

[DOI]10.12016/j.issn.2096-1456.202550052

· 临床研究 ·

鼻中隔-鼻小柱复合体支架在单侧唇裂继发鼻畸形二期鼻尖精细化整复中的应用

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【摘要】 目的 探讨肋软骨鼻中隔-鼻小柱复合体支架用于单侧唇裂继发鼻畸形鼻尖精细化整复的临床效果, 为临床治疗提供参考。**方法** 本研究已通过单位医学伦理委员会批准及患者知情同意。收集31例单侧唇裂继发鼻畸形患者, 采用肋软骨鼻中隔-鼻小柱复合体支架移植, 术后随访至少6个月。术前及术后拍摄患者正位、侧位及仰位照片, 分别测量鼻尖观察指标(鼻尖突出度、鼻额角、鼻唇角、鼻尖鼻翼角、鼻尖切角)以及鼻孔相关指标(鼻孔面积、鼻孔高度、鼻孔宽度、鼻槛高度), 并计算患侧与健侧的比值。使用视觉模拟量表(visual analogue scale, VAS)进行鼻尖美学评价。所有测量均采用患者术前及术后最长随访照片。**结果** 术后随访6~49个月, 平均28个月。所有纳入患者的切口均行一期愈合治疗。鼻尖观察指标中, 与术前相比, 术后鼻尖突出度(术前0.48, 术后0.55), 鼻唇角(术前83.98°, 术后100.80°)和鼻尖鼻翼角(术前160.30°, 术后168.40°)均显著增加($P < 0.05$); 鼻额角显著减小(术前139.20°, 术后133.50°, $P < 0.05$), 鼻尖切角减小(术前43.76°, 术后35.80°, $P = 0.062$)。鼻孔相关指标中, 与术前相比, 术后鼻孔面积患侧与健侧比例显著下降(术前1.10, 术后0.94, $P < 0.05$), 鼻孔宽度患侧与健侧比例下降(术前1.10, 术后1.02, $P = 0.194$); 术后鼻孔高度患侧与健侧比例显著升高(术前0.71, 术后0.90, $P < 0.05$), 鼻槛高度患侧与健侧比例升高(术前0.53, 术后0.79, $P = 0.065$); 术后所有比例均更接近1, 患侧与健侧对称性提高。术后效果满意度较高。**结论** 肋软骨鼻中隔-鼻小柱复合体支架可有效纠正单侧唇裂继发鼻畸形患者鼻尖偏斜及塌陷的问题, 长期效果较为稳定。

【关键词】 唇裂; 鼻畸形; 二期手术; 肋软骨; 移植; 鼻尖精细化整复; 隆鼻术; 主观评价; 客观测量

【中图分类号】 R78 **【文献标志码】** A **【文章编号】** 2096-1456(2025)07-0563-10

【引用著录格式】 董哲, 李乔乔, 杨解纲, 等. 鼻中隔-鼻小柱复合体支架在单侧唇裂继发鼻畸形二期鼻尖精细化整复中的应用[J]. 口腔疾病防治, 2025, 33(7): 563-572. doi:10.12016/j.issn.2096-1456.202550052.

Application of strut-septum complex stent in nasal tip refinement of secondary unilateral cleft rhinoplasty
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【Abstract】 Objective To evaluate the clinical efficacy of costal cartilage septal-columellar composite grafts in refining nasal tip aesthetics for secondary unilateral cleft lip nasal deformities, and to provide a reference for clinical treatment. **Methods** This study has been approved by the institutional medical ethics committee and informed consent



微信公众号

【收稿日期】 2025-02-11; **【修回日期】** 2025-04-02

【基金项目】 湖北省慈善总会微笑列车项目(0190746)

