Soft Tissue Augmentation With Artecoll: 10-Year History, Indications, Techniques, and Complications

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Most of the biologic filler materials that increase the thickness of the corium in a wrinkle line are phagocytosed within a certain time. Therefore, a lasting effect can only be achieved with nonresorbable synthetic substances. Artefill consists of 20 volume percent microspheres of polymethyl-methacrylate and 80 volume percent of bovine collagen. Beneath the crease, the microspheres with their exceptional surface smoothness stimulate fibroblasts to encapsulate each individual one of the 6-million microspheres contained in 1 mL of Artefill. Collagen is merely a carrier substance that prevents the microspheres from agglomerating during tissue ingrowth. The 20 volume percent of microspheres in Artefill provides the scaffold for the 80% volume of connective tissue deposition, a complete replacement of the injected collagen. The filler material beneath a crease acts like a splint and prevents the possibility of its further folding, thereby allowing the diminished thickness of the corium in a crease to recover. This recovery process is well known even in older patients with facial paralysis or after a stroke, whose facial wrinkles and furrows on the paralyzed side disappear over time.

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SINCE 1994, Artecoll has been used in an estimated 200,000 patients worldwide (except in the United States) with a low complication rate. Because of its higher viscosity and its persistence, technique-related side effects may occur initially. A moderate learning curve on the physician's part and the knowledge of the effect of corticosteroids, however, should prevent solvable potential minor side effects. Patient satisfaction after Artecoll treatment is above 90%; they usually experience the optimal result after only 3 months when the thickness of the dermis in a wrinkle or fold has recovered.

History

Zyderm was introduced in 1982 as the first dermal filler material and was extremely well received.[1] This was the substance in which we all were waiting for. Although it is still one of the safest materials injected into the dermis, the early enthusiasm has quieted because of its short duration.

The senior author's experience for the last 3 decades with all kinds of autologous grafts, including dermis, fat, cartilage, bone, and tendon, is that they will disappear at sites where they do not maintain their native biologic function. With most of these grafting materials, there is little left behind after a few months, except minimal scar tissue. In order to promote collagen deposition over a longer period of time, one has to stimulate the connective tissue constantly with a scaffold of nonresorbable synthetic material.[2] In an attempt to find a solution to this problem, he studied all types of microparticles from different synthetic materials already used in medicine. These were suspended in Tween 80 or gelatin in order to facilitate injections into rats.[3] The material with the least tissue reaction turned out to be bone cement, which consists of all sizes of polymethyl-methacrylate (PMMA) microspheres and many impurities attached to them (Figure 1).

To purify this powder further and to increase its biocompatibility, we separated a certain fraction of microspheres, 30 to 42 μm in diameter (Figure 2). This is the ideal size, as it is large enough to escape phagocytosis[4] but small enough to be injected through a fine 26-gauge needle and to be able to intrude into the network of the collagen fibers of the deep dermal layer. The smaller the microspheres, the larger is the overall surface area and the promotion of collagen deposition (Figure 3). Microspheres of a diameter of 100 μm promote only approximately 56% connective tissue encapsulation; microspheres of a diameter of 40 μm promote 78% connective formation.[2] The animal experiments at the University of Frankfurt (Frankfurt, Germany) in 1985[3] were encouraging for further experimentation in humans (Figure 4).[5]

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