

## Cement Pulmonary Embolism during Cemented Total Hip Arthroplasty: A Case Report and Review of Literature

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### Abstract

### Case Report

Fractures of the femoral neck are the most frequent in elderly patients. They represent the most prevalent pathology in traumatology. Their incidence increases with age due to osteoporosis and the tendency to fall. Treatment is by cemented or uncemented arthroplasty. The use of polymethylmetacrylate cement provides primary stabilization of the implant and compensates for the poor bone quality in the elderly. However, the use of cement is not without complications and cement pulmonary embolism is one of the most serious complications. We report the case of a 64-year-old patient admitted to the Department of Orthopaedic and Traumatologic Surgery for a femoral neck fracture classified as Garden 2 and who underwent cemented arthroplasty complicated by cement pulmonary embolism and death.

**Keywords:** Femoral neck fracture, cemented total arthroplasty, cement pulmonary embolism.

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## INTRODUCTION

Fractures of the upper extremity of the femur are a very frequent pathology in traumatology. They occur mainly in elderly, osteoporotic patients following minor trauma.

The prosthetic indication for the treatment of femoral neck fractures has been well defined since the work of Skinner *et al.*, [1] in 1989. The choice of a cemented implant is based on age, mechanical qualities of the bone tissue, and the shape and size of the femur.

Cement embolism is a rare but serious complication of cemented fixation. Many articles have addressed this issue during vertebroplasty. In contrast, very few reports have been written in the context of hip arthroplasty.

## CASE PRESENTATION

A 64-year-old woman was admitted to the Department of Orthopaedic and Traumatologic Surgery for hip arthroplasty following a basicervical fracture of the right hip classified as Garden 2 (Figure 1), caused by a common fall on the pelvis.

A preoperative preparation was made with a standard biological check-up including a blood count, the dose of crase factors, an ionogram with urea-creatinine. This work-up was accompanied by a standard chest X-ray with no particularities. At the cardiac exploration, the patient had a good functional capacity; the realization of an ECG and an echocardiography, did not reveal any anomaly. Finally, the patient was under preventive anticoagulation and had an echodoppler of the lower limbs before the day before the operation, excluding deep vein thrombosis.

The procedure was performed under general anesthesia, in lateral decubitus; the hip was approached from the posterolateral approach; after preparation of the acetabulum, the insert was placed after installation of a cement layer. The femoral time was done by opening the medullary canal and progressively reaming it; a dose of cement was prepared (a mixture of 20ml of cement methylmetacrylate (PMMA) with 7ml of solvent) and introduced into the canal at the must followed by placement of the femoral implant until strength was obtained. Immediately after, the patient presented a decrease in tissue oxygen extraction with hypocapnia, a brutal desaturation from 98% to 82% and hypotension (BP=5/2), all refractory to resuscitation measures. The bleeding was of one liter compensated

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by the transfusion of two red blood cells during the procedure. A cardiac catheterization revealed an enlarged right ventricle, hypokinetic with distension of the inferior vena cava (figure 2). Four consecutive

cardiorespiratory arrests followed, the fourth of which was not recovered, and therefore the death of the patient.



**Figure 1: Radiological assessment affirming a basicervical fracture classified as Garden 2**



**Figure 2: Intraoperative ultrasound image showing dilatation of the right cavities**

## DISCUSSION

The treatment of femoral neck fractures in the elderly is based on prosthetic replacement. The use of PMMA was introduced by Sir John Charnley and has been used for a long time in arthroplasty to compensate for poor bone quality secondary to osteoporosis and to allow primary mechanical fixation.

One of the complications of this surgical procedure is the occurrence of cement pulmonary embolism causing a bone sealing syndrome. This syndrome is characterized by hypoxia [2, 3], a sudden drop in blood pressure [3, 4], pulmonary hypertension

[4, 5], loss of conscience and cardiorespiratory collapse [6, 7].

In total hip arthroplasty, the incidence of intraoperative death is 0.11% and mortality occurs at the time of cementing [8, 9].

In terms of pathophysiology, the increase in intramedullary pressures leads to the migration of emboli through the venous system until total occlusion of the pulmonary vessels. A comparative study was conducted by Orsini *et al.*, [10] on the role of intramedullary pressure and its impact on cardiopulmonary function. The cemented implant group had significant pulmonary microemboli with major

cardiopulmonary changes, including hemodynamic instability and increased pulmonary pressures, in contrast to the uncemented implant group.

Insufficient polymerization of the cement at the time of introduction is an independent risk factor for extravasation [11]. Dose and speed of injection have also been suggested as risk factors [12], but no correlation could be found between the volume used and the occurrence of pulmonary embolism [13].

### Ethics Approval

The study is exempt from ethical approval in our institution.

### Patient Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

### Availability of Data and Materials

The datasets used and analysed during the study are available from the corresponding author.

### DECLARATION OF CONFLICTING INTEREST

The authors declare that there is no conflict of interest.

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### Authors Contributions

All authors have read and approved the final manuscript.

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