Surgical Outcomes and Complications of Septal Extension Graft Supported by 3D Printed Polycaprolactone Plate in Asian

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INTRODUCTION

Tip plasty using a septal extension graft (SEG) is useful in the Asian populat ion. However, complications such as decreased tip projection, infection, or deviation are noted post-surgery, and additional support using an SEG is of ten necessary. We aimed to transplant an additional 3D printed polycaprola ctone (PCL) graft to the tip plasty using the SEG to reinforce the SEG.

Methods

The study included 43 patients (20 males and 23 females; mean age, 28.7 years; range, 17–58 years) who received rhinoplasties using the SEG metho d combined with a 3D printed PCL graft from November 2016 to August 20 17. The mean observation period was 14.8 months (range, 12–20 months).

Techniques

Rhinoplasty was generally performed under general anesthesia, or local anesthesia up on patient request. The anesthetic solution consisted of 1% lidocaine with 1:200,000 e pinephrine. The mucoperichondrium and the septum were infiltrated, and the nose was hyperinflated with the solution. A total of 15 to 20 mL of local anesthetic solution was used for infiltration of the nose, including the dorsal skin, nasal floor, and septum. An open rhinoplasty approach was used; a midcolumellar inverted V-shaped incision was made, running along the rim of the LLC(lower lateral cartilage) at its caudal aspect. Th e columella and dorsal skin flaps were elevated to the level of the perichondrium of the LLC with angled iris scissors. The surgeon used a two-pronged skin hook to avoid pull ing the fat off of the dermis when the skin flap was elevated. The ULC was then releas ed from its attachment to the dorsal septum using either scissors or a scalpel. The LL C was separated completely, the right and left LLC were separated from each other, a nd the nasal septum was exposed. The nasal septal mucoperichondrium was elevated bilaterally in order to generate mucoperichondrial pockets for the insertion of the SEG. The septal cartilage was harvested and designed to a size of 2 cm long, 2 cm wide, a nd 1.5–2 mm thick on the grid plate. The prepared cartilage graft and the PCL graft we re inserted into the mucoperichondrial pocket of the septum and fixed to the septum w ith 5-0 PDS sutures at 3 or 4 points bilaterally. The PCL mesh (1 mm) can provide add itional support to the nasal tip. The degree of the septal extension was dependent on t he tip projection and rotation but generally consisted of a 10–15 mm intraoperative pro jection. After fixation of the cartilage graft, the LLC were suspended to the tip of the S EG and fixed in position with 5-0 PDS sutures; for enhanced projection, one or two on -lay grafts were performed. Finally, the nasal skin was closed with 6-0 nylon sutures.

Intraoperative photos show an SEG combined with PCL graft bilaterally (one side is an SEG using septal cartilage and the opposite side is a 3D-printed PCL graft). 3D = three-dimensional; PCL = polycaprolactone; SEG = septal extension graft

	Male (n=20)	Female (n=23)	Number(%)
Excellent	13	13	26(60.5%)
Good	6	7	13(30.2%)
Fair	1	2	3(7%)
Poor	0	1	1(2.3%)

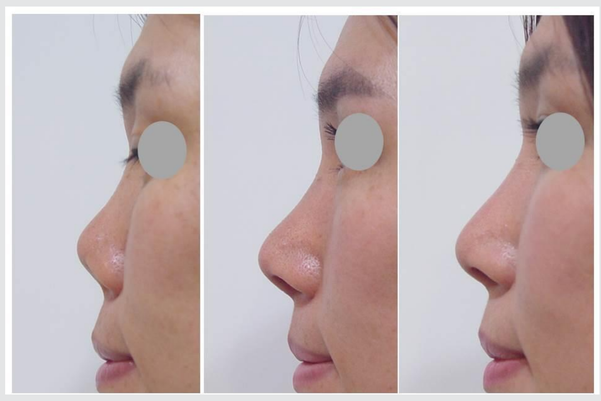
The Satisfaction for Tip Plasty with Septal Extension Graft Combined with 3D-Printed PCL Graft.

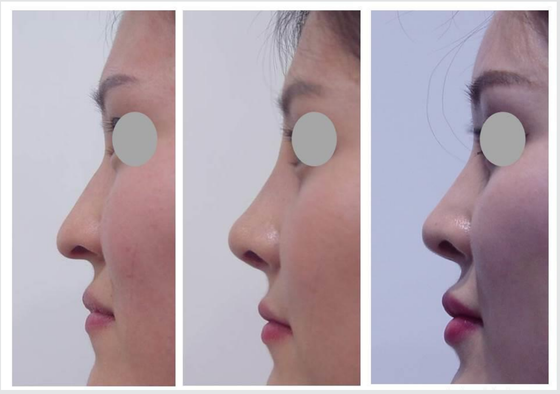
		Preoperation (mean ± SD)	Postoperation (3 months) (mean ± SD)	Postoperation (1 year) (mean ± SD)
Tip projection	Male	0.88±0.14	1.02±0.13	0.98±0.12
	Female	0.89±0.14	1.09±0.12	1.07±0.13
	Total	0.88±0.14	1.06±0.13	1.03±0.13
			P=0.000	P=0.001
Nasolabial angle	Male	88.81±9.67	86.09±7.83	85.90±7.81
	Female	90.26±12.18	92.43±7.27	91.91±8.13
	Total	89.58±10.99	89.48±8.10	89.12±8.45
			P=0.929	P=0.087

The Changes of Tip Projection and Nasolabial Angle of Before and After Operation

Complications	Male (n=20)	Female (n=23)	Number(%)	Comparison
Tip decrease			28(65.1)	p=0.167
<10%	13	15	13(30.2)	
≥10% ~ <50%	2	6	2(4.7)	
≥50%	5	2		
Stiffness				p=0.333
No	8	4	12(27.9)	
Without discomfort	10	10	20(46.5)	
With discomfort	2	9	11(25.6)	
Deviation	1	1	2(4.7)	
Infection	1	0	1(2.3)	
Revision	1	0	1(2.3)	

The Complications of Septal Extension Graft Combined wi th 3D-Printed PCL Graft





DISCUSSION

In the current study, despite the use of 3D-printed PCL as a supplemental su pport, 15 patients (34.9%) demonstrated tip drooping at the 1-year follow-u p, of which 13 patients (30.2%) reported mild to moderate tip drooping, and t wo patients (4.7%) reported severe tip drooping. Although tip support using a n SEG combined with a 3D printed PCL was maintained up until 3 months, tip drooping developed at the 1-year follow-up. The reason of tip drooping see m to occur due to absorbable PDS fixation sutures as opposed to permanent sutures. We need to consider using permanent suture materials instead of ab sorbable PDS sutures for fixating of SEG and PCL graft to septum in the futur e to avoid tip ptosis. Comparing to the previous study, tip stiffness increased from 45.5% in SEG without PCL to 72.1% in SEG with PCL. Tip drooping decr eased from 34.1% of mild to moderate and 11.4% of severe in SEG without P CL, and 30.2% of mild to moderate and 4.7% of severe in SEG with PCL. Dev iation of nasal tip decreased from 11.4% in SEG without PCL to 4.7% in SEG with PCL.

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