LETTERS TO THE EDITOR

Pulmonary embolism with in-transit thrombus and foramen ovale: a source of fatal paradoxical embolism

Embolia de pulmón con trombo en tránsito y foramen oval permeable: una fuente de embolismo paradójico mortal

Sir,

In-transit thrombus (TT) in the right atrium (RA) in patients with pulmonary embolism (PE) and permeable foramen ovale (PFO) is a rare phenomenon, associated with high mortality and much controversy about its management. We report a case with this disease, complicated by fatal paradoxical embolism.

A 69 year-old man visited the emergency department for chest pain, without dyspnea, of several hours duration. He had previously been immobilized during 40 days for quadriceps tendon rupture, without thromboprophylaxis. Physical examination showed blood pressure of 115/72 mmHg, heart rate 110 bpm, oxygen saturation 99%, and the remaining parameters were normal. ECG showed sinus tachycardia at 112 bpm with an S1Q3T3 pattern. Laboratory tests showed very high levels of D-dimer and NT-proBNP, so chest CT angiography was performed, which showed a massive PE. Transthoracic echocardiogram revealed severe right ventricular systolic dysfunction, severe pulmonary hypertension and TT through the PFO (Figure 1). Transesophageal echocardiogram showed an elongated 8.5 cm image that extended from the right atrium to the inferior vena cava, reaching the left PFO cavities and prolapsing into the left ventricle. Treatment was initiated with anticoagulant dose enoxaparin and the patient was totally asymptomatic at 24 hours. On the fifth day he underwent surgery during which the TT was not observed in cardiac cavities. The postoperative period was complicated by acute thrombosis of the superior mesenteric artery, the left renal artery and splenic infarction; the patient later died.

TT is a rare phenomenon, seen in only 4% of the PE, where the role of echocardiography in early diagnosis and prognostic evaluation is paramount. According to previous studies, these patients have a high mortality rate (40%), an increased risk of recurrent PE as well as paradoxical embolism, which requires urgent treatment[1-4]. There is much controversy about its management. Thrombolysis, embolectomy surgery or anticoagulation are the different options available, although the latter seems insufficient. Generally, urgent surgical treatment (thrombectomy and PFO closure) is chosen because of the risk of fragmentation and systemic embolization with thrombolysis, although there are no large series that support this option[5-7].

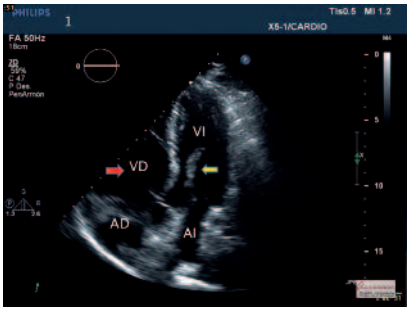

Figure 1. Transesophageal echocardiogram showing severe systolic strain. Severe right ventricular (RV) systolic dysfunction and in-transit thrombus (TT) are both marked with arrows.

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Residents in the emergency department, or doctors "in spite of themselves"

Residentes en urgencias o la formación del "médico a palos"

Sir,

We appreciate the editorial[1] on our article by Coll-Vinent B, mentioning concepts that ideally should prevail in medical education. The author of the editorial comments that in our article we forget two things: residents are doctors in training without the required expertise of an emergency doctor; and emergency training is important for residents of any specialty. The authors, university lecturers of undergraduates and graduates including MIR in emergency services, are aware of both aspects and corroborate them. What our paper reveals is the cost of this medical education in a department to which residents do not belong, where they are required to perform shift work and where "understaffing in many centers leads to internal medical residents bearing an excessive degree of responsibility for the healthcare activities of the hospital emergency department" according to findings of a joint study of Spanish ombudsmen[2].

