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Clinical case

Impending paradoxical embolism When and how to treat?

Menace d'embolie paradoxale Quand et comment traiter ?

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Abstract

Impending paradoxical embolism (IPDE) is the presence of an entrapped thrombus through the patent foramen ovale (PFO). Usually IPDE are diagnosed by echocardiography or thoracic CT-scan performed during the evaluation of patient presenting with a suspicion of pulmonary embolism (PE). We report the case of a 73-year-old patient presenting with a very large IPDE successfully treated with cardiac surgery and we focus our discussion on the treatment modalities of this rare entity (anticoagulation alone, fibrinolytic regimens, cardiac surgery, percutaneous thrombectomy) and on PFO management after IPDE.

Résumé

La menace d'embolie paradoxale est constituée par la présence d'un thrombus dans un foramen ovale perméable (FOP). Habituellement, le diagnostic repose sur l'échocardiographie ou le scanner, chez un patient avec suspicion d'embolie pulmonaire. Nous rapportons un cas survenu chez une patiente de 73 ans avec une menace embolie paradoxale, traitée chirurgicalement. La discussion est centrée sur les différentes possibilités thérapeutiques (anticoagulants seuls, fibrinolytiques, chirurgie cardiaque, thrombectomie percutanée) et sur la prise en charge ultérieure du FOP.

Keywords: PFO; Thrombus; Paradoxical embolism

Mots clés : Embolie paradoxale ; Foramen ovale permeable ; Échocardiographie ; Scanner

1. Introduction

Paradoxical embolism (PDE) through a patent foramen ovale (PFO) is the most plausible cause of cryptogenic stroke, particularly, in a young patient population without cardiovascular risk factors (CVRF) [1].

Despite PDE being often suspected in cryptogenic stroke, in vivo evidence of venous thrombus passing through the PFO is rarely demonstrated, and therefore this diagnosis remains presumptive in most of the cases.

Impending paradoxical embolism (IPDE) or entrapped thrombus through the PFO is the used terminology to designate the presence of thrombotic material straddling the PFO. The first case of suspected paradoxical embolism was reported in 1877

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by Cohnheim J. [2]. However, the first well documented case of IPDE was reported only in late 1985 [3]. Since 1985, almost 70 cases of IPDE have been reported in the English literature with a quite constant incidence of three new reported cases per year [4,5].

The clinical presentation of the reported cases of IPDE was a history of isolated pulmonary embolism (PE) in half of the patients; in almost 35–40% of cases a combined clinical presentation of PE and PDE, and in the remaining cases an isolated PDE [5,6].

To diagnose a paradoxical embolism one needs to have evidence of:

- deep venous thrombosis (DVT) or PE;
- presence of an intra-cardiac shunt (i.e., most of the time a PFO);
- presence of systemic embolism (cerebral or peripheral) [7].

The most available and easy to perform diagnostic tool to detect IPDE is echocardiography (trans-thoracic [TTE] ± trans-oesophageal [TEE]), even if increasingly, IPDE is observed or suspected when performing a multi-slice computer tomography (MSCT) in case of suspected PE.

Treatment options vary from anticoagulation alone [8–12], to more aggressive strategies including fibrinolytic regimens [13–16] or cardiac surgery [4,5,17,18].

Herewith, we report the case of a 73-year-old patient presenting a very large IPDE, successfully treated with cardiac surgery, and we focus our discussion on the therapeutic approach of such a rare but life-threatening thrombo-embolic disease.

