, compared with 2 per 10,000 in non-pregnant women; This risk increases during pregnancy and reaches the highest level in the postpartum period. The incidence of VTE increases slightly above that of the general population in the first trimester, increases more during the third trimester, and peaks in the first two weeks after delivery, although the risk of VTE remains elevated up to 12 weeks.2

The most common risk factors for VTE in the general population remain present in pregnancy, however, there are specific risks in pregnancy such as personal history of VTE, Thrombophilia, Age >35 years, BMI >30 kg/m², Immobility, Nulliparity, Multiple gestation, Gestational diabetes, Preeclampsia, Caesarean section, Postpartum infection, Smoking, Hypertension, Diabetes, Systemic lupus erythematosus, Antepartum hemorrhage, Sick cell disease. 2

The pregnancy is in a prothrombotic state in the final stage of pregnancy to prevent bleeding at the time of delivery. Coagulation factors II, VII, IX, X, XII, von Willebrand factor, and fibrin increase, protein S decreases, contributing to greater resistance to activated protein C. Decreased venous flow rate, venous distention, and obstruction of venous return by a pregnant uterus, which leads to blood flow stasis. Together, these factors account for between 6% to 11% of pregnancy-associated DVT. 3

The diagnosis of PE during pregnancy is complex, the clinical presentation does not differ in this condition, within this presentation: Dyspnea represents (34.7%), Sinus tachycardia (30.4%), pain or edema of the lower limbs (9.6%) and chest pain (13%). Risk prediction models and algorithms currently validated in the context of VTE, such as Wells criteria, modified Geneva score, have not been validated in the Pregnancy condition. Within the biochemical diagnosis, D-dimer concentrations are unreliable because they increase continuously during pregnancy and are higher than the VTE exclusion threshold in almost a quarter of women during the third trimester of pregnancy. 4

Within the diagnostic approach in conditions of pregnancy, with a high suspicion of PE, the aim should be to rule out DVT as a possible etiology. In this context, venous compression ultrasound plays an important role in the approach, thus reducing the use of radiation. It is worth mentioning the use of imaging methods for the diagnosis of

PE in this context includes: CT Angio, V/Q Scintigraphy, and Chest Magnetic Resonance Angiography.

Among the limitations in the choice of imaging modality are maternal and fetal exposure to radiation and contrast, it is worth mentioning for V/Q scintigraphy and CT angiography, the fetal radiation dose is much lower than the threshold associated with Fetal complications due to radiation of 50 to 100 mSv. Both a normal perfusion scan and a negative CT angiography appear to be equally safe in excluding the diagnosis of PE in pregnancy.4-5.

Among the therapeutic options, the gold standard in this context is anticoagulation with low molecular weight heparin, currently considered the treatment of choice for PE during pregnancy. Unlike VKAs and direct anticoagulants, LMWH does not cross the placenta and, therefore, does not carry a risk of fetal hemorrhage or teratogenicity. Thrombolysis or surgical embolectomy should be considered depending on the degree of severity, hemodynamic status, risk markers, etc. Likewise, it is recommended to replace LMWH with UFH at least 36 hours before delivery. The infusion should be stopped 4-6 hours before delivery with a normal activated partial thromboplastin time before starting regional anesthesia. LMWH should not be administered for at least the first 4 hours after removal of the epidural catheter; reinstatement of LMWH in the postpartum period will depend on the evaluation of thrombotic risk versus hemorrhagic risk. Anticoagulant treatment must be administered for at least 6 weeks after delivery and with a total duration of treatment of 3 months. It is worth mentioning that if breastfeeding is chosen, the use of LMWH and/or warfarin must be chosen, since In this context, the use of direct anticoagulants is not recommended. 5-10.

The foramen ovale is an intracardiac structure at the level of the interatrial septum essential for fetal circulation. After birth, pulmonary flow increases, therefore the left atrial pressure increases intracavitary pressures, which favors the closure of this structure 1 to 3 years later. at birth. However, when the septum primum and septum secundum around the foramen ovale are not completely fused, a unidirectional right-left shunt occurs, when the right atrial pressure exceeds the left atrial pressure, this is known as patent foramen ovale (PFO), which is present in 15 to 25% of healthy adults. This is relevant, since the generation of thrombosis at the level of the right cavities with continuity to the left cavities through a PFO is a condition for a paradoxical cerebral embolism. 11