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was obtained from the patients. A total of 31 patients underwent surgery with a costal cartilage strut-septum complex stent graft. The follow-up period was a minimum of 6 months. Anteroposterior, lateral, and supine photos of the patient were taken before and after the operation. The following measurements were obtained: nasal tip projection (NTP), nasofrontal angle (NFA), nasolabial angle (NLA), nasal tip alar angle (NAA), and nasal tip tangent angle (NTA). Nostril-related indices [nostril area (S), nostril height (h_1), nostril width (w), and nasal sill height (h_2)] were measured before and after surgery, and cleft/non-cleft side ratios were calculated. Satisfaction with nasal tip aesthetics was investigated using the visual analogue scale (VAS). All measurements were made using preoperative photographs and the most recent follow-up photographs of the patients. **Results** The follow-up period ranged from 6 to 49 months, with an average of 28 months. All patients underwent healing by first intention. Compared with preoperative measurements, postoperative NTP (preoperative 0.48 *vs.* postoperative 0.55), NLA (preoperative 83.98° *vs.* postoperative 100.80°), and NAA (preoperative 160.30° *vs.* postoperative 168.40°) were significantly increased ($P < 0.05$). NFA (preoperative 139.20° *vs.* postoperative 133.50°, $P < 0.05$) and NTA (preoperative 43.76° *vs.* postoperative 35.80°, $P = 0.062$) were decreased. On the cleft versus non-cleft sides, the ratios of S (preoperative 1.10 *vs.* postoperative 0.94, $P < 0.05$), w (preoperative 1.10 *vs.* postoperative 1.02, $P = 0.194$), h_1 (preoperative 0.71 *vs.* postoperative 0.90, $P < 0.05$), and h_2 (preoperative 0.53 *vs.* postoperative 0.79, $P = 0.065$) were all near 1. Satisfaction with postoperative results was fairly high. **Conclusion** The costal cartilage strut-septum complex stent can effectively correct the deflection and collapse of the nasal tip in patients with unilateral cleft lip nose deformity. The postoperative long-term effect is relatively stable.

【Key words】 cleft lip; nasal deformity; secondary surgery; costal cartilage; graft; nasal tip refinement; rhinoplasty; subjective assessment; objective measurement

J Prev Treat Stomatol Dis, 2025, 33(7): 563-572.

【Competing interests】 The authors declare no competing interests.

This study was supported by the grants from Hubei Charity Federation Smile Train Program (No. 0190746).

唇裂继发鼻畸形整复是唇腭裂序列治疗中一个重大的美学和功能挑战。唇裂患者的鼻尖通常表现出圆钝、轮廓不清晰、突出度不足等特点。双侧鼻孔、鼻翼缘和鼻基底部通常不对称,鼻小柱短且向健侧偏移^[1]。鼻畸形往往在患者儿童时期就已出现,且随着青春期软硬组织生长逐渐加重,严重影响面部美观,甚至造成鼻气道阻塞、呼吸不畅^[2-4]。目前通常选择在患者青少年时期行唇裂继发鼻畸形二期整复术(secondary cleft rhinoplasty, SCR)^[5]。

鼻尖及鼻下1/3部分具有重要的功能及美学作用。研究发现,单侧唇裂鼻畸形相比于双侧往往表现出更严重的鼻下1/3畸形,是患者求治想解决的主要问题^[6]。然而,潜在的解剖畸形(梨状孔及前牙区的骨性塌陷、口周及鼻基底部肌肉附着紊乱等)以及先前手术(包括唇裂一期修复和其他手术)留下的瘢痕为鼻整复手术带来极大的挑战性^[7]。此外,鼻中隔偏曲也增大了手术难度^[4,7]。尽管已报道了多种手术方法,但目前关于SCR的最佳策略仍存在争议^[8-11]。

本研究利用肋软骨搭建鼻中隔-鼻小柱复合体支架,在延长鼻中隔的同时为鼻尖提供良好的支

撑,使鼻尖上抬,恢复患者鼻尖形态及鼻唇角。通过视觉模拟量表(visual analogue scale, VAS)调查及二维形态测量分析,评价鼻中隔-鼻小柱复合体支架在单侧唇裂继发鼻畸形二期鼻尖美学整复中的效果。

1 资料和方法

1.1 研究对象

回顾性收集2020年1月至2024年3月于武汉大学口腔医院正颌与唇腭裂整形外科行SCR手术的单侧唇裂继发鼻畸形(unilateral cleft lip nose deformity, uCLND)患者资料。为保证纳入患者一致性,本研究将SCR手术定义为在唇裂一期唇鼻整复(即患儿出生3~6个月)之后,骨骼生长基本完成时进行的鼻整形手术。

