One-year Survival of AlloDerm Allogenic Dermal Graft and Fat Autograft in Lip Augmentation

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Background: Although many methods for cosmetic lip augmentation are available, none represents an ideal solution.

Objective: A quantitative analysis of surgical lip augmentation was undertaken comparing AlloDerm (Lifecell Corp., Branchburg, NJ) allogenic dermal graft and autologous fat injection with autologous fat injection alone.

Methods: Horizontal stab incisions were made at the vermilion border in the lateral commissure of the lip. A tunnel connecting the incision was created with a canthal awl by use of blunt dissection along the vermilion border in a submucosal supraorbicularis muscle plane. AlloDerm grafts were affixed to the end of the awl, pulled through the tunnel, and held in place with interrupted 4-0 chromic sutures. Fat was injected into the lips in a “string-of-pearls” fashion, with approximately 0.5 to 0.8 mL used per pass. Volume measurements were taken at 1 month, 3 months, and 1 year after operation.

Results: Mean vermilion show was substantially increased at 1 month after surgery in both groups. At 3 months, mean vermilion show was unchanged in the AlloDerm/fat group but decreased 0.6 mm in the fat-only group. At 12 months, mean vermilion show had decreased 0.2 and 1.0 mm, respectively, for these 2 groups. Measurements of lateral lip projection in the AlloDerm/fat group demonstrated a sustained increase at 3 and 12 months.

Conclusions: AlloDerm used with injected autologous fat appeared to result in a long-lasting increase in vermilion show and lateral lip projection. Future studies with quantitative analysis of surgical outcomes can be used to compare various allograft implantation techniques and identify the optimum technique for maximum volume maintenance. (Aesthetic Surg J 2002;22:349-354.)

The increasing popularity of thick, full lips in Western popular culture has inspired a renewed interest in cosmetic lip augmentation. The use of mucosal flaps, exogenous implants, autologous dermis, and autologous fat has been described for lip augmentation. Although these methods all have their own advantages and disadvantages, none represents an ideal technique that can provide a safe, reliable, and long-lasting result. The use of AlloDerm (Lifecell Corp., Branchburg, NJ) in lip augmentation has recently been described as a safe, effective and technically uncomplicated procedure.1,2 However, no quantitative long-term analysis of the results has yet been published.

AlloDerm is an allogenic, acellular dermal graft processed from tissue-banked human skin. Because of its acellular nature, this material is nonimmunogenic.3 Because the graft has an intact, porous dermal matrix, ingrowth and colonization from host fibroblasts and endothelial cells lead to excellent integration.4 The clinical use of AlloDerm was first described in the management of full-thickness burns. AlloDerm has more recently been...
used for the treatment of facial defects, depressed scars, septal perforations, and nasolabial fold and lip augmentation. We chose to use AlloDerm instead of autogenous dermal grafts because of the lack of donor site morbidity, reduced procedure time, and absence of risk for postoperative epidermal inclusion cysts. In this study, we provide a quantitative analysis comparing surgical results in lips treated with AlloDerm allogenic dermal graft and fat autograft versus those treated with fat autograft alone.

Methods

Six adult female patients between the ages of 25 and 58 years were included in the study. Three underwent autologous fat injection of the lips by use of the Coleman technique to a total of 4 lips. Three patients received an AlloDerm acellular dermal graft in addition to autologous fat injection to a total of 5 lips. Patients generally desired augmentation to correct hypoplastic lips caused by atrophy/aging and congenital/hereditary factors. One patient in the AlloDerm group had undergone traumatic cleft lip repair.

The combination was typically performed with the patient under local and regional anesthesia on an outpatient basis. Horizontal stab incisions were made with a number 11 blade at the vermillion border in the lateral commissure of the lip through the moist mucosa (Figure 1). A plane superficial to the orbicularis oris muscle was identified by use of blunt scissors and developed for approximately 1 to 1.5 cm. Blunt dissection along the vermillion border in a submucosal/supraorbicularis oris muscle plane was continued with a canthal awl, creating a tunnel connecting the lateral stab incisions (Figure 2).

The AlloDerm graft was prepared by rehydration in sterile normal saline solution for 2 sequential 5-minute periods, with each period performed in a separate sterile container. The soft, pliable AlloDerm was trimmed to the appropriate dimensions with scissors and fashioned into a cigarette shape by rolling it upon itself (Figure 3). Interrupted 4-0 chromic sutures secured the roll. Sutures were placed at each end of the rolled graft and at the regions of predetermined high points of the vermilion cupid’s bow for the upper lip and in the midline for the lower lip. The diameter of this cigarette-shaped graft ranged from 5 to 8 mm, depending on the desired degree of augmentation. The graft was then affixed to the end of the canthal awl and pulled through the previously created submucosal tunnel (Figure 4). After careful positioning of the graft, it was held in place with 2 interrupted 4-0 chromic sutures placed in the submucosal plane at the commissures.