The mix of emergency physicians and medical residents generates inefficiency in a public health system that advocates precisely efficiency and excellence. And our study shows that neither is achieved by resident doctors taking care positions that should be filled by emergency physicians. This is precisely the key point of our article, forgotten by the editorialist, that residents in emergency care occupy a position not covered by experienced medical staff, a situation unparalleled in any other medical and surgical departments in Spanish hospitals. This circumstance greatly distorts the teacher-learner relationship in the ED that is far from a purely formative relationship, since patient demand is compelling. Clearly, medical residents from other

specialties should be trained in emergencies, but this should not affect the quality of care and efficiency of a key service in the public health system.

Regarding the fact that there are no studies analyzing the efficiency of medical residents versus emergency specialists, a very recent study by Pitts et al[3] (which appeared while the editorial was in press), similar to ours, evaluated precisely the efficiency of residents. The authors came to similar conclusions as we did, and determined that the cost-effectiveness of medical residents should not only be assessed but also serve for certification of competence. Therefore, it is not about "efficiency prevailing over teaching" but this must be taken into account based on scientific evidence.

The uniqueness of EDs in Spain has no limits. We talk about MIR training in emergency medicine when there is no specialty of emergency medicine, when the teachers are not formally involved in teaching committees (only out of courtesy, by invitation or convenience) since the specialty does not exist, and their teaching activity is not accredited. Legally, emergency physician cannot tutor resident doctors, so emergency medical training is at least alegal.

We believe that the ED must be staffed by emergency physicians in accordance with existing quality standards, and provide qualified, consistent and efficient assistance; these physicians should be responsible for formal patient-centered teaching, properly accredited by the state. We believe that medical residents should receive tuition but without the burden of care as a handicap for training, and they should only be required to offer assistance in accord with their level of training. We believe that assistance and teaching should not be separate activities, but juxtaposed, and also cost-effective. So we continue to build Emergency Medicine in Spain while waiting for the creation of the specialty in which we truly believe. That will certainly homogenize and improve the functional organization of our hospital EDs and stop the idea of training of medical residents as "doctors in spite of themselves" reflected in the Spanish version of Moliere's play "The doctor in spite of himself".

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Author's reply

Réplica de la autora

Sir,

I will be brief in my reply to the letter of Montero-Murillo Perez Jimenez as essentially I agree with its contents. I would just like to make a couple of remarks.

Regarding the model of teaching, I subscribe to that proposed by the authors of the letter and in their article[1], based on a staff full of medical specialists that allows for adequate assistance and quality teaching of rotating residents. Still, I would like to emphasize that this situation should not prevent responsibility being progressively given to residents according to their time in training and experience. This responsibility is important, since without it one cannot achieve satisfactory involvement and learning.

On the other hand, my editorial[2] does allude, albeit indirectly, to poor teaching conditions for resident physicians in Spanish emergency services, which depend solely on the unrecognized will and effort of the teachers in these departments. Undoubtedly, the existence of the specialty of emergency medicine would fill the legal vacuum to which the authors correctly refer while greatly contributing to improving the quality of teaching the specialty's own residents and others.

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On studies with multiple Statistical comparisons

Acerca de los estudios con múltiples comparaciones estadísticas

Sir,

We have read with interest the work of Montero-Pérez et al. describing the impact of a strike by resident physicians on the efficiency of an emergency department in a university hospital[1]. We have some doubts about the statistical analysis, its possible limitations and influence on the validity of the results.

The authors describe the value of $p < 0.05$ as significant. However, such consideration may result in a type I error (finding spurious associations), motivated by multiple comparisons: when performing more than one statistical comparison in data analysis, one increases the probability that some yield statistically significant results by chance (29 hypothesis comparisons were made in this work: 11 appear in Table 1, three in Table 2 and fifteen in Table 3). The nominal value of significance (conventionally 0.05) should be adjusted depending on the number of hypotheses involved. Inadequate correction for multiple tests can lead to two equally undesirable outcomes: a) increase in false positives or type I error (due to a weak correction); b) the failure to detect actual effects or Type II error (due to over-correction).