纳入标准:①单侧唇裂继发鼻畸形;②年龄大于16岁;③已行一期唇鼻修复术。

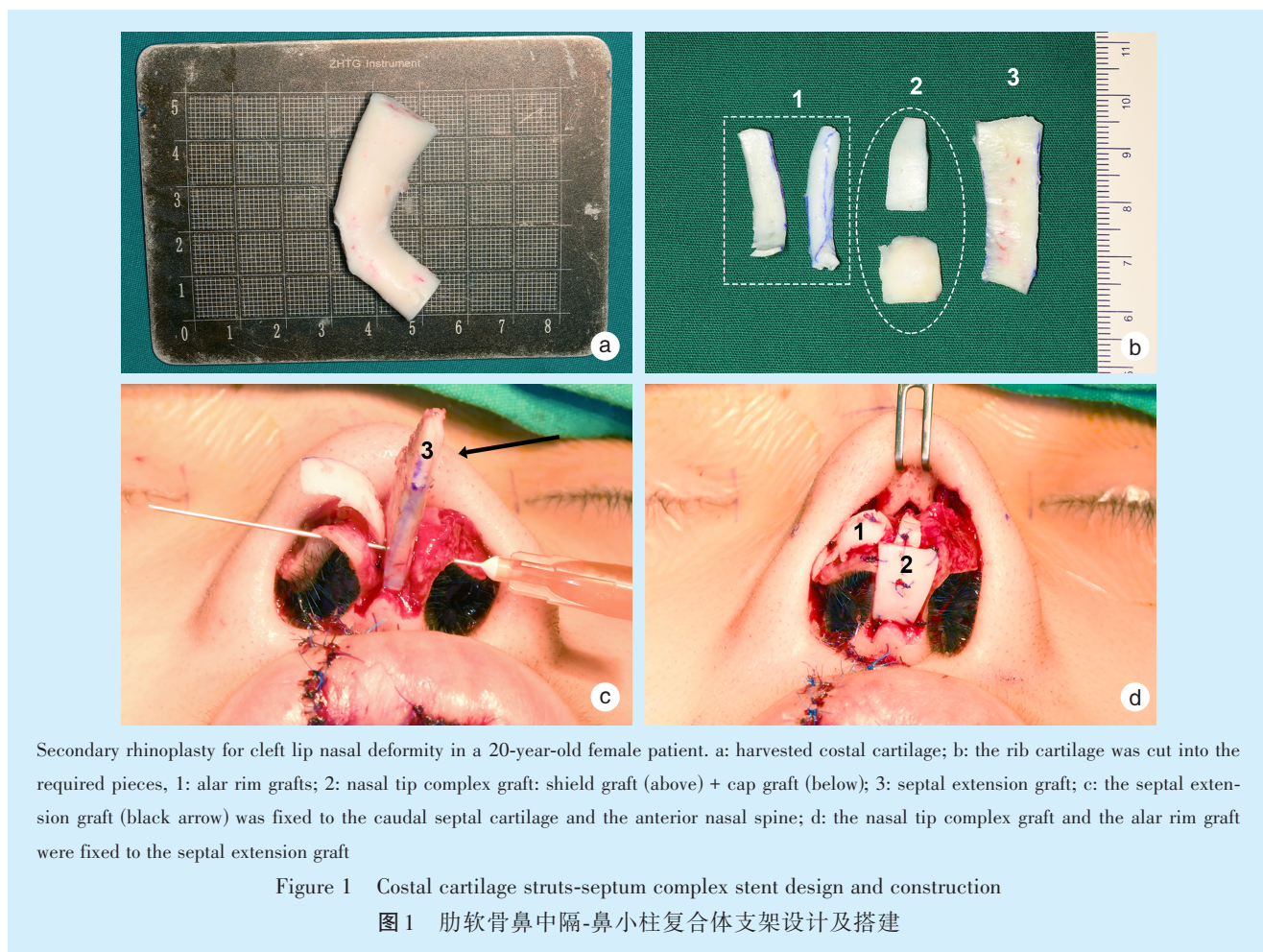
排除标准:①综合征型唇腭裂;②已进行过鼻部移植术充填;③资料不完善者。所有患者均由同一名经验丰富的医生进行手术。术后至少随访6个月。该研究方案经武汉大学口腔医院伦理委员会批准(审批号:2023C16),所有纳入患者均签

