

CHAPTER 56

Customized Tissue Clay: A New Surgical Material and Technique for Facial Reconstruction

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A new technique for facial augmentation reconstruction was utilized in 469 patients over a period of 5 years. Microfibrillar collagen (Avitene) was combined immediately preoperatively with autogenous whole blood, forming a “tissue clay,” which was then customized by the addition of appropriate autogenous tissue (cartilage, bone paste, fat, or minced muscle). Figure 56-1 shows an overview of various regions that can benefit from customized tissue clay. Tissue clay can be used (1) to augment the wrinkles around the frown and smile lines; (2) to correct frontal area defects either superficial or deep, as in frontal bone fractures or after obliterative sinus surgery; (3) for nasal reconstructions in which dorsal augmentation up to 1 cm has been successful, as well as subtle corrections of contour defects during or after cosmetic rhinoplasty; (4) for the creation of new nasal tips; (5) for use after cosmetic blepharoplasty when too much fat and muscle are removed; and (6) when new cheekbones and chins are desired. Many different types of deep facial contour deficits are readily repaired with tissue clay. These may include postparotidectomy depressions or almost any type of posttraumatic facial concavity.

Tissue clay’s remarkable ability to incorporate itself almost immediately into the reconstructed area allows the surgeon to actually sculpt and shape the clay into its newly desired shape. The influence of the blood clot derived from the autogenous whole blood allows for its intimate tissue interaction.

MATERIALS AND METHODS

Tissue clay is composed of 1g of microfibrillar collagen mixed immediately preoperatively with 3 ml of autogenous whole blood. A claylike substance results after 30 seconds of stirring. Customized tissue clay

is made using the basic preparation described above mixed with one of the following additionally prepared tissues: grated cartilage, minced muscle, suctioned fat, or bone paste.

The preparation of “bone tissue clay” (Fig. 56-2A) is facilitated by drilling cortical mastoid bone via a postauricular incision using continuous suction irrigation. The contents are then filtered through a sterile micropore filter apparatus and mixed into the basic tissue clay in a ratio of 1:1.

“Fat tissue clay” (Fig. 56-2B) is made by mixing suctioned fat procured during submental or abdominal liposuction in a ratio of 1:1 with basic tissue clay. This blend finds use in any area where there is loss of deep subcutaneous soft tissue with a high fat content and in areas of superficial skin wrinkling.

“Muscle tissue clay” (Fig. 56-2C) is usually prepared from a temporalis muscle graft because of its ease of procurement and proximity to the facial area, although any muscle can be used. The proportion of muscle to basic tissue clay is 1:1. The muscle is finely minced just before mixing. This compound is used successfully in postblepharoplasty sunken lower eyelid areas, mid-nasal dorsum, and soft tissue augmentation, when a firmer more resilient texture is desired.

“Cartilage tissue clay” (Fig. 56-21)) is made from septal cartilage that is finely grated and mixed with basic tissue clay in a ratio of 1:1. Other potential harvesting areas for autogenous cartilage include the ear and rib. This mixture most readily resembles cartilage when it finally hardens and is used for auricular, nasal tip, and mid-nasal dorsum repairs.

