

Fat Embolism in Common Carotid Artery after Temporal Lipofilling in Post-Cancer Reconstruction: A Case Report and Review of the Literature

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Abstract

Background: Lipofilling is a common aesthetic and reconstructive procedure. Embolism is a possible complication of every filler, which can be lethal. We describe the case of a 56 years old man who had a fat embolism in the common carotid artery with fatal issue.

Case presentation: Our patient initially had a left oropharynx cancer, treated by surgery and adjuvant radiotherapy. Many flaps and graft procedure has been tried to treat an ankyloglossia sequelae, and the effective procedure was a forearm free flap. Lipofilling was performed for a temporal defect after a temporal myocutaneous flap. A common carotid embolism was the source of a severe unilateral stroke, leading patient to the death 15 days after initial surgery.

Discussion and conclusion: Reverse-flow mechanism explains the artery tropism of fat embolism in the face, contrary to venous tropism for fat embolism in the body. Pressure of injection, needle (in contrast to blunt end cannula) and large syringe use are the factors of fat embolism in lipofilling procedure. Volume is not a significative factor.

Keywords: Lipofilling • Liposuction • Fat transfer • Head and neck cancer • Plastic surgery • Reconstructive surgery • Fat embolism • Fatal • Cancer

Introduction

Coleman intervention (lipofilling) is a common aesthetic and reparative surgery procedure. The aim of the intervention is an autologous fat graft. First fat transfer was assessed by Neuer in 1893, for a facial reconstruction case [1]. Coleman et al. improved the procedure using traumatic implements, permitting sampling and injections of adipocyte cells to be less injured, in particular by new cannulas. Liposuction is performed in any potential donor site (usually lipomeria) and tunnels are created in the interested sites. Fat cells are after deposited as a mesh trellis [2]. Fat embolism is a rare but major complication of the Coleman procedure. We present here the case of a patient, who underwent a Coleman procedure in order to fill a post-surgical temporal defect complicated with a fat embolism with fatal issue.

Case Report

We described the case of a 56-year-old male, former smoker (10 pack-years), his medical background was characterized by bilateral knee arthroscopy for meniscopathy. Lichen planus was diagnosed five years before the initial carcinologic surgery, followed up by the patient's primary care physician. Due to a local evolution, patient has been referred to our otorhinolaryngology health-care unitcare unit. The cancer staging found an extensive lichen planus, and a left oropharynx cancer of 3 cm, T₂N₀M₀

(squamous cell carcinoma). There was no other localization. Our patient had a left maxillectomy reconstructed with an infra hyoid flap, cervical lymph node dissection, and a short-term tracheotomy. The post-operative care evolution was simple. Nodes analysis found no metastasis. An adjuvant radiotherapy of 66 Gy fraction in supra clavicular (nodal) and tumoral region has been assessed.

The follow-up was marked by a restricted oral aperture, imputable to a post-operative fibrosis in the inner side of the cheek, due to a defect. Many surgical procedures were realized: full thickness skin graft after fibrosis section two years after carcinologic surgery which was not effective despite kinesitherapy; temporal muscular pedicled flap five years after initial surgery also not effective. Finally, a radial forearm free flap sixth years after initial surgery allowed a satisfying oral aperture. Thereafter, patient consulted for an esthetical discomfort facing to the left temporal region. The defect was minor, a lipofilling procedure was suggested. The surgical procedure was performed under general anaesthesia. The donor site was abdominal and the injection site was left temporal. Pre-aspiration was performed before each injection. Tunnels were created before injecting fat cells, 17 G Coleman blunt-end cannulas were used with syringes of 1 mL. The procedure ended at 3:00 PM, and spent one and half hour. Injected volume was around 50 mL (Figures 1 and 2).

At 3:40 PM, nurses of Recovery Room called for an unusual end of anaesthesia. Hyperventilation, bilateral areactive myosis, absence of consciousness, decerebrise posture and horizontal gaze variability were observed. A cerebral CT-scanner was realized at 4:20 PM, showing a recent

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Figure 1. Blunt end cannula.

superficial and deep left sylvian stroke on occlusion of the left common carotid artery by intra-luminal fat reaching up to the distal branches of the middle cerebral artery (Figures 3-6). At 5:30 PM an attempt endovascular aspiration of the fat in the common carotid and the M1 segment of the middle cerebral artery was performed but was unsuccessful. The patient was admitted in the Surgical Reanimation Service at 11 PM, with severe renal failure. The following days were marked by a major intracranial hypertension, not regressive despite a craniectomy. Twenty-four hours after surgery, bilateral are active mydriasis was observed. Reanimation care was stopped 15 days after surgery, with a persistent coma and severe renal failure.