署知情同意书。

1.2 手术方法

①于右胸肋骨6、7水平上方行一2~3 cm切口。取腹直肌筋膜约3 cm×2.5 cm,肋软骨约5~5.5 cm。②将取出的肋软骨按设计的形状进行切割。剩余的肋软骨切成不大于1 mm×1 mm的碎片,浸泡在生理盐水中。③在鼻小柱中下1/3处做“倒V”形切口,在健侧鼻孔做环状切口,在患侧鼻孔做Tajima“倒U”形切口,充分暴露鼻翼软骨。分离两侧鼻翼软骨内侧脚,暴露鼻中隔软骨。充分松解鼻中隔及其黏膜附着,并向尾端分离至前鼻棘,离断鼻中隔与鼻侧软骨连接,充分游离鼻中隔软骨,矫正鼻中隔偏曲,采用摇门式成形术,去除

部分偏曲严重的鼻中隔软骨,对背侧和尾端部分软骨进行保留,用丝线将鼻中隔重新定位到前鼻棘正中。沿中线从鼻尖至眉间将软组织与软骨膜及骨膜进行充分松解分离。④使用切好的肋软骨条搭建复合体支架,鼻中隔延伸移植物固定于鼻中隔软骨及前鼻棘上,承担鼻小柱支撑和鼻中隔延伸的联合功能作用。将鼻翼缘移植物及鼻尖复合体缝合固定于鼻中隔延伸移植物上。然后,将腹直肌筋膜包裹的切碎软骨植入鼻背松解的组织袋中,以增加鼻背高度。⑤采用鼻底肌肉复位术搭建鼻翼外侧脚形态,使双侧对称。⑥无张力缝合伤口,并在鼻背固定一个低温热塑鼻夹板以确保术后鼻型稳定(图1)。



1.3 二维照片分析

对患者术前术后照片进行自身配对分析。由一位科室的摄影师分别拍摄术前及术后的正位、侧位及仰位照片,为保证可靠性和可重复性,所有患者均处于面部肌肉放松、习惯性咬合状态。使

用 Adobe Photoshop CS6 软件定点并测量研究指标。使内眦连线与水平线平行,测量指标如下。

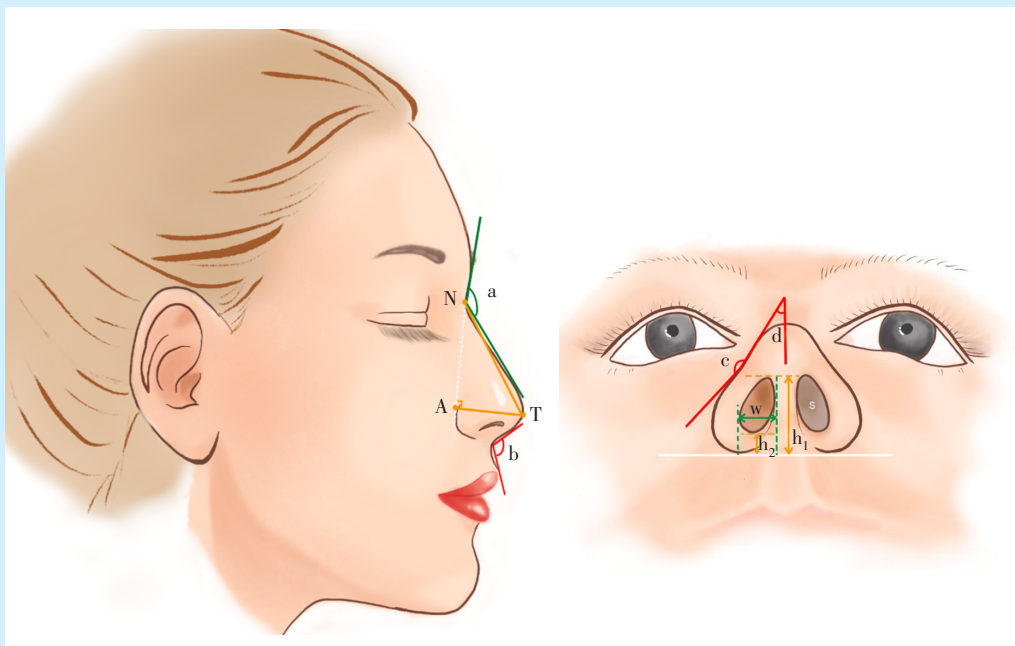
鼻尖观察指标:鼻尖突出度(nasal tip projection, NTP)、鼻额角(nasofrontal angle, NFA)、鼻唇角(nasolabial angle, NLA)、鼻尖鼻翼角(nasal tip alar

