

## Avoidance of Arterial Occlusion From Injection of Soft Tissue Fillers

In recent years, several cases of blindness, stroke, and skin necrosis have occurred after injection of soft tissue fillers. To avoid such complications, the author recommends using larger, blunt cannulas and epinephrine at the injection site, while avoiding the injection of large boluses of soft tissue filler in the face. (*Aesthetic Surg J* 2002;22:555-557.)

In the past 2 years in the United States, 2 cases of retinal artery occlusion have occurred in patients immediately after periorbital fat injections. Injectable fillers (fat, collagen, etc) are generally regarded as being safe, with occasional aesthetic complications; however, skin necrosis, cerebrovascular strokes, and blindness from arterial occlusion after the injection of a soft tissue filler can occur and may be underreported in the medical literature.

### Reports of Blindness, Stroke, and Skin Necrosis from Injections

As early as 1963, retinal artery occlusion from the injection of a particulate substance (steroid injections) was described.<sup>1</sup> Blindness from central retinal artery occlusion after steroid injections in the nose,<sup>2-5</sup> retrobulbar region,<sup>6</sup> scalp,<sup>7</sup> and eyelid has been reported.<sup>8</sup>

In 1991, the Food and Drug Administration warned that adverse reactions related to injections of collagen had occurred, including "open sores, healing of the skin. . . and partial blindness."<sup>9</sup> Recently, the first case of partial visual field loss after an injection of Cymetra (LiteCell, Branchburg, NJ)<sup>10</sup> was reported.

Blindness from a fat injection was first reported in 1988.<sup>11</sup> Few details were given, but the basic presentation was identical to the later reports. The patient experienced excruciating pain accompanied by immediate and permanent loss of vision in one eye. In the following

years, reports of permanent unilateral blindness from central retinal artery occlusion by injectable fillers have continued to appear in the ophthalmology and neurology literature and frequently describe stroke and skin necrosis as associated complications. Although most instances of central retinal artery occlusion and blindness resulted from injections in the nose or periorbital region,<sup>11-13</sup> some were reported with injection of fat into the nasolabial folds<sup>14</sup> or even the lower lip.<sup>15</sup>



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### How Does an Injected Filler Cause Blindness?

The retinal artery and posterior ciliary arteries are proximal branches of the ophthalmic artery. Many superficial arteries of the face are distal branches of the ophthalmic artery (supraorbital, supratrochlear, dorsal nasal, angular artery of the nose). A needle or cannula used to inject a soft tissue filler can accidentally perforate the wall of one of the distal branches and enter the artery's lumen. If the tip of the needle or cannula is in the lumen of an artery when the plunger of the syringe is pressed to propel the injectable filler out of the syringe, the filler will be injected into the lumen of the cannulated artery. As more pressure is applied to the plunger, the filler displaces the arterial blood and travels as a column proximally past the origin of the retinal artery. As soon as the surgeon stops placing pressure on the plunger, the forced injection ceases and the arterial systolic pressure propels the filler into the branches of the ophthalmic artery. Even a tiny amount of the filler slipping into the retinal artery can precipitate a central retinal artery blockage, which can result in permanent blindness.

Just as the pressure on the plunger of a syringe can force

a column of a soft tissue filler into the ophthalmic artery, a little more pressure on the plunger of a syringe can force the column back into the internal carotid artery. From there the soft tissue filler can embolize into any area supplied by the internal carotid artery and may result in stroke.<sup>16</sup>

Obviously, the same soft tissue filler can also embolize the arterial supply of mucosa, conjunctiva, or skin and result in necrosis. Because the arteries are tiny, the volume of filler necessary to reach even the internal carotid artery is probably small. Last year, a neuroophthalmologist reported the occurrence of blindness, stroke, and skin necrosis from the injection of only 0.5 mL of filler into the left side of the nasal bridge.<sup>17</sup> Even a small amount injected into the lower face has been reported as having devastating complications: unilateral blindness and brain infarction occurred after the injection of only 0.5 mL into a nasolabial fold.<sup>14</sup>

### Unreported Cases

Reports of blindness or other catastrophic arterial phenomena resulting from the injection of fat or other fillers have all been made by someone other than the operating surgeon. Therefore all descriptions in the literature of injections of soft tissue fillers causing catastrophic emboli are vague, with little discussion of the cannulas, syringes, or methods used for injection.