In the presence of patent foramen ovale, the diagnostic approach is by performing a transthoracic/transophageal Echocardiogram by injection of contrast bubbles, as well as a transcranial Doppler Study.11

Most PFO cannot be detected at rest and a contrast bubble study using the Valsalva maneuver is essential. Normally, the left atrial pressure is higher than the right atrial pressure, however it is not a significant difference, however, immediately after performing the Valsalva maneuver, the

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right atrial pressure becomes temporarily higher than left atrial pressure, and the right-left shunt can be detected more clearly. 11

There are several evaluation criteria for the bubble test, and it is common for test results to be considered positive when contrast is found in the left atrium after filling the right atrium or within 3 heartbeats after it is filled. releases the Valsalva maneuver. If contrast appears in the left atrium after 3 beats, pulmonary shunt due to pulmonary arteriovenous fistula is suspected.

Bypass grades are classified into grades 0 to 3 depending on the number of bubbles detected in the left cardiac system: Grade 0 without passage of bubbles, Grade 1 of 1 to 9 bubbles, Grade 2 of 10-20 bubbles and Grade 3 more of 20 bubbles that strongly suggest the presence of a PFO.

When the presence of a PFO is suspected after a contrast echo study, morphological evaluation should be performed using transesophageal echocardiography. 12

Transesophageal contrast echocardiography is necessary to characterize PFO and stratify risk in the diagnostic phase to stratify and evaluate surgical/percutaneous treatment decision making.

Among the characteristics to be evaluated of the PFO are the size, location, length of the tunnel, spatial relationship and distances between the PFO and the aortic root, vena cava, valves and the free walls of the atrium, comprehensive evaluation of the interatrial septum, including the inspection for aneurysms of the interatrial septum, movement and other defects, presence/absence of Eustachian valve and/or Chiari network, thickness of the septum primum and secundum, also perform color Doppler evaluation of the shunt at rest and after Valsalva maneuver, with Based on the previously mentioned characteristics, a score is given on the MorPFO score scale to assess the risk of cerebrovascular event. This scale is divided into low risk from 0 to 7 points, intermediate risk from 8 to 11 points and 12 to 21 points. high risk and closure is recommended. 12

Currently, based on accumulated evidence, there have been no techniques that can be considered a gold standard since, in most cases, an accurate diagnosis of PFO requires the combined use of different techniques, prescribed according to their different characteristics. 13

Treatment for patients who have already had an event, antiplatelet or anticoagulant therapy has been recommended to prevent recurrence of cerebral infarction in patients with paradoxical embolism. However, it has not shown significant differences in the benefit of anticoagulant therapy compared to antiplatelet therapy. If cryptogenic stroke occurs due to thromboembolism through PFO, transcatheter closure contributes to the reduction of recurrence. 13

The 2019 European guidelines that evaluate the risks and benefits of treating patients with patent foramen ovale recommend performing percutaneous closure in carefully selected patients aged between 18 and 65 years with the following criteria: confirmed cryptogenic stroke, transient

ischemic attack or systemic embolism and estimated high probability of a PFO causative agent as assessed by clinical, anatomic, and imaging characteristics. 14

Interventional treatment must be individualized according to the context of each patient, evaluating the risk-benefit of the PFO closure procedure versus medical treatment based on indefinite formal anticoagulation. 14

Patients on oral anticoagulants for pulmonary embolism or those considered at high risk for recurrences may undergo evaluation of the PFO for possible closure. 15

The choice of device must take into account that most of the available studies have been obtained with the AMPLATZERTM PFO Occluder and CARDIOFORM septal occluder. The potential use of these devices must reevaluate the technical, anatomical and clinical characteristics for decision making regarding their risks and benefits. There are no current indications for surgical closure of a PFO as first-line treatment.

Surgical closure of incidental PFO is usually performed during valve surgery or in the rare cases where a thrombus is found mounted in the PFO, or in complications of percutaneous closure that cannot be treated by non-invasive means. 15

CLINICAL CASE

This case report describes a 35-year-old female with these cardiovascular risk factors: sedentary lifestyle, consumption of an atherogenic diet, overweight, BMI 27.4 kg/m², denies chronic degenerative diseases, gynecological and obstetric history, 6 pregnancies, 2 deliveries, 1 cesarean section, 2 abortions, with a pregnancy of 10.5 weeks of gestation, no contraceptive method. To the directed cardiovascular questioning: With a history of dyspnea with medium exertion. Denies, palpitations, syncope, lipothymias, paroxysmal nocturnal dyspnea, edema, bendopnea, angina and deterioration of functional class.