angle, NAA)、鼻尖切角(nasal tip tangent angle, NTA)。

鼻孔观察指标:鼻孔面积(nostril area, S)、鼻孔宽度(nostril width, w)、鼻孔高度(nostril height, h_1)和鼻槛高度(nasal sill height, h_2)(图 2)。

NTP 为鼻翼面部转折点和鼻尖之间的距离与鼻根到鼻尖之间的距离的比值,正常值为 0.5 ~

0.65。NFA 为眉间点到鼻根点连线与鼻根点到鼻尖连线之间的夹角。NLA 为鼻小柱点到鼻小柱基底连线与鼻小柱基底上唇中点连线之间的夹角。NAA 为鼻尖外侧缘平行线与鼻翼缘平行线的夹角。NTA 为穿过两内眦连线中点的垂线与鼻尖外侧缘平行线的夹角。所有照片由同一个人重复测量 3 次,每次间隔 2 周。



N: nasion; T: nasal tip; A: alar crease; a: nasofrontal angle (NFA); b: nasolabial angle (NLA); c: nasal tip alar angle (NAA); d: nasal tip tangent angle (NTA); S: nostril area; h_1 : nostril height; h_2 : nasal sill height; w: nostril width; nasal tip projection: TA/NT; white line: a horizontal line parallel to the line connecting the inner corners of the eyes

Figure 2 Nasal tip measurement indexes for patients before and after operation

图 2 患者术前术后鼻尖测量指标

1.4 VAS 评价

手术效果的第三方满意度调查采用 VAS 评分。邀请包括 3 名资深整形外科医生和 7 名非专业人士在内的 10 名独立检查员组成了一个评估小组。向小组展示了术前和术后半年的正位、侧位和仰位视图,以评估术前和术后美学。VAS 评分为 0 ~ 10 分,0 ~ 2 分为非常差,3 ~ 4 分为差,5 ~ 6 分为一般,7 ~ 8 分为好,9 ~ 10 分为非常好。分数越高,鼻子外观的审美满意度越高。

1.5 统计学处理

采用 SPSS 21.0 软件进行数据分析。用 Kolmogorov-Smirnov 检验正态性。

配对 t 检验用于比较连续变量,对于非正态分

布的连续变量采用配对 Wilcoxon 秩和检验。数据以平均值 $\pm$ 标准差表示。 $P < 0.05$ 为差异具有统计学意义。所有图形都是使用 GraphPad Prism 软件制作。

2 结果

2.1 术前术后(随访>6 个月)鼻尖观察指标对比

接受 SCR 手术的 49 例患者中 31 例符合纳入标准。31 例中,男性 21 例,女性 10 例;年龄 16 ~ 32 岁,平均(22 ± 5)岁,左侧唇裂继发鼻唇畸形 20 例,右侧 11 例。术后随访 6 ~ 49 个月,平均(28 ± 12)个月,中位数 27 个月。所有纳入患者的切口均行一期愈合治疗。所有患者均未出现术后并发症。

术后各项鼻尖观察指标均在正常值范围内。鼻尖突出度术前为 0.48 ± 0.04 , 术后为 0.55 ± 0.05 ; 鼻唇角术前为 $83.98^\circ \pm 18.16^\circ$, 术后为 $100.80^\circ \pm 10.15^\circ$; 鼻尖鼻翼角术前为 $160.30^\circ \pm 9.83^\circ$, 术后为 $168.40^\circ \pm 5.73^\circ$, 三项指标与术前相比均显著增加