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Author's Reply

Réplica del autor

Sir,

The whole set of patients under study, in statistical terms, is called the population and the particular group of individuals participating in the study is called the sample; the number of individuals in the sample is known as the sample size. The set of procedures that allows passing from the particular, i.e. the sample, to the general, usually the population, is what is called statistical inference. The error associated with studying an issue based on a particular sample chosen at random is called random error. The test or tests of hypotheses are statistical tools to answer research questions, that is, to quantify the compatibility between a previously established hypothesis with the results of a study. In any hypothesis testing we start from what is called the null hypothesis which states the equality of the two possibilities being investigated. In this hypothesis testing, two errors can be committed: type I error or α error consists of rejecting the null hypothesis being true, and a type II or β error consists of accepting the null hypothesis being false[1]. In addition, from a clinical point of view, statistical significance does not resolve all the questions that must be answered since a statistically significant association may not be clinically relevant and a statistically significant association may not be causative[2].

With these statistical premises, the comments by Guerrero Marquez and Gonzalez Diez are statistically plausible. To them we must add that in our study[3] we did not analyze samples, but populations, and they can be considered as all the patients attended during a particular period with particular circumstances, such as the strike period, and all the patients assisted in another period of normal care.

In addition, we would highlight the difference between statistical significance and clinical significance or relevance when addressing clinical problems in the investigation. The clinical relevance of a phenomenon goes beyond arithmetic calculations and is determined by clinical judgment. The relevance depends on the magnitude of the difference, the severity of the problem being investigated, vulnerability, mortality and morbidity caused by it, its cost and frequency, among other things[2]. In this context, evidence of better results in one period versus the other, far from any statistical significance, especially when we are talking in terms of cost-effectiveness, makes us think about the validity of our results and their applicability and potential impact on the hospital emergency department (ED) in the event of extrapolating our results to other hospitals. Our study, beyond the importance of statistical significance, showed highly relevant results.

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Fournier's Gangrene due to *Salmonella typhimurium*

Gangrena de Fournier por Salmonella typhimurium

Sir,

Fournier's gangrene is a necrotizing fasciitis of polymicrobial origin affecting the perineal region, predominantly appearing in men (10:1) aged 50-60 years[1]. It is characterized by obliterative endarteritis of subcutaneous arteries producing subcutaneous tissue and cutaneous gangrene. Clinically it is characterized by rapid progression: starting with necrotic patches on the skin and subcutaneous emphysema, and rapidly evolving to septic shock[2]. Treatment should be early with extensive surgical debridement, placement of drainage and broad-spectrum antibiotics[3,4]. Despite advances in treatment it is associated with high mortality (3-67%)[5].

The patient was a 53 year-old man with unremarkable medical history of interest. Since 10 days before he had been treated by a primary care physician for acute gastroenteritis, without antibiotic treatment. He visited the emergency department for intense perineal pain during several hours, accompanied by a necrotic plaque in the scrotum. He was hemodynamically unstable with tachycardia (105 bpm), hypotension (82/55 mmHg) and general malaise. Blood tests showed: leukocytes 11,000 / uL (93% neutrophils), hemoglobin 115 g / L, platelets 257,000 / uL, ions within normal range, urea 77 mg / dL, creatinine 1.86 mg / dL, blood pH 7, 23, lactate 3.6 mmol / L, PCR 394 mg / L, procalcitonin 36.94 ng / mL, CPK 912 U / L and LDH 149 U / L. Urgent CT scan showed extensive inflammatory changes in the pelvis and extraperitoneal gas which dissected abdominal muscle planes and subcutaneous tissue (Figure 1). Urgent laparotomy showed the presence of purulent fluid in the pelvis, as well as emphysema and extraperitoneal fat necrosis without intestinal involvement. Debrided necrotic tissue cultures were obtained and drainage tubes were inserted. Cultures showed the presence of *Escherichia coli, Streptococcus mitis, Bacteroides fragilis and Peptostreptococcus anaerobius*, and *Salmonella typhimurium* was isolated in all surgical specimens. He received postoperative antibiotic treatment with meropenem, linezolid and clindamycin, but no adjuvant hyperbaric treatment due to non-availability of a hyperbaric chamber at our center. The patient made a full recovery.s

