Original Article

Glabellar region filling: examining the reasons for the high incidence of complications and blindness

Preenchimento na região glabelar – dissecando as razões da alta incidência de complicações e cegueira

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ABSTRACT

Introduction: Fillings are currently one of the most sought-after treatments for aging. The glabella area is subject to complications arising from the application of fillers, the most common of which are transient erythema, granulomatous reactions, arterial occlusion, and blindness. Nevertheless, the pathogenic mechanisms that lead to a loss of sight following the injection of fillers in the glabellar region remain unknown.

Objective: To evaluate the percentage of patients with severe obstruction of the internal carotid artery who present carotid flow reversal, in order to demonstrate a possible cause of a higher incidence of complications linked to the use of filling substances in the glabella.

Methods: Prospective study carried out with duplex scan at the Radiology Department of the Hospital de Base de São José do Rio Preto, São Paulo, Brazil.

Results: Advance detection of carotid flow reversal (external to internal carotid system) – which is a common event in patients with a hemodynamically significant obstruction of the internal carotid artery – can prevent serious consequences – the most critical of which is blindness.

Conclusion: Filling procedures in the glabellar region must be avoided due to the risk of carotid flow reversal and subsequent occlusion of the central retinal artery, which causes blindness.

Keywords: *Carotid artery, internal; blindness; glabella*

RESUMO

Introdução: *Os preenchimentos constituem uma das opções mais procuradas na atualidade para tratar o envelhecimento. A glabela é área sujeita a complicações decorrentes da aplicação de preenchedores, sendo as mais comuns eritema transitório, reações granulomatosas, oclusão arterial e cegueira. Os mecanismos etiopatogênicos que levam à perda da visão após a injeção de preenchedores na região glabelar, porém, permanecem desconhecidos.*

Objetivos: *Avaliar a porcentagem de pacientes com obstrução grave da artéria carótida interna que apresentam reversão do fluxo carotídeo, com a finalidade de demonstrar um dos possíveis mecanismos que pode levar à maior incidência de complicações por preenchedores na glabela.*

Métodos: *Realizado estudo prospectivo, com duplex-scan no Serviço de Radiologia do Hospital de Base de São José do Rio Preto.*

Resultados: *Nossos resultados evidenciaram que a reversão do fluxo carotídeo (sistema carotídeo externo para o interno) em pacientes com obstrução hemodinamicamente significativa da artéria carótida interna é evento comum, possível de ser documentado, podendo acarretar sérias consequências, sendo a mais temível a cegueira.*

Conclusão: *O preenchimento na região glabelar deve ser evitado em razão do risco da reversão do fluxo carotídeo e posterior oclusão da artéria central da retina conduzindo à cegueira.*

Palavras-chave: *artéria carótida interna; cegueira; glabela.*

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INTRODUCTION

Filling techniques present early or late risks of complications. [1] Fillings in the glabella region have the highest risk of vascular side effects.[1-4] Of all necrosis events following the injection of fillers containing bovine collagen reported in the literature, 56% occurred in the glabella.[2] Four cases of partial loss of vision following filling in the glabellar region have also been reported (one related to polymethyl methacrylate, and three to autologous fat graft [5-8]).

That strong predisposition suggests an anatomical or mechanical cause. Unlike other tissue in the medial line, the glabella is supplied by only a few small blood vessels, implying that its collateral circulation is less competent than that of other areas.[4] The glabellar region's vascularization is poor and predominantly terminal.[4] Thus, those small arteries can easily be obstructed by injections of filler materials. Infectious and noninfectious granulomatous reactions are also more frequent in that region.[9]

The major issues concerning the occurrence of blindness following injections in the glabella are linked to the mechanism and to the path that the material takes until it reaches the central retinal artery.

The duplex scan is a radiological method that assesses the vessels' caliber, detects constricted vessels and clots, and measures the speed and direction of the blood flow. It provides a color image of the blood flow (color Doppler), which helps identify small vessels, exposes the direction of the blood flow, and can show areas of turbulence.[10-12]

This study's objective was to investigate the possible causes of the loss of vision following filling procedures in the glabellar area.

METHODS

With the patients' consent, a prospective study was carried out using duplex scan at the Radiology Department of the Hospital de Base de São José do Rio Preto, in the State of São Paulo in Brazil, to assess the percentage of patients with severe obstruction of the inner carotid artery (greater than 70%) who had carotid flow reversal. The study was performed in two phases. In the first phase, duplex scan was performed in the neck region in 122 patients of both genders, aged 43-79, to detect severe obstructions of the internal carotid artery. In the second phase, patients who had severe lesions in the carotid artery underwent an color Doppler in the glabellar, orbital and periorbital regions to document the carotid flow reversal, and thus demonstrate the mechanisms and paths that can lead to a higher incidence of complications in the glabellar region.

RESULTS

Severe obstruction (greater than 70%) of the internal carotid artery was observed in 14 of 122 patients studied (11.4%). Seven of the 14 (50%) were reassessed using color Doppler, and carotid flow reversal was verified in three patients (43%).

These results suggest that blindness resulting from fillings in the glabella could be caused by secondary collateral circulation that developed due to previous pathological processes. The subsequent obstruction of the collateral circulation (with the filling material) during the reversal of the carotid flow would carry that material to the central retinal artery, leading to blindness (Figures 1 and 2). The participation of the secondary flow system can be seen in the retrograde flow, demonstrated with the application of the duplex scan technique in the ophthalmic arteries (Figure 3). [10-12]

DISCUSSION

The Latin term *glabella* means "hairless" and corresponds to the region located between the eyebrows and the median eminences, in the vertical part of the frontal bone.