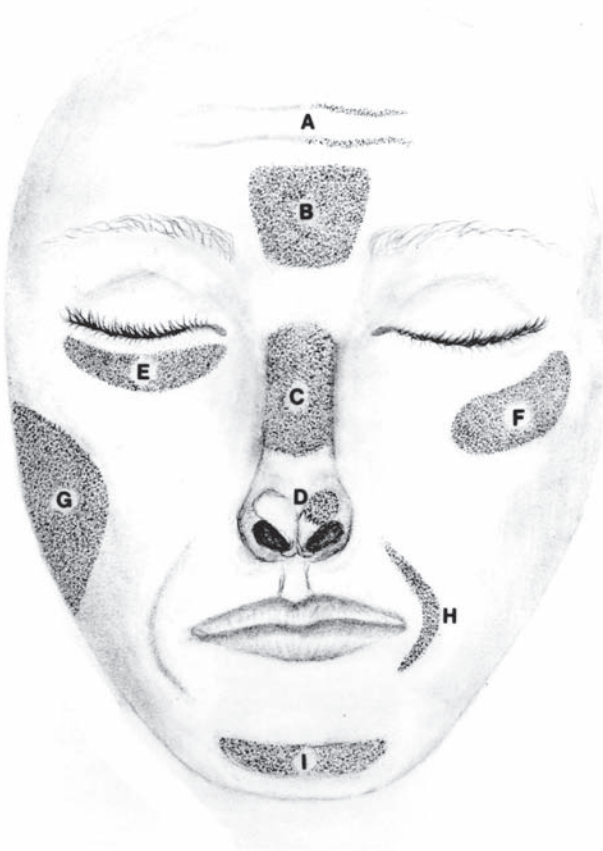


Figure 1. Distribution of tissue clay reconstructions. *A*, augmentation of frown lines. *B*, Augmentation of superficial and deep frontal area defects. *C*, Nasal reconstruction. *D*, Creation of new nasal tips, *E*, Augmentation after excessive cosmetic blepharoplasty, *F*, New cheek bones. *G*, Augmentation of post-parotidectomy depressions, *H*, Augmentation of smile lines. *I*, New chine construction

TECHNIQUE

Nasal Reconstruction

The nature of customized bone tissue clay is ideal for immediate sculpting of the nasal dorsum as outlined in Fig. 3.

The nasal tip is rebuilt using customized cartilage clay to match the tip's underlying tissue structure. The nasal columella is augmented in congenitally retracted or postsurgical deformities with customized muscle clay because this particular preparation is firm and resilient and thus closely matches the musculomembranous nature of this anatomic site.

The tissue clay is prepared immediately before the operation and the additional tissue used for customizing is then harvested. This mixture is then held in a 3-ml syringe until needed. For dorsal augmentation, routine intercartilaginous incisions are performed, followed by undermining of the subcutaneous pocket. If tip revision is planned, a rim incision is used and the appropriate area

is undermined with scissors. Columella augmentation is achieved by constructing a perfectly sized pocket with blunt scissors. The syringe is placed just through the incision and injected into the preformed pocket under minimal pressure. After the clay is appropriately positioned, water is placed on the nose and the clay is sculpted and molded into the desired contour and configuration. Some of the excess clay will exude from the incision site at this time; therefore slight overinjection initially is desirable. The incisions are closed securely with 6-0 chromic suture to allow for the minimal leakage of the clay during the immediate postoperative period. Routine tape and aluminum splint dressings are utilized for 7 days, after which time the dressings are removed and the tissue clay is semisolidified. At 7 days postoperative after the dressings are removed, slight contour imperfections can be molded effectively by placing warmed gauze over the nose for 5 min and then resculpting. The final setting of the tissue clay occurs in approximately 1 month. Fig. 4 shows an example of the results achieved with this technique.

Chin Augmentation

The tissue clay is prepared as above for nasal dorsal operations and injected into a preformed soft tissue pocket overlying the chin periosteum. The intraoral incision is closed with 6-0 chromic suture and a padded circumferential head dressing is placed over the area. Dressings can be removed in 1 week, with final solidification of the clay expected in 1 month.

Eyelid Augmentation

Fig. 5 shows the technique for augmentation of the lower eyelid area after excessive removal of fat and orbicularis muscle, during cosmetic blepharoplasty. A skin muscle flap is raised through an infraciliary incision and the "customized muscle clay" is injected to fill out the cadaveric sunken appearance.

Malar Eminence (Cheekbone) Augmentation

There are two direct routes of exposure for this area. If bone clay is used, an incision is then made in the upper gingival buccal sulcus and the plane of dissection is directly on the bony malar eminence. The tissue clay is injected into the preformed pocket and the incision is closed. An alternative method is to use regular tissue clay or muscle clay and inject it into the soft tissue overlying the malar eminence, through an identical intraoral incision but into a pocket raised in a slightly more superficial plane. This technique is slightly newer than implantation directly over bone, but I feel it is the method of choice. The nature of tissue clay allows for a natural-looking, yet defined cheekbone, which is difficult to obtain with artificial malar implants.