($P < 0.05$)。鼻额角术前为 $139.20^\circ \pm 5.53^\circ$, 术后为 $133.50^\circ \pm 9.13^\circ$, 与术前相比显著减小($P < 0.05$)。鼻尖切角从术前 43.76° 矫正为术后 35.80° ($P = 0.062$), 鼻尖抬高, 鼻尖形态获得改善(表1)。

表1 31例单侧唇裂继发鼻畸形患者行鼻中隔-鼻小柱复合体支架SCR术前及术后(随访>6个月)鼻尖观察指标对比
Table 1 Comparison of preoperative and postoperative (follow-up > 6 months) nasal tip measurements in 31 patients with unilateral cleft lip nose deformity who underwent SCR using a strut-septum complex stent graft $\bar{x} \pm s$

Parameter	Preoperative	Postoperative	<i>t</i>	<i>P</i>
Nasal tip projection	0.48 ± 0.04	0.55 ± 0.05	21.000 [‡]	0.031
Nasofrontal angle/ $^\circ$	139.20 ± 5.53	133.50 ± 9.13	3.482 [†]	0.018
Nasolabial angle/ $^\circ$	83.98 ± 18.16	100.80 ± 10.15	2.758 [†]	0.040
Nasal tip alar angle/ $^\circ$	160.30 ± 9.83	168.40 ± 5.73	2.582 [†]	0.049
Nasal tip tangent angle/ $^\circ$	43.76 ± 11.48	35.80 ± 4.88	2.393 [†]	0.062

[‡]Wilcoxon Signed Rank Test. [†]Paired-Samples *t* Test. SCR: secondary cleft rhinoplasty

2.2 术前术后(随访>6个月)鼻孔观察指标对比

术后健患侧鼻孔面积及鼻孔高度比例的改变与术前相比具有统计学意义, 术后健患侧鼻孔宽度与鼻槛高度比例更接近1, 提示鼻孔对称性获得较好的改善(表2)。

2.3 VAS评分

第三方满意度调查结果显示(表3), 双方对于术后鼻美学评价均达到7分以上, 即“好”或“非常好”。相比于术前, 术后评分有显著提高($P < 0.05$)。数据表明通过手术使鼻尖达到了令人满意的修复效果。

2.4 典型病例

病例1, 20岁女性, 左侧唇裂术后鼻唇畸形, 曾行“唇裂修复术”。鼻部特征表现为左侧鼻翼塌陷, 鼻头圆钝, 鼻尖表现点不明显, 鼻小柱短小且向左侧倾斜, 鼻基底凹陷, 健患侧鼻槛高度差异较大。行肋软骨鼻中隔-鼻小柱复合体支架移植, 术后22个月随访效果良好, 无明显并发症。可见双侧鼻孔以及鼻翼对称性明显提高, 鼻尖鼻翼角 175° , 鼻尖切角 35.45° , 鼻小柱居中, 鼻尖突出度增加, 鼻尖表现点恢复, 鼻背适度提高。鼻槛高度基本恢复一致, 鼻基底凹陷得到一定程度改善(图3)。

表2 31例单侧唇裂继发鼻畸形患者行鼻中隔-鼻小柱复合体支架SCR术前及术后(随访>6个月)鼻孔观察指标对比
Table 2 Comparison of preoperative and postoperative (follow-up > 6 months) nostril measurements in 31 patients with unilateral cleft lip nose deformity who underwent SCR using a strut-septum complex stent graft $\bar{x} \pm s$

Parameter (Ratio of cleft side-noncleft side)	Preoperative	Postoperative	<i>t</i>	<i>P</i>
Nostril area	1.10 ± 0.06	0.94 ± 0.09	3.412	0.027
Nostril width	1.10 ± 0.18	1.02 ± 0.10	1.500	0.194
Nostril height	0.71 ± 0.12	0.90 ± 0.10	5.773	0.005
Nasal sill height	0.53 ± 0.20	0.79 ± 0.28	2.522	0.065

SCR: secondary cleft rhinoplasty

病例2, 20岁男性, 左侧唇裂术后鼻唇畸形, 曾行“唇裂修复术”。鼻部特征表现为双侧鼻翼扁平塌陷, 鼻孔形态不佳, 鼻小柱短小, 鼻尖下旋, 患侧鼻槛高度轻微降低。行肋软骨鼻中隔-鼻小柱复合体支架移植, 术后28个月随访效果良好, 无明显并