His condition begins with sudden oppressive chest pain of moderate intensity, diffuse onset, without irradiation, without aggravating or mitigating factors, accompanied by dyspnea on medium effort without disabling daily activities, which progresses to dyspnea on small effort, with loss of alert condition, reason why she went to the emergency department, on physical examination she presented tachypnea, polypnea, tachycardia and oxygen desaturation, with supplemental oxygen support through high flow cannulas Fio₂ 100% maintaining saturation 67%, so it was decided advanced airway management through invasive mechanical ventilation. An evaluation was carried out by gynecology, reporting a single live intrauterine product of 10.5 sdg, excluding obstetric pathology. She was evaluated by the cardiology service with suspicion of pulmonary thromboembolism, was performed an echocardiogram, reporting systolic dysfunction of the right ventricle; McConell sign (+), dilated right ventricle with RV/LV ratio >1, TAPSE 13, Fraction shortening 13%. (Fig 1)

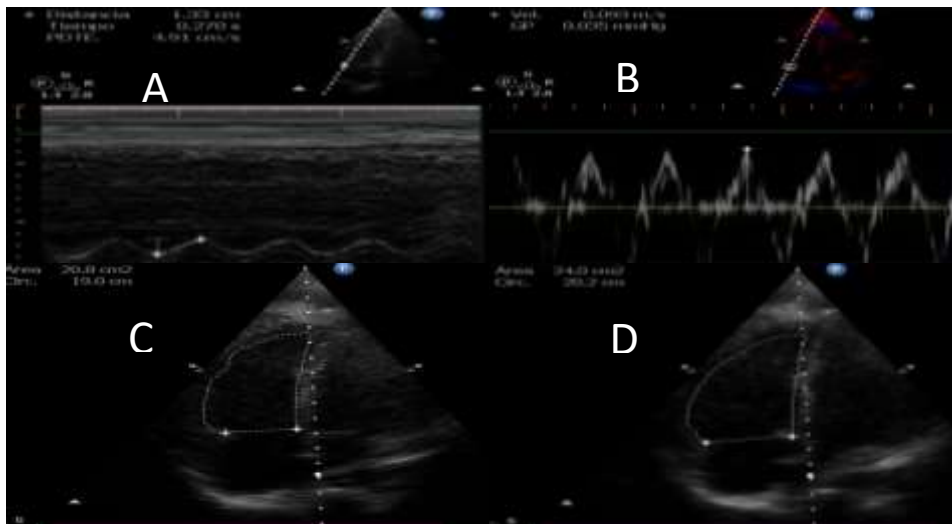


Fig 1 Transthoracic echocardiogram, Apical four chambers with systolic dysfunction of the right ventricle in M mode with 13mm TAPSE (A) with tissue Doppler and pulsed with S wave of 8m/s (B), fractional shortening 13% (C and D)

Angiotomography was requested to corroborate the diagnosis, showing thrombus in the bifurcation of the main pulmonary artery on the right side with segmental and lower lobar obstruction. (Fig 2)

Management with thrombolytic (alteplase) was initiated at a dose of 100 mg for 2 hours and subsequently an episode of cardiorespiratory arrest occurred requiring 3 cycles of cardiopulmonary resuscitation and 2 doses of adrenaline (1 mg each) with spontaneous return of circulation in sinus rhythm. She was admitted to intensive cardiological care therapy to continue management, and remained unstable without improvement in oxygenation due to the support of inotropes and vasopressors. Subsequently, a simple cranial tomography was performed in which no hyperdense lesions suggestive of hemorrhage or ischemia were observed, so the

patient was admitted to the hemodynamics room to perform a mechanical thrombectomy procedure as rescue therapy. At the time of admission to the hemodynamics room, she presented a new episode of cardiorespiratory arrest with pulseless electrical activity, 2 cycles of advanced cardiopulmonary resuscitation were performed, with spontaneous return of circulation in sinus rhythm. The procedure begins by incidentally documenting patent foramen ovale vs interatrial communication. Mechanical thrombectomy was performed with a 6-fr pigtail catheter towards the pulmonary artery trunk, left and right pulmonary branches. Permeability is obtained of the right pulmonary arterial segment in its entirety and the left pulmonary arterial segment is able to become patent superior and middle lobar artery, leaving inferior lobar artery occlusion. (Fig 2)