Wrinkles

A syringe is filled with fat clay and attached to a 16-gauge angiocath. The entire needle and overriding sheath are advanced superficially under the skin extending the full

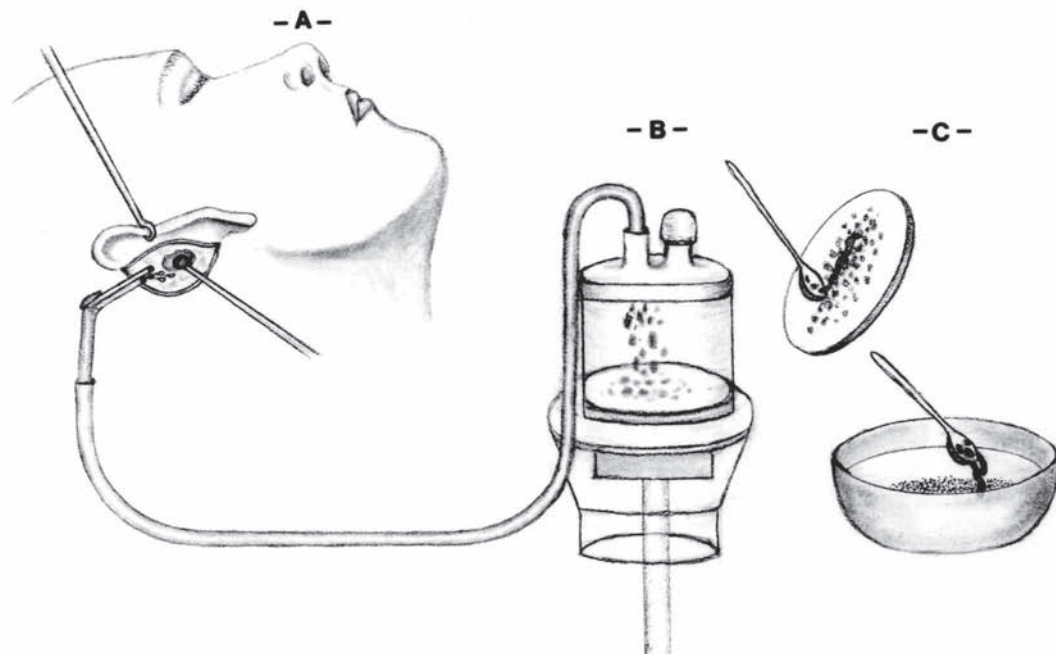
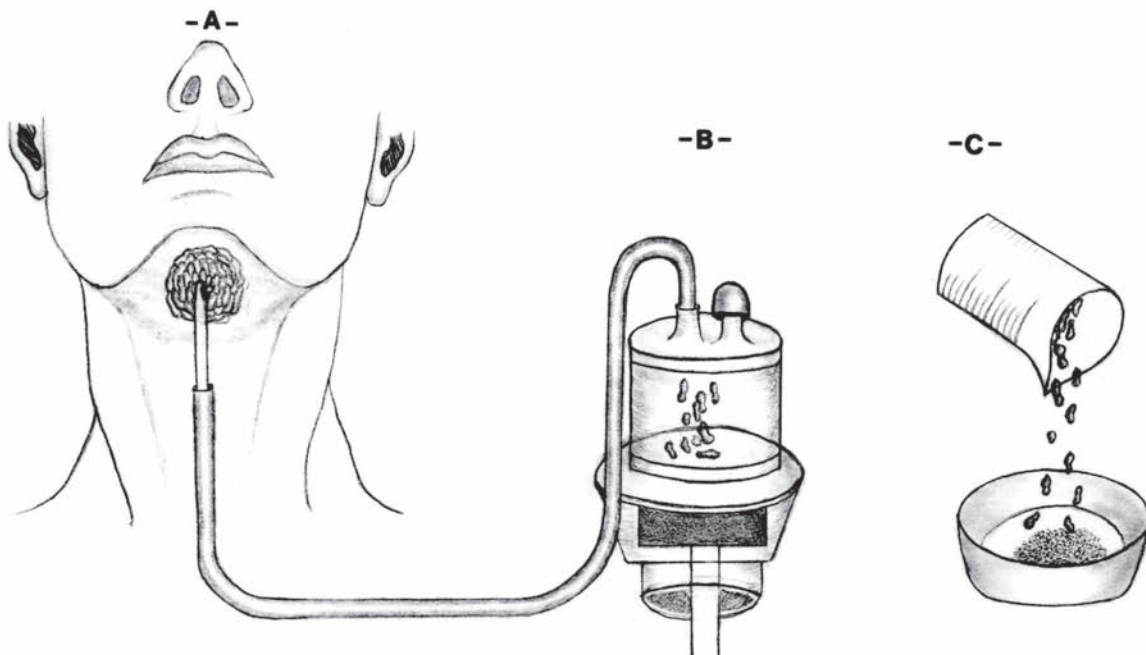


