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ORIGINAL ARTICLE

# Quantitative analysis of midface fat compartments mass with ageing and body mass index, anatomical study



*Analyse quantitative de la masse graisseuse au sein des compartiments adipeux médiofaciaux selon l'âge et l'indice de masse corporelle*

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## KEYWORDS

Facial fat compartment;  
Facial ageing;  
Anatomical study;  
Face lift;  
Filler;  
Fat grafting

## Summary

**Introduction.** – Volume restoration is not a new concept in facial rejuvenation. The deep fat compartments would appear to be more greatly subjected to age-related volumetric deflation. However, this view lacks scientific evidence. The purpose of the present study is to quantify fat mass variability in the superficial and deep compartments of the midface as a function of age and BMI. **Materials and methods.** – A cadaveric anatomical study was performed by dissection of superficial and deep facial fat compartment of 40 body. The studied compartments were identified by methylene blue injection and were weighed. The data obtained were analyzed as a function of subject age (two groups:  $\leq 75$  or  $> 75$ ), sex, and BMI (three groups:  $< 20$ ,  $\geq 20 \leq 25$ , or  $> 25$ ). **Results.** – The mean weight of the deep compartments was significantly lower in the group with subjects aged  $> 75$  years (1.48 g vs 3.41 g,  $P < 0.001$ ) and the deep-to-superficial fat ratio decreased significantly by more than 50% (0.2 vs 0.44,  $P < 0.001$ ). No statistically significant difference as concerns the mean weight of the superficial compartments (7.93 g vs 6.73 g). The deep-to-superficial fat ratio as a function of BMI was largely significantly lower in subjects with BMIs  $< 20$  (0.15, vs 0.31 and 0.34,  $P < 0.001$ ).

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**MOTS CLÉS**

Compartiments graisseux ;  
 Vieillesse faciale ;  
 Étude anatomique

**Conclusion.** — The present anatomical study confirmed that fat atrophy affects in priority the deep midface compartments with ageing and in subjects with a BMI less than 20. Thus to obtain natural-looking results in facial rejuvenation, the volumetric restoration of these deep compartments should be considered a priority.

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**Résumé**

**Introduction.** — La restauration des volumes de la face dans la prise en charge du rajeunissement est un concept ancien. Il semble que les compartiments profonds médiofaciaux subissent une déflation volumétrique avec le vieillissement. Cette théorie manque de support scientifique. L'objectif de cette étude est de quantifier la variabilité de la masse graisseuse des compartiments superficiels et profonds de la face en fonction de l'âge et de l'IMC.

**Matériel et méthodes.** — Une étude anatomique sur 40 cadavres a été réalisée par dissection des compartiments graisseux superficiels et profonds médiofaciaux. Les compartiments graisseux ont été identifiés par injection de bleu de méthylène, puis pesés. Les données obtenues ont été analysées selon l'âge (2 groupes :  $\leq 75$  ou  $> 75$ ), le sexe, et l'IMC (3 groupes :  $< 20$ ,  $\geq 20 \leq 25$ , ou  $> 25$ ).

**Résultats.** — Le poids moyen des compartiments profonds est significativement inférieur chez les sujets de plus de 75 ans (1,48 g contre 3,41 g ;  $p < 0,001$ ), ainsi que rapport entre le poids des compartiments profonds sur celui des compartiments superficiels qui est divisé par 2 (0,2 vs 0,44 ;  $p < 0,001$ ). On ne retrouve pas de différence statistiquement significative pour les compartiments superficiels (7,93 g vs 6,73 g). Les sujets avec un IMC inférieur à 20 ont également un rapport entre le poids des compartiments profonds sur celui des compartiments superficiels très diminué (0,15 contre 0,3).

**Conclusions.** — Ces données confirment la théorie de l'atrophie sélective du tissu adipeux au sein des compartiments profonds médiofaciaux survenant au cours du vieillissement de la face et l'amaigrissement sévère. Il apparaît donc nécessaire de restaurer en priorité le volume de ces compartiments profonds pour obtenir des résultats naturels en chirurgie du rajeunissement facial.

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**Introduction**

Volume restoration is not a new concept in facial rejuvenation. The conceptualization of facial aging as a three-dimensional process has been developed over the past ten years through the works of such authors as Lambros [1] and Little [2,3]. Numerous studies have demonstrated roles for bony tissue resorption and remodeling in the aging process [3]. The theory of soft-tissue descent in facial aging has been progressively enriched by the concept of volumetric deflation and leading to the idea of "pseudoptosis", illusion of ptosis [1]. The works of Rohrich, Pessa et al. [4–10] greatly demonstrated that facial fat was not distributed as a homogenous mass, but organized in individual compartments separated by septa that carry vessels toward the skin. These adipose compartments are distributed in two distinct planes, one superficial and subcutaneous, and the other deep, located under the superficial musculoaponeurotic system (SMAS).

A precise understanding of the distribution of fat within the various compartments and how it evolves under the influence of aging would allow surgeons to redistribute the fat volume in a manner more coherent with a younger appearance. Numerous observations suggest that these compartments may evolve differently with age [11]. The deep fat compartments would appear to be more subjected to age-related volumetric deflation. Deep midfacial fat, repre-

sented by the deep medial cheek compartment (DMCC) [7,11] and the sub-orbicularis oculi fat pad (SOOF) [6], seems to be particularly affected by the phenomenon, in contrast with the relative augmentation of superficial fat compartments. However, this view lacks scientific evidence. The purpose of the present study is to quantify fat mass variability in the superficial and deep compartments of the midface as a function of age and BMI.

**Materials and methods**

We performed a cadaveric anatomical study at the East Lyon Faculty of Medicine of Claude Bernard University Lyon 1 (Lyon, France). The anatomical specimens were harvested from fresh cadavers less than 72 hours after death. Patient data including age, weight and height were recorded.

**Identification of compartments**

The studied compartments were identified by methylene blue injection after percutaneous localization, this latter aided by data from preceding anatomical studies [6,7,11] (Fig. 1). Superficially, the cheek compartments were injected strictly subcutaneously:

The nasolabial compartment was injected laterally to the fold. The superficial medial cheek compartment, lateral to

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