发症。可见鼻小柱高度恢复, 双侧鼻孔呈“水滴状”, 鼻尖上旋, 鼻尖突出度 0.56 , 鼻唇角 106.3° , 鼻背提高, 鼻额角 132° , 鼻槛高度基本恢复一致(图4)。

表3 31例单侧唇裂继发鼻畸形患者行鼻中隔-鼻小柱复合体支架SCR术前及术后(随访>6个月)鼻尖美学的VAS评分对比

	Comparison of preoperative and postoperative (follow-up > 6 months) VAS scores in 31 patients with unilateral cleft lip nose deformity who underwent SCR using a strut-septum complex stent graft		$\bar{x} \pm s$	
	Preoperative	Postoperative	<i>t</i>	<i>P</i>
Senior plastic surgeon	4.30 ± 1.06	8.00 ± 0.75	14.830	<0.001
Non-professionals	3.67 ± 0.73	7.19 ± 0.68	12.550	<0.001

SCR: secondary cleft rhinoplasty. VAS: visual analogue scale

3 讨论

单侧唇裂患者常常伴发不同程度的鼻畸形。鼻子作为颜面部中心最大的器官,在功能和美学方面都起着至关重要的作用,然而单侧唇裂患者的鼻畸形往往无法通过一期手术修复达到良好的长期效果。先天的解剖畸形以及前期修复手术遗留的瘢痕均增加了二期手术的修复难度^[7]。单侧唇裂鼻畸形的主要特征表现为鼻尖和鼻翼基部的不对称。口轮匝肌异常牵拉造成了鼻部软组织及软骨的发育异常,鼻翼塌陷、鼻孔扁平,鼻翼外侧脚向外下方移动。唇裂患者鼻尖塌陷往往是由于

前鼻棘异位、鼻中隔偏曲而造成的矢状向组织量缺乏所致^[12]。通过单纯的组织松解与软骨悬吊缝合往往无法达到恢复鼻尖突度的效果,需要利用移植物以抬高鼻尖。本研究设计了一种肋软骨鼻中隔-鼻小柱复合体支架,作为改良的鼻中隔延伸移植物。本研究随访结果表明,术后鼻尖轮廓和鼻孔的对称性、鼻尖的投影和旋转都得到了明显改善,术后健患侧鼻孔宽度与鼻槛高度比例更接近1。术前及术后鼻唇角的平均变化范围为83.98°~100.80°,接近正常亚洲面孔的平均鼻唇角(90°~110°)^[13]。

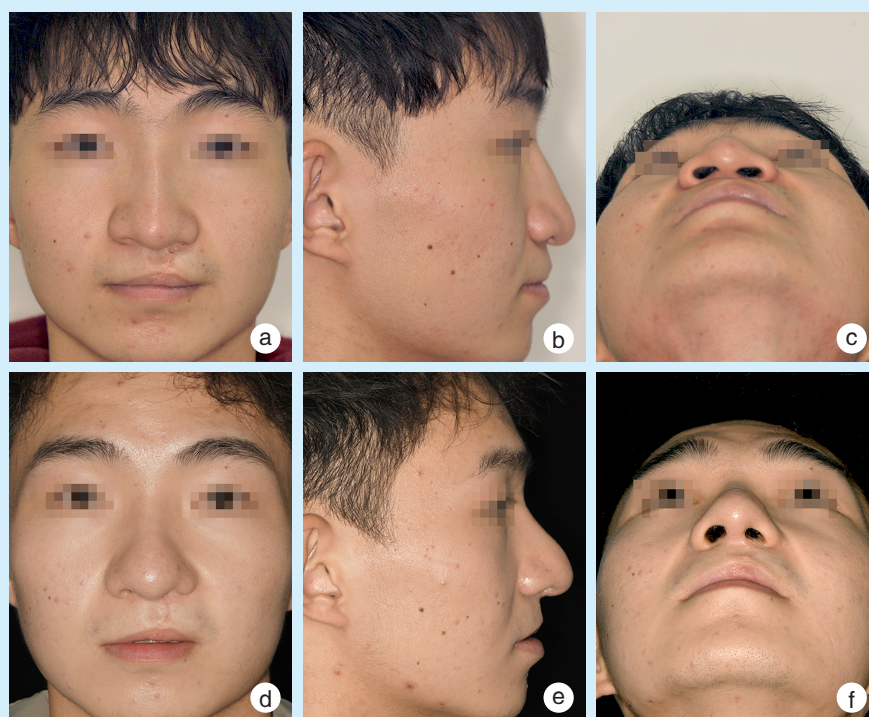
“三脚架理论”在鼻整形术中被认为是一种鼻尖支撑结构。Hogan提出的倾斜“三脚架理论”表明,三脚架是由下外侧软骨两侧的外侧脚和中线的鼻中隔组成,但在单侧唇裂患者中,由于患侧上颌骨发育不良,支撑三脚架的底座不足,导致三脚架倾斜^[14]。Fisher等^[15]提出,鼻尖是由斜向和水平的拱形结构构成,当唇裂的鼻翼底部移位时,拱形结构就会坍塌。这两种唇裂鼻畸形的概念模型为阐明单侧唇裂鼻畸形的机制提供了理论基础^[16]。因此,根据概念模型设计鼻尖移植物对于SCR中鼻尖支撑的稳定性和持续时间至关重要。



