A typical case of paradox cerebral embolism during cemented total hip arthroplasty

Abstract

It is known that implantation of hip endoprosthesis, especially when cemented, is accompanied by the risk of fat embolism to the pulmonary circulation. We here report the case of a paradox embolism in a patient with a persistent foramen ovale in the heart.

A 77-year old man with a known multiple myeloma fell on his hip and suffered a femoral neck trochanteric fracture (AO 31.B3). A cemented total hip arthroplasty was performed and the greater trochanter was stabilised by cerclage. After surgery, slurred speech and a deviation of the eyes were observed. Magnetic resonance imaging (MRI) of the brain showed ischemia in the dorsal flow area of the cerebellum on both sides, especially in the pica flow area, the left thalamus, left temporal and occipital due to multiple embolisms. Trans esophageal echo-cardiography showed a persistent foramen ovale (pfo) with free flow. Intensive specialized physio and ergotherapy was initiated with good results. Upon control three and a half years later the patient showed no neurologic sequelae and a stable hip prosthesis.

Keywords: hip endoprosthetics, paradox embolism, cerebellar ischemia, persistent foramen ovale

Introduction

In the past decades, hip endoprosthetics became one of the most successful standard procedures in orthopaedic and trauma surgery. Improvement of surgical techniques and implants yield better results and less morbidity, each year more than 200,000 hip endoprosthesis are implanted in Germany.¹

Nevertheless, the cardio-pulmonal system is put at risk especially in cemented prostheses by fat embolism.² In most cases the embolism is clinically in apparent or leads to mild fluctuations of the blood pressure. A more severe complication based on a patho-mechanism believed to be rare was seen in the following case.

Case report

A 77-year old man with a known multiple myelomas fell on his hip and suffered a femoral neck trochanteric fracture (Figure 1). He was administered to our hospital. Due to the type of the fracture (AO 31.B3) as well as a metastasis in the neck and acetabulum a cemented total hip arthroplasty was performed. The greater trochanter was stabilised by cerclage (Figure 1).

The procedure was performed under general anaesthesia. Both cup and stem were cemented. While implanting the cemented stem the heart beat raised from 60bpm to 95bpm and the blood pressure dropped to 90/45mmHg (Figure 2). To the end of the procedure the patient had recovered and was extubated showing stable vitals.

After surgery a slurred speech and a deviation of the eyes were observed. The MRI (1.5 T, T1w SE sagittal, FLAIR coronar, T2w TSE transversal, bleeding- and diffusions sensitive sequences T2w TSE sagittal TOF angiography and secondary multiplanar reconstructions) showed multiple ischemic regions in the dorsal flow area of the cerebellum on both sides, especially in the pica flow area, the left thalamus, left temporal and occipital due to multiple embolisms (Figure 3). Space occupying cerebral edema was not found.

Figure 1 Femoral neck trochanteric fracture (AO 31.B3), control after cemented total hip arthroplasty, and follow-up 3.5 years after surgery.

Figure 2 Blood pressure and heart rate during surgery. Changes of blood pressure and heart rate precede cement implantation, possibly indicating fat embolism through reaming.
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The first description of a paradox embolism was by Cohnheim in 1877. Pathophysiological a right to left shunt is mandatory for the transition of veinous embolic material into the arterial circulation. The most common path therefore is a persistent foramen ovale (pfo). In an anatomic study of 1100 hearts the incidence of a pfo was 35%. Usually the foramen ovale closes after birth due to changes of the pressure conditions in the pulmonary circulation. Despite the high incidence of pfo the rate of paradox embolism as a cause of cerebral ischemia is rare.

Pulmonary or intracranial embolism as a complication following and endoprosthetic procedure are figured 0.5-2% in current literature. Most cases of paradox embolism are based on deep vein thrombosis or formation of a venous thrombus at another location. With intraoperative tran esophageal echo-cardiography while reaming of femur and tibia and is a possible complication whenever manipulating bones marrow. In patients with a known pfo a thorough discussion of therapeutic options is mandatory.

In conclusion paradox embolism is a rare but severe complication of hip arthroplasty. It is caused by insertion of the (cemented) stem or reaming of femur and tibia and is a possible complication whenever manipulating bones marrow. In patients with a known pfo a thorough discussion of therapeutic options is mandatory.

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Conflict of interest
The author declares no conflict of interest.

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