Figure 2. 1 mL syringe used in procedure.



Figure 3. A cerebral CT-scanner was realized at 4:20 PM, showing a recent superficial and deep left sylvian stroke on occlusion of the left common carotid artery by intra-luminal fat reaching up to the distal branches of the middle cerebral artery.

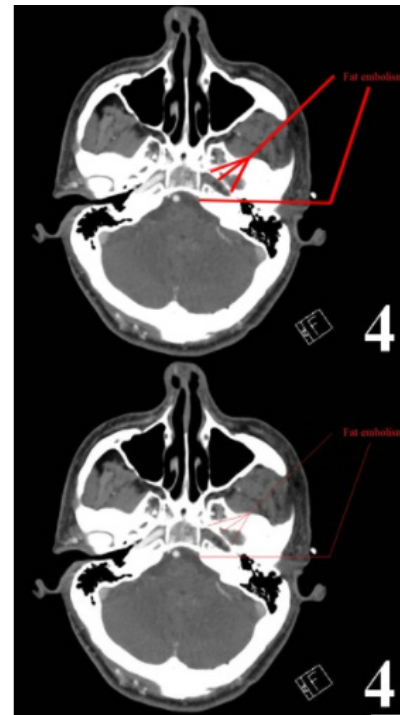


Figure 4. Fat embolism in the petrous portion of the left internal carotid.

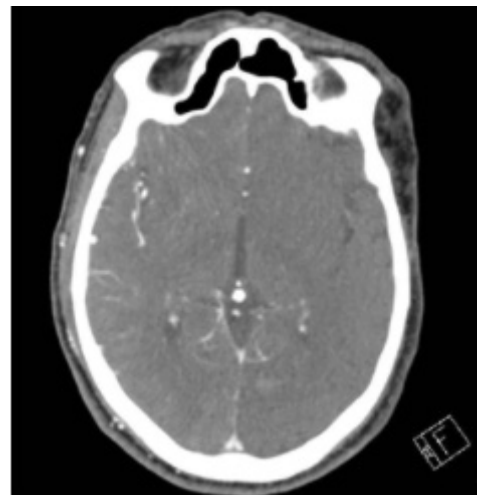


Figure 5. Absence of perfusion in the left middle cerebral territory.

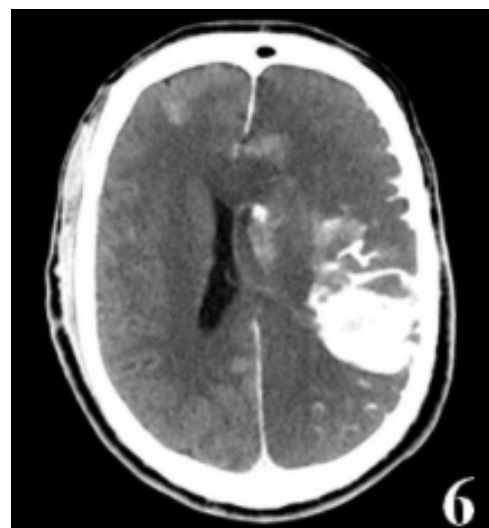


Figure 6. Haemorrhagic transformation.

Discussion

Teimourian B. reported in a study of 75,591 patients the complications of liposuction, 2 patients passed away of pulmonary embolism (one of fat, one cruorical). Complication rate in this study is 0.1% [3]. Rothman C. et al. [4] described the case of 24-years-old female patient who had a liposuction to treat riding-breeches had a bifocal bilateral pulmonary fat embolism. It spontaneously regressed, a pulmonary angio-TDM at the 7th day was normal. Astarita DC [5] described the case of a pulmonary fat embolism with fatal issue of a female patient without medical background, for an aesthetic butt lipofilling. 600 mL of fat volume has been injected in each buttock. The death occurred the day of the operation, resuscitation was unsuccessful. The relation with sciatic varices has been mentioned and authors recommend using large cannulas to avoid intravascular injection. After this incident, ASERF (Aesthetic Surgery Education and Research Foundation) reported 198,857 cases of gluteal fat grafting, performed by 692 surgeons. 103 non-fatal pulmonary fat emboli has been reported, 32 were fatal [6]. Zilg B. [7] described a fat embolism case after a penis lipofilling and incomplete section of suspensory ligament of the penis on a 30 years old patient with no medical background except mild asthma. The patient died the day of intervention, autopsy showed pulmonary fat embolism. 60 mL was injected subcutaneously and sus fascially. Previous trauma by section of the ligament could raise the embolism risk as evoked by Feinendegen et al. [8], because of damages that permeabilize vessels.

