Malar Reconstruction Using Y-V Advancement Flaps after Tissue Expansion in Treacher Collins Syndrome

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Summary: The Treacher Collins syndrome is characterized by both soft and hard tissue deficiencies. To reconstruct malar hypoplasia with both soft and hard tissues, we designed a new method using cartilage grafts, Y-V advancement flaps, and Z plasty with tissue expansion. (Plast Reconstr Surg Glob Open 2016;4:e715; doi: 10.1097/GOX.0000000000000717; Published online 24 May 2016.)

Treacher Collins syndrome is an uncommon hereditary malformation, and the hallmarks of the syndrome are malar hypoplasia and eyelid coloboma. It was reported by Berry in 1889 and Collins in 1900. The syndrome is characterized by both soft and hard tissue deficiencies. To reconstruct malar hypoplasia with both soft and hard tissues, we designed a new method using cartilage grafts, Y-V advancement flaps, and Z plasty with tissue expansion.

METHODS

Tissue expanders are inserted bilaterally cranially to the zygomatic arch and posteriorly to the frontal process on the deep temporal fascia of the lower temporal region from a small incision of the upper temporal area. Expansion of this location helps both to make space for cartilage graft and to reconstruct the lower eyelid. After tissue expansion, 2 Y-V advancement flaps are designed (Figs. 1 and 2). The base of the larger lateral flap is situated on the expanded flap. Recently, a lambda incision has been added to the flap.

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After removal of the tissue expander, T-shaped rib cartilage grafts are implanted bilaterally in the hypoplastic malar regions (Fig. 3). A hole was drilled through the zygomatic bone, and the lateral canthal ligament was repositioned and pulled through it in the upper and lateral direction. Two Y-V advancement flaps were inserted, and the positions of their tips were exchanged in a Z-plasty like fashion (Fig. 2).

This method was used from January 1993 to February 2014 in 4 patients with Treacher Collins syndrome (Table 1). Three of the 4 patients were female, and 1 was male, aged 12 to 26 years. The 4 patients were followed up postoperatively for 1 to 16 years. In 1 case, a dermal fat graft was performed because of a small depression in the malar region.

Case 1

A 25-year-old woman had bilateral lower lid coloboma, hearing disturbance, micrognathia, and malar hypoplasia (Fig. 4). She presented for the treatment of the lower lid coloboma, malar hypoplasia, and micrognathia. Sleep apnea was not noted.

During the first operation, 28 cm³ tissue expanders were inserted bilaterally cranially to the zygomatic arch and posteriorly to the frontal process on the deep temporal fascia of the lower temporal region. Segmental osteotomy and mentoplasty of the mandible were performed simultaneously.

Four months later, T-shaped cartilage grafts were performed in both malar regions with 2 Y-V advancement flaps. Reconstruction of the coloboma, Y-V advancement, and Z-plasty were performed bilaterally.

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Holes were drilled in the zygomatic bones, and the bilateral lateral canthal ligaments were pulled through them in the upper and lateral direction. Thirteen years later, bilateral dermal fat grafts were performed because of small depressions in the malar regions. The condition 14 years after the first malar cartilage grafts is shown in Figure 4.

**Fig. 1.** A, A tissue expander is inserted bilaterally on the deep temporal fascia from the small incision of the lower temporal region. After tissue expansion, 2 Y-V advancement flaps are designed. A lambda incision is added to the base of the larger lateral flap. B, The 2 Y-V advancement flaps are advanced, and the positions of the tips are exchanged with each other in a Z-plasty-like fashion after removal of the tissue expander.

**Fig. 2.** A schematic diagram of transposition of the flap.

**Fig. 3.** After removal of the tissue expander, T-shaped rib cartilage grafts are implanted bilaterally on the hypoplastic malar regions.

Holes were drilled in the zygomatic bones, and the bilateral lateral canthal ligaments were pulled through them in the upper and lateral direction. Thirteen years later, bilateral dermal fat grafts were performed because of small depressions in the malar regions. The condition 14 years after the first malar cartilage grafts is shown in Figure 4.

### Table 1. Patient Data

| Case | Age (y) | Sex | Follow-Up  |
|------|---------|-----|------------|
| 1    | 25      | F   | 1 y        |
| 2    | 12      | M   | 10 y 11 mo |
| 3    | 26      | F   | 16 y 7 mo  |
| 4    | 25      | F   | 2 y 4 mo   |

F, female; M, male.

### Case 2

A 10-year-old boy had bilateral lower lid coloboma, microtia, hearing disturbance, micrognathia, malar hypoplasia, and sleep apnea.

The patient underwent distraction osteogenesis of the mandible at the age of 10 years. At 12 years of age, 28 and 95 cm³ tissue expanders were inserted in the right lower temporal and microtia regions, respectively. Four months after harvesting of the right rib cartilage, grafts were fashioned for the right ear and the right malar regions. From 2 Y-V advancement flaps, T-shaped cartilage grafts were grafted in the malar region, and for reconstruction of the right coloboma, YV advancement and Z-plasty were performed, and a part of the cartilage was grafted for microtia. The same operations were performed...
at the age of 13 years on the left side by harvesting left rib cartilage.

Mentoplasty to pull the muscles attached to the tongue and hyoid bone was performed to improve sleep apnea at the age of 16 years.

DISCUSSION

Treacher Collins syndrome is characterized by both soft and hard tissue deficiencies and is thought to be the bilateral occurrence of combined Tessier numbers 6, 7, and 8 craniofacial cleft. Menard et al reported tissue expansion in the reconstruction of a series of Tessier craniofacial clefts; primary correction of facial clefts and preparation for bone grafting or osteotomy. They concluded that long-term bone graft viability demanded coverage with tissue of adequate vascularity and that tissue expansion was effective in tension-free reconstruction for osteotomy and bone grafting. Therefore, the use of tissue expansion is ideal for the reconstruction of soft tissue and establishing good conditions for bone or cartilage grafts.

For treating Treacher Collins syndrome, placement of a tissue expander in the malar area has been reported. In this study, expanders were inflated gradually over several years. In a secondary procedure, the expander was removed and a cranial or rib graft was placed directly into the space formed by the expander.

In Treacher Collins syndrome, there is also coloboma of the lower eyelid. For its reconstruction, a composite upper lid flap has been reported. In this method, a full-thickness incision through the lower lid is made to release the coloboma, and an upper lid flap is transferred to the lower lid defect. In a similar method, an advancement rotation flap from the upper eyelid was performed secondarily. For the coloboma, an advancement rotation flap was performed secondarily.

In our method, the expanded skin for coverage of cartilage grafts can also be used to reconstruct the lower eyelid by using Y-V advancement flaps. An upper eyelid incision to make an upper lid flap is unnecessary. A coronal incision is also not needed. From the flap incisions, we can approach both the malar region and the coloboma. However, an incision for harvesting rib cartilage and an operation for placing a tissue expander are necessary. Autologous costal cartilage seems to retain some

Fig. 4. A, A 25-year-old woman with Treacher Collins syndrome. B, The condition 14 years after the first malar cartilage grafting.
growth potential. The expanded skin must provide cartilage grafts with good vascularization and absence of tension. Costal cartilage can be harvested safely and plentifully even in children. If absorption occurs, additional cartilage grafts can be performed.

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PATIENT CONSENT
Patients, parents, or guardians provided written consent for the use of their images.

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