Costal Cartilage Graft to Prevent Drooping after Free Flap Reconstruction of the Lower Lip

Masamitsu Kuwahara, MD, PhD
Satoshi Yurugi, MD
Kumi Mashiba, MD
Junji Ando, MD
Mika Takeuchi, MD
Riyo Miyata, MD
Masayuki Harada, MD
Yasumitsu Masuda, MD
Saori Kanagawa, MD

Summary: For large lower lip defects, a thin flap combined with a tendon is the standard reconstructive option. However, this method can result in flap ptosis, which occurred in two of our patients. To correct the ptosis, we transplanted costal cartilage into the reconstructed lower lips, which produced good or moderate results. We report our experience based on long-term follow-up. In case 1, reconstruction was performed with a latissimus dorsi myocutaneous flap. Within 10 years of the first cartilage transplant, two additional surgeries were required due to cartilage/screw breakage. These problems may have been triggered by the bulkiness of the flap and/or the angle at which the cartilage was anchored in place. There have not been any further problems for 3 years. In case 2, reconstruction was performed with a free anterolateral thigh flap. The skin around the flap had poor extensibility, and the patient had marked Class II occlusion. We grafted cartilage without fixing it to the mandible. However, temporary interference with the maxillary dentition was observed. In conclusion, costal cartilage grafts are effective against flap ptosis after free flap reconstruction of the lower lip in patients without Class II occlusion. To achieve long-term stability, the optimal angle and positioning of the cartilage and the extensibility of the skin must be thoroughly investigated before surgery, and a thick piece of cartilage must be firmly fixed in place. (Plast Reconstr Surg Glob Open 2022;10:e4110; doi: 10.1097/GOX.0000000000004110; Published online 17 February 2022.)

For large lower lip defects, a thin flap, such as a free radial forearm or anterolateral thigh flap, combined with a tendon is the standard reconstructive option. However, this method can result in flap ptosis, which occurred in two of our patients. To correct the ptosis, we transplanted costal cartilage into the reconstructed lower lips, which produced good or moderate results. We report our experience based on long-term follow-up.

PATIENT 1

The patient was a 50-year-old man who underwent a free anterolateral thigh flap transfer for a large lower lip defect after tumor resection, but the flap necrosed. Re-reconstruction with a free latissimus dorsi myocutaneous flap was subsequently carried out. The original skin of the flap was used to reconstruct the oral side, and a skin graft was placed over the muscle on the facial side. The free tensor fascia suspension was reused. However, 5 months later, the patient complained of difficulty eating caused by the flap drooping.

We transferred a costal cartilage graft to the lower lip to prevent drooping and followed up the patient for 10 years. We subsequently made several improvements, which prevented the lip from drooping.

The first cartilage graft, a T-shaped piece of costal cartilage (thickness: 4 mm), was fixed in place with two KLS Martin screws (Fig. 1). Later, the cartilage broke at the screw fixation site. Therefore, we replaced it (thickness: 8 mm). Because the flap was bulky, we reduced its fat content. Subsequently, the screw holding the cartilage in place was damaged (Fig. 2A). We reused the grafted cartilage and moved it to the cranial side by about 1 cm. We fixed it in place with a reconstruction plate and screws. When we moved the cartilage upward, it was necessary to reduce the fat volume of the flap to ensure it retained sufficient extensibility (Fig. 2B).

Disclosure: The authors have no financial interest to declare in relation to the content of this article.

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.
Three years have passed since the last operation, and no flap ptosis, damage to the plate or screw, or loosening of the cartilage has been observed. In addition, the tumor has not recurred. The patient does not have a problem with drooling or with water or solid food intake. He can drink from a glass without spilling anything. Last year, his tooth decay progressed. For unknown reasons, some restriction of mouth opening had occurred. There were no problems with the function of the lower lip itself after the final surgery. The patient does not hesitate to eat, drink, or talk in public. (See Video [online], which shows how oral competence was confirmed by speech and drinking water from a cup.)