Fournier's gangrene is a surgical emergency. The source of infection is

usually located in genitourinary or colorectal diseases such as perineal abscesses, prostatitis, epididymitis, bartholinitis, or perforated rectum or sigmoid neoplasms[6]. It results from the synergy between aerobic and anaerobic bacteria. Numerous causative organisms have been described, with the most commonly cited being *Escherichia coli, Staphylococcus spp, Pseudomonas aeruginosa, Streptococcus spp, Enterobacter cloacae and Bacteroides spp*[7,8]. Cases of necrotizing fasciitis by *Salmonella enteritidis* have been described in immunocompromised patients[9,10] but this is the first case of Fournier's gangrene in the context of acute gastroenteritis due to Salmonella typhimurium in an immunocompetent patient.

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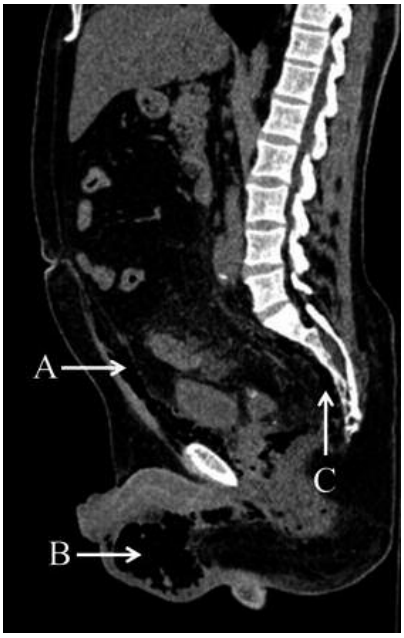

Figure 1. CT scan (sagittal slice). Arrow A: Presence of gas in the extraperitoneal retropubic space. Arrow B: Presence of gas in the scrotum. Arrow C: Presence of extraperitoneal gas in the presacral space.

Young woman with postpartum chest pain

Mujer joven con dolor torácico posparto

Sir,

Spontaneous coronary artery dissection (SCAD) is a rare cause of acute coronary syndrome (ACS). It is more common in women, and there is a strong relationship with the peripartum period[1].

A 37 year-old woman with no risk factors, at 4 weeks post-partum, visited the emergency department with angina-like chest pain. Initial ECG showed 0.5 mm elevation of the J point in V2-4, with neutralization of the T wave on serial ECG in V2-6. Biomarkers were elevated with a troponin I peak of 9.03 ng / dl [normal values (0.01- 0.05)]. Echocardiogram showed preserved left ventricle ejection fraction without alterations in regional contractility. Finally, urgent coronary angiography (within 48 hours) showed complete distal occlusion of the left anterior descending (LAD) coronary artery with apparent dissection and distal filling due to homocolateral circulation. Since this segment was a low caliber vessel, we opted for medical treatment. The patient improved and was discharged on treatment with aspirin, statins and beta-blockers.

SCAD causes 0.1-0.4% of ACS[2], a third occurring in women during pregnancy or postpartum[3]. The LAD coronary artery is affected in 80% of cases[4], and in 20% of cases the cause is unknown[5]. During pregnancy and the postpartum period, hormonal and physiological factors play an important role in the pathophysiology due to increased cardiac output, alterations in collagen synthesis, increased progesterone and estrogen and the resulting prothrombotic state[6]. Chest pain is the most common symptom, and acute myocardial infarction the most common form of presentation[7]. The prognosis is generally good, with a mortality rate of 5-66% depending on the series[8]. Optimal treatment is controversial. In most cases a conservative approach is adopted. However, thrombolytic therapy, primary angioplasty or even aortocoronary bypass surgery have been described[9].

Antiplatelet therapy, beta blockers and statins are recommended. Other drugs such as nitroglycerin or loop diuretics can also be used in the acute phase[10]. In our case, we opted for medical treatment. In conclusion, SCAD should be considered in a young woman with chest pain during the peripartum period.