This area has been of little medical importance for a long time. Wrinkles in that region represented cosmetic changes that signalled aging, worry, sight difficulties or excessive concentration. The area became more significant with the heightened importance of beauty, in particular with the advent of fillers and botulinum toxin injections for aesthetic purposes.

Glabellar wrinkles are caused by the contraction of the corrugators, procerus, and orbicularis oculi muscles, which help express censure and concentration. They also occur when the muscles traction the eyebrows medially and inferiorly as a reaction to intense sunlight, which helps the individual see. A number of cases of irreversible partial or total blindness following injections of different drugs in the head and neck have been

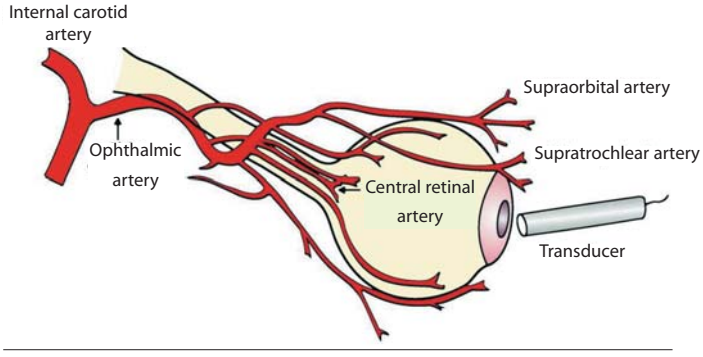

Figure 1: Schematic representation of the anterograde physiological flow (in red) in the ophthalmic and central retinal arteries, without occlusion of the internal carotid arte

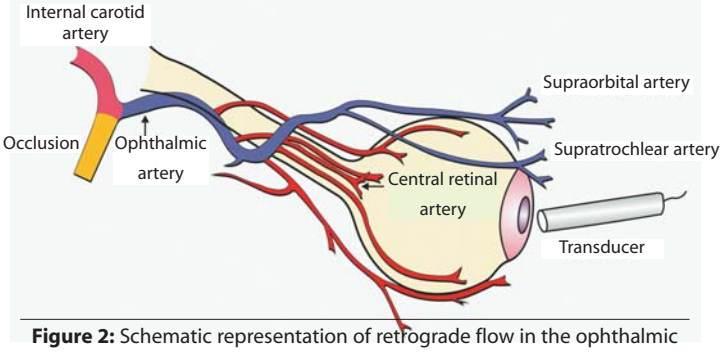

Figure 2: Schematic representation of retrograde flow in the ophthalmic artery (in blue) and anterograde flow in the central retinal artery (in red), with the occlusion of the ipsilateral internal carotid artery (in yellow)

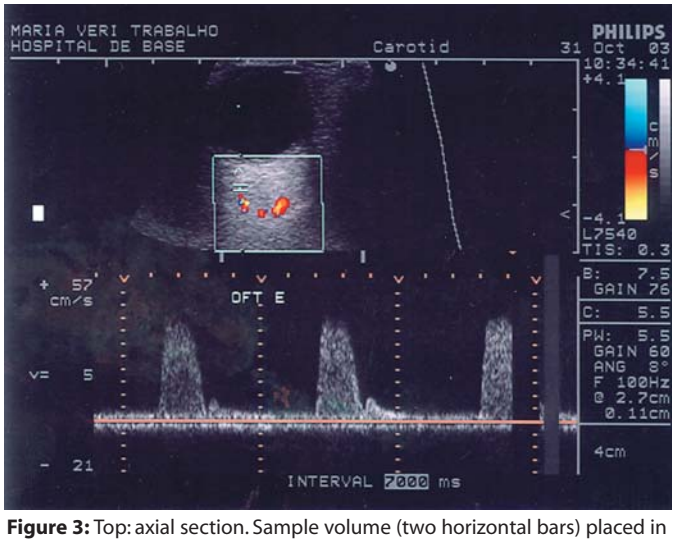

Figure 3: Top: axial section. Sample volume (two horizontal bars) placed in the path of the ophthalmic artery. Flow (in blue) in the ophthalmic artery suggests a retrograde flow moving away from the transducer. Bottom: speed curve with dicrotic incisure ("V" shape in the deceleration phase), a characteristic sign recorded in the ophthalmic artery

reported in the international literature.[13, 14]

To date, no study has attempted to explain the mechanism by which a filler injection causes blindness. Aberrant vascularization, arteriovenous shunt, gem-pass pulmonary drugs, vasospasm, and flow retrograde arterial microembolization have been theories.[5, 13.14]

Our results showed that reversal of the carotid flow system (external to internal carotid) in patients with a hemodynamically significant obstruction of the internal carotid artery is a common event, which can be detected and may have serious consequences, the most serious of which is blindness.

CONCLUSIONS

Filling techniques are one of the main options in the treatment of aging. Glabellar wrinkles – caused by the dynamic action of the brow depressor muscles – are a major aesthetic complaint, and botulinum toxin is the best treatment alternative. Fillings in this region, however, are still carried out without a complete understanding of the inherent risks. This study described the mechanisms that increase the incidence of complications in the injection of filling material in the glabellar area, and serves as a warning to all professionals who administer that technique. ●

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