Fig 2. Angiotomography, thrombus in bifurcation of main branches (A) and in right branch with segmental and lower lobar obstruction (B), Pulmonary angiography with obstruction of main branches predominantly right (C), post mechanical thrombectomy with pigtail catheter with patency of main branches, patent right branch in its entirety and left branch only superior and middle lobar artery (D)

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Subsequently, she was admitted to the intensive care unit to continue surveillance and monitoring with notable ventilatory improvement. Catastrophic antiphospholipid syndrome and refractory shock were suspected. During hospitalization, she presented a spontaneous and complete abortion of the child and placenta. She was evaluated by gynecology and infectious disease, calculating a very low risk of chorioamnionitis and recommended an antibiotic regimen with Ceftriaxone, metronidazole and azithromycin. Likewise, she was evaluated by the hematology service due to the presence of bicytopenia (thrombocytopenia and anemia), an approach for thrombophilia and antiphospholipid syndrome (APS) was initiated with negative antibody results, treatment with hydroxychloroquine was initiated. A Doppler ultrasound of the pelvic limbs was performed with the finding of left popliteal venous thrombosis. . (Fig 3)

During his hospitalization, she presented data of targeting and decreased visual acuity, a new simple cranial CT scan was performed, showing ischemic type cerebrovascular event dependent on the posterior cerebral artery, treatment with neuroprotection was started, presenting hemodynamic and ventilatory improvement, achieving successful extubation, transcranial Doppler was performed. evidencing a curtain pattern (Fig 3) suggestive of a shunt from right to left. An echocardiogram was performed, reporting an aneurysmal interatrial septum and a patent foramen ovale that allowed the passage of air-fluid contrast to the left cavities, in a number greater than 20. A control cranial tomography was performed and a hypertensive lesion compatible with cerebral hemorrhage was visualized, evaluated with neurology and commenting. which does not modify the prognosis or management (Fig 3).