Figure 2. (1) Technique for making customized bone paste tissue clay. *A*, Continuous suction irrigation of mastoid bone. *B*, Misco pore filter apparatus for separation of bone paste. *C*, Addition of bone paste taken from filter into pre-mixed tissue clay. (2) Technique for making customized fat tissue clay. *A*, Submental liposuction. *B*, Filter apparatus for separation of fat globules. Figure continues on following page.



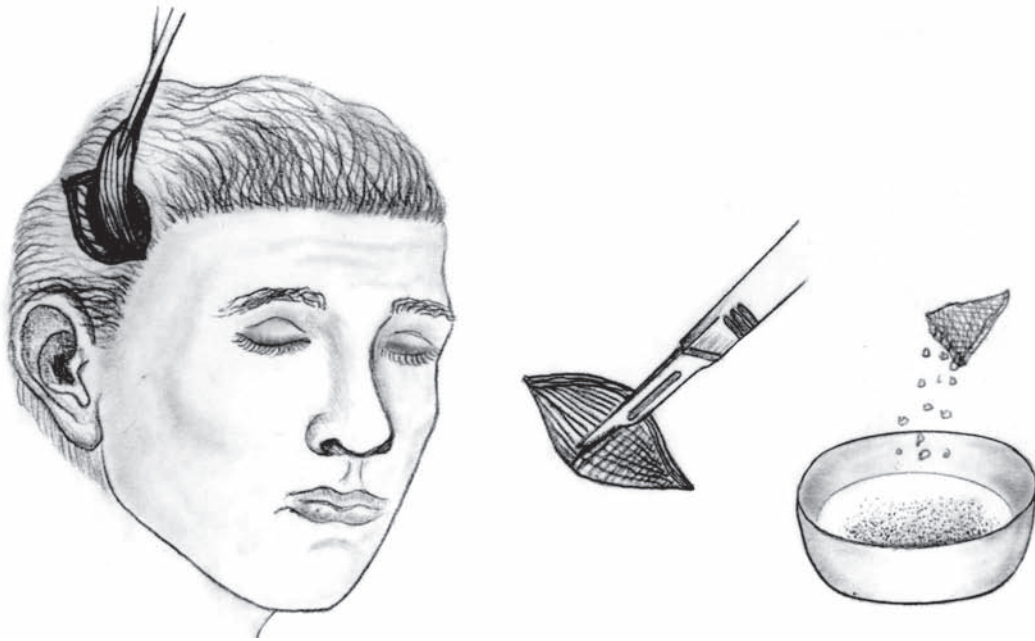
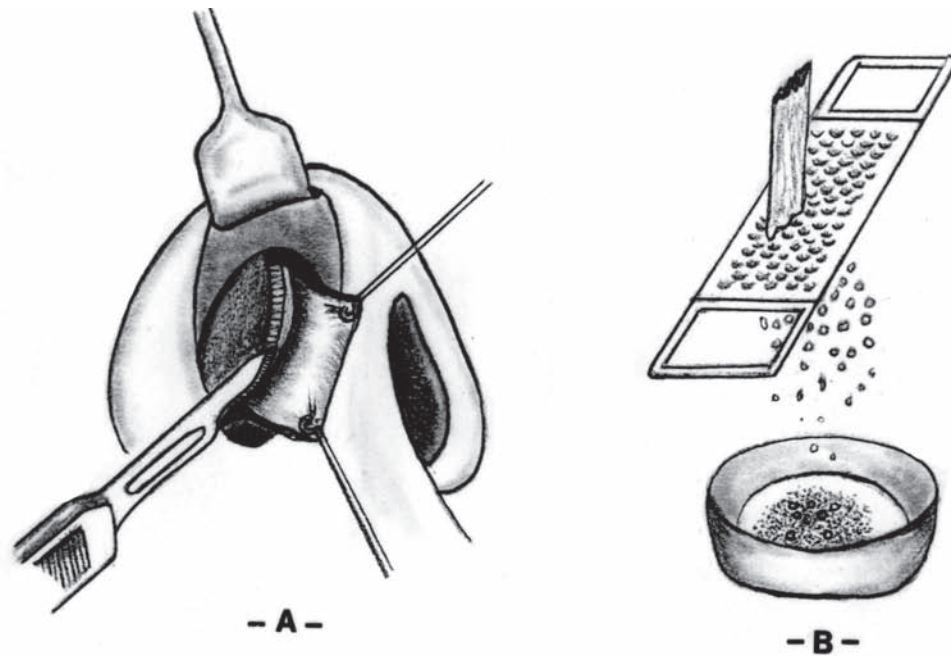