In the last year, I spoke to the operating surgeons involved in 2 recent cases of fat injections resulting in permanent, unilateral blindness accompanied by cutaneous manifestations without other neurologic signs. They were able to provide me with details of the procedures.

The most recent case occurred less than a year ago in a healthy young patient. While performing a minor reconstructive procedure with the patient under general anesthesia, the surgeon injected fat into the cheek to fill a small deficiency. A total of 3 mL of fat in a 10-mL syringe was injected in 2 passes with a 20-gauge Angiocath needle (BD, Franklin Lakes, NJ). After recovering from general anesthesia, the patient was found to have an embolus to the central retinal artery that caused permanent unilateral blindness. Five days later, a 3 × 2-cm vesicular lesion on the ipsilateral side of the nose developed in the patient.

In a second recent case, a healthy patient returned for a secondary fat injection under local anesthesia, lidocaine with epinephrine. The injections were performed through a 16-gauge sharp needle from a 10-mL syringe with the assistance of a Dispos-a-ject (Byron Medical, Tucson, Ariz) mechanical gun. Fat was injected in the following quantities: 0.5 mL in each oral commissure and into each lateral canthal area, 0.25 mL into each nasojugal trough, and 1.5 mL into a transverse scar and wrinkle in the forehead. During the injection of the forehead, the patient, who was not sedated, complained first of unilateral blindness and a little later of excruciating hemicranial pain. She was transferred to an eye center where the diagnosis of central retinal artery occlusion was established. Four days later a superficial skin eruption of the forehead developed. In both cases detailed above, the injections were performed through a sharp needle with a 10-mL syringe with greater than 0.5 mL of fat injected during some of the passes.

### Avoiding Complications

Sharp cannulas, small cannulas, and needles are much more likely to perforate the wall of an artery and cannulate the artery lumen than are larger, blunt cannulas. Also, a vasoconstricted artery is harder to cannulate than a vasodilated one. Therefore consideration should be given to the use of larger, blunt cannulas and epinephrine at the injection site for the placement of fillers.

A second consideration is the volume of each injection. For a column of the filler to extend back all the way to the ophthalmic artery or internal carotid artery, a volume of filler must be injected with 1 bolus. When using a larger syringe (20 or 10 mL), the surgeon's control over the volume injected is less than with a smaller syringe. If the surgeon limits the amount of any filler injected to less than 0.1 mL with each pass, the probability of a column of the filler reaching all the way back to the ophthalmic artery is low.

### Recent E-mail Survey by ASAPS

The American Society for Aesthetic Plastic Surgery recently conducted a survey by e-mail in an effort to determine the incidence of embolic complications with fillers used by its members. No catastrophic problems

were reported, although only 186 members responded. However, 7% reported partial or full-thickness skin loss. It is possible that these phenomena were related to embolism of injected fillers. Vascular occurrences can happen in a localized fashion also, and if a good collateral blood supply is not available, injection of a filler that occludes a peripheral artery can cause skin necrosis anywhere on the face or body.

## Conclusion

Blindness and stroke have occurred as a result of the injection of soft tissue fillers in almost every part of the face: glabella, forehead creases, temple, crow's feet, nose, cheeks, nasolabial folds, and lower lip. During injection of any soft tissue filler in the face, consideration should be given to the possibility of cannulation of arteries and to the volume of filler injected at any instant. Accidental injection of soft tissue fillers into the arterial system can result in catastrophic complications. The injection of large boluses of soft tissue fillers in the face and the use of needles or cannulas that can easily perforate an arterial wall should be avoided. ■

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