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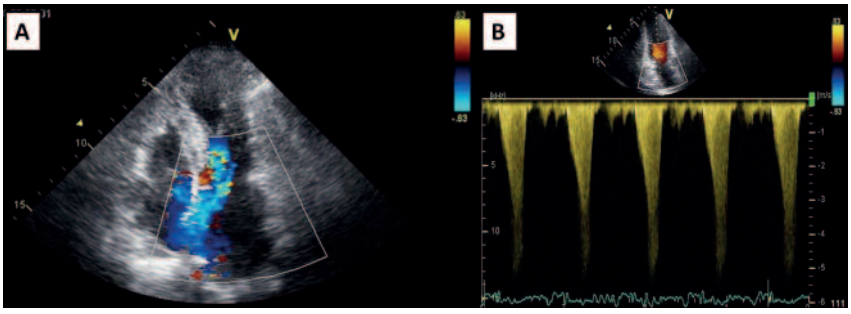

Figure 1. A) Color Doppler echocardiogram: accelerated flow in the left ventricle outflow tract (LVOT) and mitral regurgitation. B) Doppler spectrum characteristic of dynamic LVOT obstruction.

Cardiogenic shock due to dynamic left ventricular outflow tract obstruction in a woman with Takotsubo syndrome

Shock cardiogénico por obstrucción dinámica del tracto de salida del ventrículo izquierdo en paciente con síndrome de Takotsubo

Sir,

Takotsubo syndrome is a reversible acute cardiomyopathy. It is related with a stressor in half the cases and occurs in 1-2.5% of patients with suspected acute coronary syndrome[1,2].

A 69 year-old woman with hypertension visited the emergency department for syncope. Blood pressure was 89/51 mmHg, heart rate 112 bpm, oxygen saturation 91% without oxygen; she presented mitral mesocardium systolic murmur and wet bibasilar crackles. ECG showed inferolateral ST segment elevation. Laboratory tests showed: ultrasensitive troponin T 814 ng / L (99-percentile <14 ng / L) and blood lactate 2.1 mmol / L (normal range: 0.3-0.8 mmol / L). Emergency coronarography showed coronary arteries without lesions and ventriculography detected a pressure gradient of 55 mmHg in the left ventricle outflow tract (LVOT). Emergency echocardiogram showed moderate left ventricular dysfunction, apical dyskinesia and basal segment hypercontractility with LVOT obstruction and anterior mitral systolic motion with severe mitral regurgitation (Figure 1). Given these findings, intravenous esmolol was administered at 100 mcg / kg / min. After 5 minutes a reduction in heart rate (76 lpm) and increased blood pressure (123/60 mmHg) was observed. Treatment was initiated with intravenous furosemide and the pulmonary congestion resolved within hours. Echocardiography at 24 hours showed normalization of ventricular function and disappearance of the obstruction. The patient was asymptomatic at that time.

Takotsubo syndrome simulates acute coronary syndrome, but is characterized by the absence of coronary lesions and the presence of transient myocardial dysfunction, with excellent prognosis in most cases[1,3]. However some cases present with serious complications such as ventricular arrhythmias, pulmonary edema or cardiogenic shock. The incidence of cardiogenic shock is 7.9-18% depending on the series[2,4], and is generally due to severe myocardial dysfuntion, although there are cases in which the mechanism is LVOT[5,6] obstruction similar to that occurring in hypertrophic cardiomyopathy. The case presented here reflects the hemodynamic compromise that LVOT obstruction can produce. The LVOT gradient seems to be explained by the distortion of the left ventricular geometry and increased contractility of the basal segments[7]. For management, one should strive to reduce the obstruction, avoiding treatments that increase the gradient (inotropic agents, diuretics, balloon counterpulsation), and initiating measures to reduce it (volume, beta blockers, alpha-adrenergic)[7]. Urgent echocardiogram is therefore important to detect this complication, as treatment differs significantly from that for shock due to pump failure.

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