Figure 2. Continued C. Addition of fat into premixed tissue clay. (3) Technique for making customized muscle tissue clay. A temporalis muscle graft is harvested and minced by a scalpel. Minced muscle is added to premixed tissue clay. (4) Technique for making customized cartilage tissue clay. A, Harvesting the septal cartilage graft, B. Addition of grated septal cartilage into premixed tissue clay.



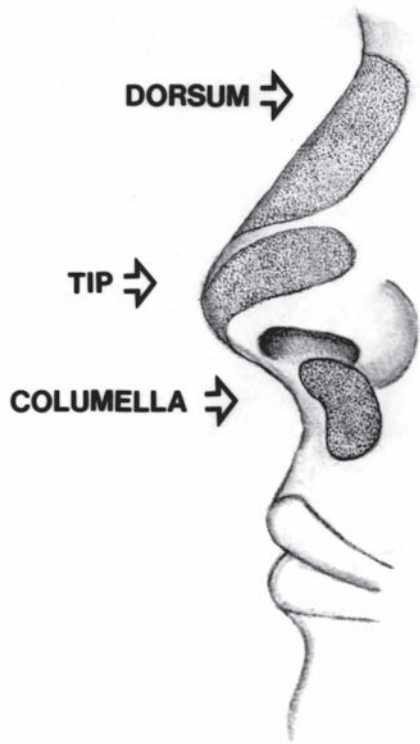


Figure 3. Distribution of tissue clay nasal reconstructions. Customized preparations are matched directly to anatomic area. Dorsum-bone tissue clay; tip-cartilage tissue clay; columella-muscle tissue clay.

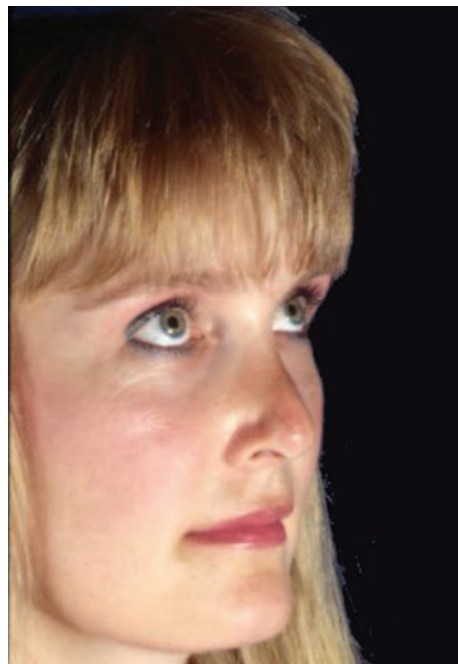


Figure 4. A, Preoperative view showing postrhinoplastic tip deformity. B, Postoperative view 2 years after “customized cartilage tissue clay” rhinoplasty.