Fat embolism is rare, commonly observed after traumatic long bone fracture. At Autopsy, presence of fat in lung vessels is showed in more than 90% of patients with skeletal trauma, and in pulmonary arteries in 70% of cases [9,10]. Amount of embolized fat must be significant in order to induce symptoms, and pathophysiology depends of the fat receiving site (face vs body). Godoy DA, et al. [11] described in a review of case-reports of cerebral fat embolism after long bone fractures or orthopedic surgery that some cerebral fat embolism could fully recover, even in patients in coma or with respiratory distress. The variability of the Circle of Willis can be the origin of this recovery. In literature, few cases of blindness, stroke, and skin necrosis after using fat or other fillers on face were reported [11,12]. The proximity of an arterial system-as ophthalmic artery [12,13] explain the occurrence of cases. The mechanism of embolism in this area is that high pressure increases the risk of reverse-flow in the arterial system. Even a small amount injected can be lethal: a case of stroke and unilateral blindness a has been reported after an injection of 0.5mL of filler.

A similar case has been reported by embolism of the internal and external carotid artery [14]. Patient developed hemiplegia, unilateral vision loss, skin necrosis and aphasia. Neurologic signs partially regressed at two month, and skin necrosis needed a middle thickness graft. Decompressive craniectomy saved the life of the patient, who lives with a major disability. Face is a well vascularized region, and the use of any solute must be cautious. Corticoids can cause blindness by occlusion of the central retinal artery after injection in retrobulbar region [15], nose [16-18], scalp [19]: Every part of face can be concerned. Fillers (hyaluronic acid) are concerned too, blindness after non-surgical rhinoplasty or peri-orbital injection [20,21]. To inject, using large cannulas instead needle is a way to prevent intra vascular injection. Reversed flow through the external carotid depends of the pressure applied by the practitioner and the blood pressure. The applied pressure must be low, the feed-back is better with a small plunger [22]. By the way, lipofilling is a well-known treatment of post cancer surgery and radiotherapy sequelae in head and neck, as mentioned by Pulpin B. et al. [23]. This has been demonstrated by their study which went out a long period of follow up (mean 39.9 months) of 11 patients. Histopathological data has been realized, and highlighted a better vascular network associated to less necrotic area. No surgical complications occurred in this study. Our patient fat embolism went into arterial system (cerebral), and not in venous system like most fat embolism cases. Pathophysiological mechanism enlightening our cases could be:

- Post-operative neoangiogenesis can be the origin of a neo artery

in our patient's temporal region (temporal artery has been moved during the temporal flap). The fat cells would have reached the common carotid retrograde.

- Tissue redesign after radiotherapy and post-operative fibrosis, by reducing skin flexibility, can make the pressure during the fat injection higher, even if tunnels are created.
- In our case, injected amount of fat was low. Injected fat volume is probably not a significative factor of embolism, but the high pressure of injection due to all these elements may be the cause of the embolism.

Another way to fill the defect was a temporal prosthesis, or a local flap as Z-plasty [24]. In our case, defect to fill was small and Z-plasty could have been a good alternative, but with a significant risk of necrosis because of radiotherapy and multi-operated context. Low volume prosthesis could be a solution too, but with a high exposure risk on a post-radiotherapy skin

Conclusion

Fat embolism is a rare complication of Coleman procedure, but can lead to blindness, cerebral disease, and death. Many pre-empting tips can be said to prevent the incident: using large end blunt cannulas with small syringes, pre-aspiration before each injection. Tropism of embolism of face area Coleman seems to be arterial (common carotid and its divisions), in contrast to venous in other areas (pulmonary embolism). This is explained by reverse-flow path of fat cells.

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