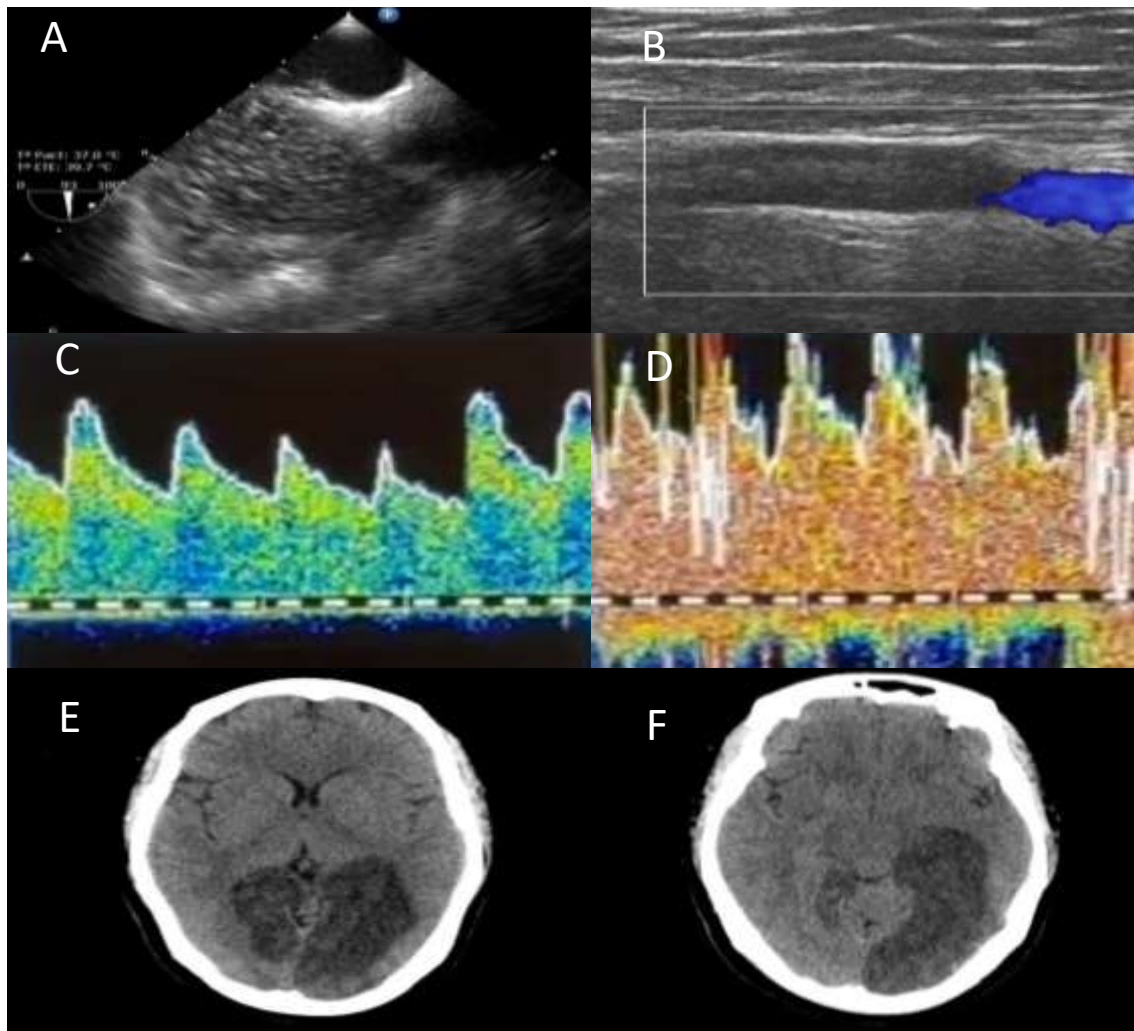


Fig 3. Transesophageal echocardiogram with hydroaerial contrast showing passage to the left cavities of more than 20 bubbles, patent foramen ovale less than 5mm, with aneurysm of the interatrial septum (A), Doppler ultrasound of the left pelvic limbs with a hypoechoic image suggestive of thrombosis that does not allow flow passage (B), transcranial Doppler curtain pattern suggestive of shunt from right to left (C and D), simple cranial tomography with hypodensity in the territory of the posterior cerebral artery predominantly left with mild cerebral edema, lacunar infarction in the left lenticular nucleus (E and F).

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Patient presents data of septic shock documenting 2 infectious foci secondary to pneumonia associated with mechanical ventilation with simple chest tomography showing right basal consolidation and placental remains at the uterine level, so instrumented uterine curettage was performed by the gynecology service while undergoing treatment. broad spectrum antibiotic for 10 days. She presented clinical improvement without hemodynamic instability with an

adequate response to treatment, so it was decided to discharge her home after 25 days of in-hospital stay.

She is evaluated in the outpatient clinic 8 weeks after discharge with negative results of antibodies for antiphospholipid syndrome, adequate anticoagulation control, with improvement in functional class without neurological sequelae and right ventricular function with improvement. (Fig. 4)