PATIENT 2

The patient was a 60-year-old man with purpura fulminans, whose upper and lower lips were reconstructed with a free anterolateral thigh flap, reported previously. Two years after the reconstruction, drooping of the reconstructed lower lip occurred. A piece of cartilage (thickness: 5 mm) was grafted without screw fixation. As the patient had Class II occlusion and the lip was not extensible, we considered that the cartilage would interfere with the maxillary dentition if it were subjected to rigid fixation. Later, the cartilage sometimes interfered with the maxillary dentition (Fig. 3). Eight years after the procedure, the scar became soft, and both the upper and lower lips drooped. In addition, the orbicularis oris muscle at the right corner of the mouth was considered to have collapsed. As the drooping was not severe, the patient did not want to undergo revision surgery. Drooling sometimes occurred from the right corner of the mouth instead of from the center. The patient could eat solid foods without problems, but sometimes spilled water if he was not careful. This made the patient hesitant to eat and drink in public places. However, there were no problems with pronunciation, and the patient did not hesitate to speak in public.

DISCUSSION

For large lower lip defects, a thin free flap combined with a tendon is the standard reconstructive option. However, it has been reported that flap contraction and the detachment of sutures connecting the tendon to the surrounding muscles can cause oral incompetence. We agree with this and consider that tendon-based reconstruction cannot prevent flap contraction and drooping.
especially in the central region, even if strong tension is maintained between the tendon and muscle.

Grafting cartilage into the lower lip to harden it may not be a physiological approach and is rarely used.\(^4\,^5\) However, it was effective at preventing drooping without causing secondary inconvenience in the first case. In the second case, with Class II occlusion and tight lip, we grafted cartilage without rigid fixation, and the entire lower lip drooped. However, we considered that it helped maintain the firmness of the central lower lip for a long time. We believe that the difference in results in these two patients is not due to differences in the adapted musculo-cutaneous or fascial flaps.

From our experience, various precautions are required when performing lower lip cartilage grafting. Based on case 1, we consider that cartilage grafts should be more than or equal to 8-mm thick. In addition, the implant angle with respect to the line from the mandibular line to the upper dentition must be minimized because we suspect that the downward pressure created by the upper lip during meals caused the cartilage/screws to break in case 1. To achieve a good angle and appropriate positioning of the cartilage, it was necessary to reduce the amount of fat in the second latissimus dorsi flap. The screws used for the facial bone fixation were not strong enough, and the use of a plate and screws for the reconstruction was considered better. The width of the cartilage above the T-shaped cartilage may be slightly narrowed so as not to impede the movement of the corners of the mouth.

Considering the above points, it is possible to perform lower lip reconstruction using a thin free flap (including the radial forearm flap) with tendon at the same time as cartilage grafting to prevent the flap from drooping.

In conclusion, costal cartilage grafts are effective at preventing flap ptosis after free flap reconstruction of the lower lip in patients without Class II occlusion. To achieve long-term stability, the optimal angle and positioning of the cartilage and the extensibility of the skin must be thoroughly investigated before surgery, and a thick piece of cartilage must be firmly fixed in place.

Masamitsu Kuwahara, MD
Division of Plastic Surgery
Nara Medical University Hospital
840 Shijocho, Kashihara
634-8522 Nara
Japan
E-mail: makuwa@naramed-u.ac.jp

PATIENT CONSENT

The patients provided written consent for the use of their images.

REFERENCES

1. Yildirim S, Gideroğlu K, Aydogdu E, Avcı G, Akan M, Aköz T. Composite anterolateral thigh-fascia lata flap: a good alternative to radial forearm-palmaris longus flap for total lower lip reconstruction. Plast Reconstr Surg. 2006;117:2033–2041.
2. Shinohara H, Iwasawa M, Kitazawa T, et al. Functional lip reconstruction with a radial forearm free flap combined with a masseter muscle transfer after wide total excision of the chin. Ann Plast Surg. 2000;45:71–73.
3. Kuwahara M, Yurugi S, Yamanaka Y, Sasaki C, Nakanishi T. Reconstruction of near-total loss of the upper and lower lips due to purpura fulminans with local tissue and a dual-skin paddled anterolateral thigh flap. Plast Reconstr Surg Glob Open. 2017;5(9):e1505.
4. Dunaevskii VA. Transplantation of the cartilage in reconstruction of the lower lip. Stomatologiya (Mosk). 1955;3:43–44.
5. Matsumoto M, Onoda S, Uehara H, et al. Correction of the lower lip with a cartilage graft and lip resection in patients with facioscapulohumeral muscular dystrophy. J Craniofac Surg. 2016;27:1427–1429.
6. Rysz M, Krajewski R. Total lower lip reconstruction with free forearm flap suspended on Adams wires. J Plast Reconstr Aesthet Surg. 2018;71:e56–e58.