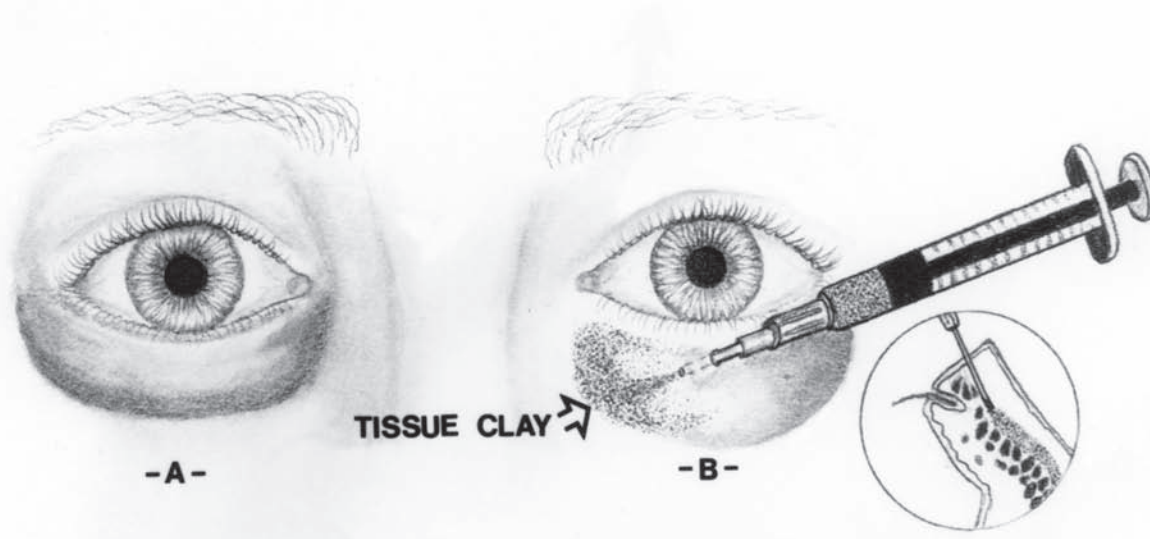


Figure 5. Technique for reconstruction of postblepharoplasty cadaveric deformity. A Sunken lower eyelid secondary to excessive removal of fat and orbicularis oculi muscle. B, injection of “customized muscle tissue clay” preparation under skin muscle flap (see inset).

Table 56-1. Overview of Customized Tissue Clay Results

CATEGORY	NO. OF PATIENTS	PREPARATION ^a	DURATION (YEARS)	% RESULT P, F, G, E
Facial Defects				
Posttrauma	4	B	>3	75G/25F
	5	C	>2	100G
	9	M	>1	66E/33G
Postsurgical	13	M	>2	75G/25F
	3	B	>3	100G
Congenital	6	M	>3	66F/33P
Wrinkles	147	F	>2	50G/50F
Malar Augmentation	36	B	>1	50G/50F
	21	M	>1	75E/75G
Chin Augmentation	16	B	>1	50G/50F
Postblepharoplasty	5	M	>2	100E
Rhinoplasty				
Primary	113	B	>3	75G/25F
	30	C	>3	50E/50G
Rhinoplasty Revision				
Tip	14	C	>2	50E/50G
Dorsum	15	B	>2	75G/25P
Columella	24	M	>2	60G/40P
Auricle				
Posttrauma	1	C	>2	100G
Postsurgical	2	C	>1	50E/50G
Congenital	2	C	>1	100F

^a Abbreviations: B, bone; C, cartilage; M, muscle; F, fat

^b Abbreviations: P, poor; F, fair; G, good; E, excellent

length of the wrinkle with an extra 2 cm length margin. The needle is then detached and the syringe is attached. The entire apparatus is then gently removed while simultaneous injection of the clay is accomplished. There have been no reports of allergic manifestations thus far. For patients testing positive to collagen sensitivity the procedure is absolutely contraindicated.

DISCUSSION

The physiologic mechanisms operative in the incorporation of tissue clay into the body are diverse and not fully understood. Basic tissue clay is composed of microfibrillar collagen² and whole blood. It is well documented that microfibrillar collagen actively entraps platelets, inducing a phenomenon of aggregation with rapid clotting and adherence to soft tissue.³ It is also recognized that blood clots tend to act as scaffolds and inducers to new osteogenesis and neocartilageneous growth in experimental animal models⁴ and in human trials⁵. Thus it is understandable that the combining of a Collagenrich scaffolding media with blood clots and basic tissue such as bone, cartilage, muscle, and fat secures a rich media for facial reconstruction. These combined factors are most probably the basis for the adaptability of the tissue clays and their ability to integrate themselves so well into the surrounding tissues.

RESULTS

The combined clinical experience in the use of customized tissue clay includes 516 cases over a 5-year period with the longest follow-up being 5 years and the minimal follow-up being 1 year. The theoretic complications include the following: local or systemic infection, toxic effect, contour defects, or adjacent tissue reaction. There is an occasional (10 percent) hyperemic reaction to the tissue clay when it is placed very superficially, which resolves spontaneously in 1 to 2 weeks. No other complications were documented. Resorption rates for the combined experience were approximately 20 percent over 3 to 4 years.

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