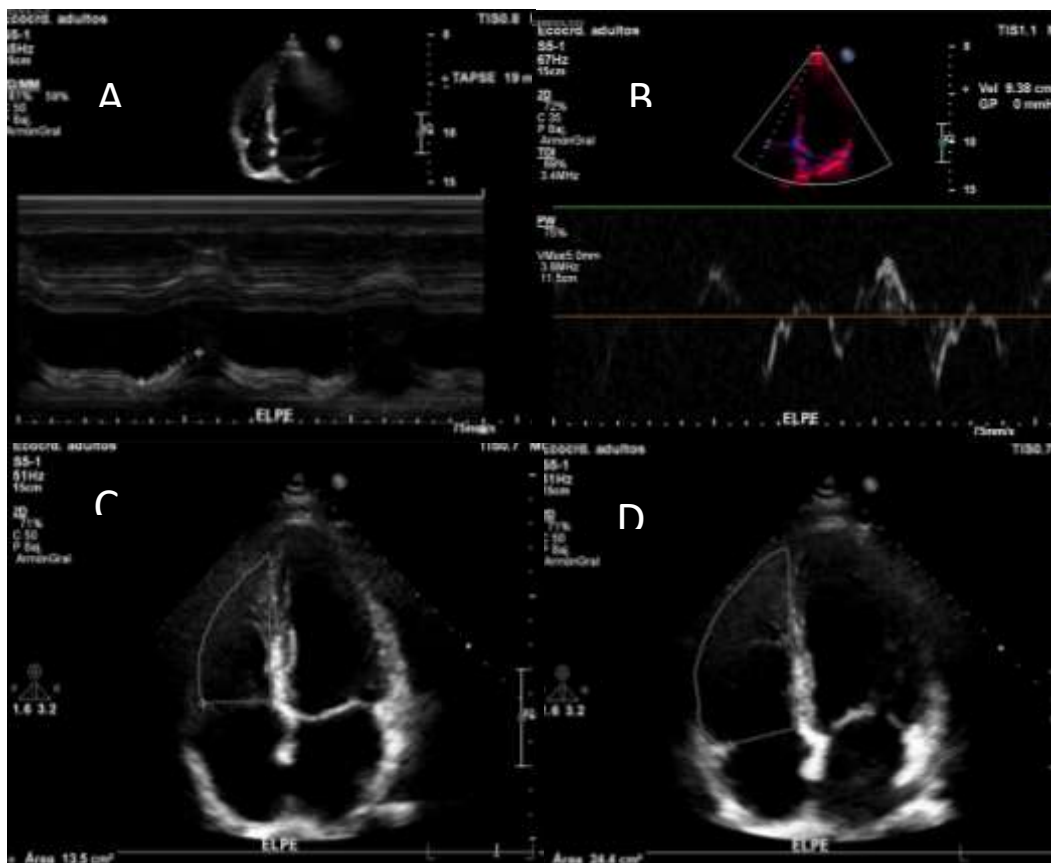


Fig 4 Transthoracic echocardiogram, Apical four chambers with systolic function of the right ventricle in M mode with 19mm TAPSE (A) with tissue Doppler and pulsed with S wave of 9m/s (B), fractional shortening 45% (C and D)

DISCUSSION

As is well known, pregnancy is a prothrombotic state which increases the risk of developing thrombosis at various levels that can put the life of the pregnant woman and the product at risk, an example of which is pulmonary thromboembolism. In these cases there is controversy about the diagnostic methods, since predictive models of the disease have not been validated for this population group and the definitive diagnosis must be carried out through imaging studies which imply exposure to radiation with the fear of cause damage to the fetus derived from it. However, current evidence supports the use of imaging techniques, being safe for use during pregnancy with radiation doses below safe those associated with fetal complications and establishing the definitive diagnosis. In addition to this, the presence of a patent foramen ovale is another condition that predisposes to suffering embolic phenomena at a different level, such as the cerebral level, being classified as a paradoxical cerebral vascular event due to the passage of a thrombus from the right circulation to the

circulatory system. left through a patent foramen ovale. For this clinical condition there are different risk scales which can guide us towards the suspicion of a cerebral vascular event related to a patent foramen ovale, these scales are RoPE score and MorPFO score.

The first of them consists of 6 items which add up a score, being able to obtain a minimum score of 0 and a maximum score of 10 pts. considering high risk of paradoxical embolism in those individuals with a score >5 pts.

The second scale is based on the characteristics of the patent foramen ovale through transesophageal echocardiography to determine the risk of CVD related to the defect. This scale considers 6 parameters to which a score is added based on the imaging finding, obtaining a minimum score of 0 and a maximum of 21 pts. those with a score >12 pts were considered high-risk patients.

Due to the damage and consequences that these entities can have, it is important to have good knowledge about the diagnostic methods and clinical tools which can help us make

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an early diagnosis, to provide timely treatment and thus avoid complications that can occur. put the patient's life at risk.

CONCLUSION

Pulmonary thromboembolism is one of the most frequent causes of mortality in pregnancy. It is closely related to deep vein thrombosis, so it is necessary to carry out an adequate assessment during prenatal consultations and identify the risk factors for developing it and preventing said pathology.

The gold standard for diagnosing pulmonary thromboembolism is angiotomography; however, in pregnant patients it must be taken into consideration due to the risk of malformations; however, this will depend on the weeks of gestation, the hemodynamic status of the patient and the availability. recommended perfusion scan for pregnant patients.

The initial treatment is anticoagulation with low molecular weight heparin since it does not cross the blood-placental barrier. As long as there are no contraindications, treatment with thrombolysis or intervention will be recommended in high-risk patients.

Patent foramen ovale has a high prevalence and appears in approximately 25% of the adult population. The diagnosis is made by transthoracic echocardiogram, if there is no evidence, but it continues with high suspicion or shows another study suggestive of right shunt. on the left, like transcranial Doppler, transesophageal echocardiography is suggested. The RoPE and MorPFO scales evaluate the probability that the cerebrovascular event is secondary to the foramen ovale and is not just an incidental diagnosis. The risk is assessed as low, moderate and high. Patients who meet high-risk characteristics such as aneurysm of the interatrial septum, PFO greater than 5mm, Eustachian valve and Chiari network, to name a few, have been shown in multiple studies to benefit from percutaneous closure with a device.

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