2. Case report

A 73-year-old lady known for previous DVT and post-thrombotic syndrome underwent a total knee replacement for gonarthrosis. Despite the previous recurrent DVT and the known post-thrombotic syndrome, the oral anticoagulation was not restarted after surgery. One month thereafter, she experienced an ischemic cerebral stroke and an aspirin regimen was begun. One year later, she was hospitalized for sudden onset of rest dyspnea with arterial hypoxemia (SaO_2: 85%). The pulmonary CT-scan showed a central PE involving both pulmonary arteries with also a large serpentine thrombus in the right atrium floating through the PFO into the left atrium. Lower limbs ultrasound confirmed a femoro-popliteal DVT and TEE confirmed the entrapped thrombus in the PFO (Fig. 1). The patient was hemodynamically stable and therefore was put under full dosis intravenous anticoagulation with unfractioned heparin without placement of an inferior vena cava filter and then transferred to our tertiary center for emergency surgical thrombectomy. The cardiac intervention consisted in a complete thrombectomy of the IPDE associated with a pulmonary trunk embolectomy. At the end of the procedure the PFO was closed with a pericardial patch. Three days after the successful surgical intervention the patient was transferred back to the peripheral hospital in stable condition. As of today (two months post-intervention), and on long-term anticoagulation, the patient remained free of symptoms or recurrence of thrombo-embolic events.

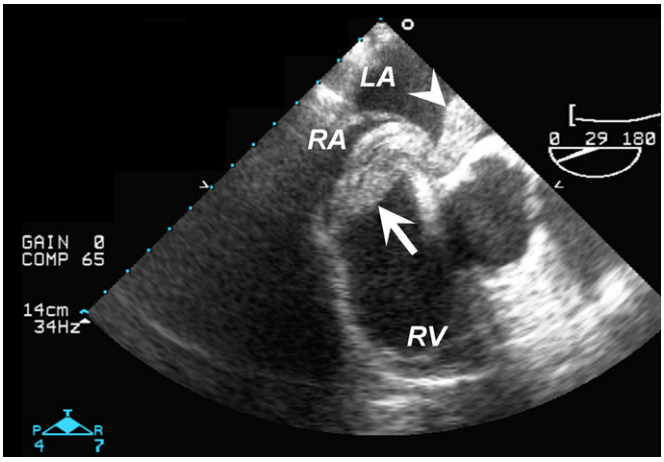

Fig. 1. Trans-oesophageal echocardiography showing a large impending paradoxical embolism from the right atrium (*RA; arrow*) passing through the patent foramen ovale into the left atrium (*LA; arrow head*). *RV:* right ventricle.

3. Discussion

The rapid and good outcome of our patient might suggest that in case of IPDE in a patient without severe co-morbidities, surgery is an acceptable therapeutic modality and thus it should be considered as first line treatment [4,5,19,20]. However, most of the reported cases presenting with IPDE are observed in patients with severe co-morbidities like an active cancer or in patients who recently experienced an ischemic cerebral event as manifestation of the PDE [4,20]. Both conditions may be considered as relative contraindication for major cardiac surgery. In such a high-risk surgical setting, the debate on how to treat these patients remains unresolved.

Fibrinolysis has already been used in several patients with acceptable results [13–16,21]. Overall, in case of IPDE or right heart thrombus the reported death rates using fibrinolysis vary between 16 and 22% [4,21]. Due to its rapid mode of action, its fibrino-specificity and its shorter half-life, allowing emergency surgical intervention if needed, rt-PA should be preferred to uro- or streptokinase regimens. The standard dose of 100 mg of rt-PA (bolus + 2 h infusion), as recommended for massive pulmonary embolism (MPE), should be adopted [22]. The theoretical risk of thrombus fragmentation, or even complete embolization to the lung or systemic circulation leading to MPE or devastating cerebral stroke, are considered major drawbacks in adopting this less invasive strategy. However, in the actually available case reports using fibrinolysis in IPDE, these serious concerns never occurred and should therefore not hamper physicians to adopt this worldwide available strategy especially where surgery is contraindicated or not rapidly obtainable. Due to the rarity of patients presenting with a documented IPDE, comparison between thrombolysis and surgery results are not available and randomized studies are unlikely to be carried on. Therefore, the treatment decision-making should be made on a case-by-case concept.