Fat for injection was harvested in the standard fashion. With the Coleman lipostructure injection system, the fat was injected into the lips in a “string-of-pearls” fashion with approximately 0.5 to 0.8 mL used per pass. The fat was injected on withdrawal of the cannula and only within the orbicularis oris musculature. Care was taken to
avoid entering the vermilion submucosal region of the previously placed AlloDerm graft. Several dozen passes were made per lip injected, allowing fine sculpting of the lip contour and shape. Finally, the stab incisions were closed with interrupted 4-0 chromic sutures.

Standard preoperative and 1-, 3- and 12-month postoperative photographs were compared by use of digital imaging software (Adobe Photoshop 4.0; Adobe Systems Inc, San Jose, CA). On the lateral-view photographs, a vertical line connecting the subnasale to the soft-tissue pogonion served as a reference plane and control length (Figure 5). Lip projection was determined as the maximum horizontal distance between the vermilion and the subnasale-pogonion reference plane. Vermilion show was measured as the vertical distance of the exposed vermilion from the white roll to the wet line in each lip. Vermilion show was measured for the fat only group, whereas both vermilion show and horizontal projection were determined for the AlloDerm/fat group. Taking the 1-month postoperative vermilion show as the baseline maximum value, estimated volume maintenance was determined. Estimated volume maintenance was defined as the retention of the 1-month postoperative increase in vermilion show, determined at the 3- and 12-month postoperative periods.

Results

Vermilion show and estimated volume maintenance

A substantial increase in mean vermilion show was seen in both groups of patients at 1 month after operation (Figure 6). In comparison with the 1-month postoperative result, mean vermilion show was unchanged at 3 months after operation and decreased 0.2 mm at 12 months after operation for lips treated with AlloDerm and fat. This represents estimated volume maintenance of 100% at 3 months and 90% at 1 year after operation. In lips treated with fat only, mean vermilion show decreased 0.6 mm from 1 to 3 months after operation, and 1.0 mm at 1 year after operation, representing estimated volume maintenance of 70% and 50%, respectively (Figure 7).

Projection

Mean projection from the subnasale-pogonion plane for lips treated with AlloDerm and fat increased from 1.2 to 2.4 mm for the upper lips and from 0.0 to 1.1 mm for the lower lips at 1 month after operation. This increased projection remained basically unchanged at 3 and 12 months after surgery (Figure 8). Patient examples are shown in Figures 9 and 10.

Discussion

The numerous methods of lip augmentation available suggest the lack of an ideal treatment. Excellent clinical results have been published on lip augmentation with AlloDerm.\textsuperscript{1,2,5} Few studies, however, have focused on the
quantitative evaluation of volume maintenance and lip projection. Our method of evaluating lip projection was similar to that described by Wang et al., in which soft tissue surface landmarks were used to measure changes in projection. It is unlikely that the location of the subnasale and pogonion would have changed significantly during 1 year follow-up, allowing for quantitative comparison of lip projection with these reference points.

Volume maintenance is a difficult measure to quantify by use of existing methods, because by definition volume is a 3-dimensional quantity. Our approximation of volume maintenance was derived from 2-dimensional measurements of maximum vermilion show. The baseline for the postoperative vermilion show was taken 1 month after surgery to allow for immediate postoperative edema to subside. Our results showed better-than-expected volume maintenance in both groups, with the AlloDerm-fat group retaining 90% of their volume increase at 1 year after surgery. The lasting increase in lip projection seen after 3 months and 1 year is consistent with this result. Other reports of autologous and allogenic dermis used in lip augmentation seem to corroborate our result. Rohrich et al. estimated the 1-year survival rate of AlloDerm graft implanted in the lips to be 80%. Errol similarly predicted an 80% 1-year survival rate of his autologous dermis/fat cocktail.

Our result of 50% estimated volume maintenance for lips treated with fat only is well within the wide range published, although these published results are mostly

**Figure 5.** Lateral illustration demonstrates the vertical line connecting the subnasale (SN) to the soft-tissue pogonion (PG), which serves as a reference plane and control length. The measurements for upper lip projection (A-B) and lower lip projection are shown. The horizontal lines mark the upper and lower extent of vermilion show.

**Figure 6.** Mean vermilion show.

**Figure 7.** Estimated volume maintenance.

**Figure 8.** Mean lip projection from the subnasale-pogonion plane.
qualitative observations by the authors. The improved volume maintenance seen in the AlloDerm-fat group may reflect biointegration of the AlloDerm by colonizing fibroblasts, or a slower rate of resorption of AlloDerm as compared with autologous fat. Our surgical technique for subvermilion implantation of AlloDerm is evolving. We currently use four 3- to 5-mm-wide strips of AlloDerm that are separately implanted within the vermilion to allow for potentially greater allograft surface exposure to the local vascularized bed.

The most obvious limitation of this study is the small number of patients studied. However, this method of evaluating lip volume and projection may be helpful in the study of this or other techniques of lip augmentation. By emphasizing quantitative analysis of surgical outcomes, we may eventually develop a more scientific basis for the cosmetic procedures that we perform for our patients.

**Conclusion**

Our results in a very small group of patients seem to indicate that AlloDerm acellular dermal graft used in conjunction with fat autograft for lip augmentation allows for lasting improvements in lip volume and projection. Future studies are indicated to compare various allograft implantation techniques to identify the optimum technique for maximum volume maintenance.
References