A 20-year-old female patient. a-c: preoperative views; d-f: 22-month postoperative frontal, lateral, and supine views. At 22 months after the operation, the nasal ala collapse on the cleft side was improved, tip defining points were restored, and the nasal base height on both sides was essentially equal (a, d). The nasal dorsum is properly raised, and the nasal tip projection has been increased (b, e). The nasal columella was in the middle and the nostrils on either side had symmetrical forms, with nearly identical widths and heights. The nasal base dip was corrected, and the alar rim and nasal sill height were restored (c, f).

Figure 3 Case 1 of a strut-septum complex stent graft used in secondary cleft rhinoplasty for unilateral cleft lip nose deformity

图3 鼻中隔-鼻小柱复合体支架应用于单侧唇裂继发鼻畸形二期整复术典型病例1



A 20-year-old male patient. a-c: preoperative views; d-f: 28-month postoperative frontal, lateral, and supine views. At 28 months after operation, the postoperative position of the nasal base in the patient remained at a similar height, and there was an improvement in nasal ala collapse (a, d). The nasal tip exhibited upward rotation, with a tip projection of 0.56 and a nasolabial angle of 106.3° . The nasal dorsum showed marked improvement, and the nasofrontal angle measured 132° (b, e). The nasal sill height was essentially restored to the same level bilaterally and bilateral nostrils displayed a symmetrical “teardrop-shaped” appearance, with improvements in both width and height (c, f).

Figure 4 Case 2 of a strut-septum complex stent graft used in secondary cleft rhinoplasty for unilateral cleft lip nose deformity
图4 鼻中隔-鼻小柱复合体支架应用于单侧唇裂继发鼻畸形二期整复术典型病例2

鼻尖整形技术取决于皮肤厚度和软骨强度^[17]。亚洲人鼻子的特点通常是皮肤厚、软组织多、软骨框架相对薄弱,因此鼻尖和鼻背的美感不够精致^[18]。鼻中隔偏曲矫正术结合鼻中隔延长移植术,可以重塑鼻中隔,并与鼻小柱支撑移植术相结合,改善鼻尖的突出和旋转^[19-20]。许多学者已提出了多种不同的手术技术及移植体支架搭建方法。柱状移植体是改善鼻尖形态的常用方法。通过肋软骨搭建鼻尖支架,联合膨体聚四氟乙烯(expanded polytetrafluoroethylene, e-PTFE)纠正马鞍鼻、鼻小柱偏曲,双侧鼻部不对称等问题获得了良好的美学效果^[21-22]。还有学者设计“伞状”自体肋软骨移植体,置于鼻翼软骨内侧脚之间,延长鼻小柱抬高鼻尖^[23]。在东亚鼻整形中使用蘑菇形肋软骨移植体获得了良好的适合亚洲人面型的鼻尖整复效果^[24]。

本研究基于此进行改进,通过鼻中隔延伸移植体、鼻翼缘移植体以及鼻尖复合体移植体来构建鼻尖整复支架。单侧唇腭裂患者的鼻子往往存在严重的畸形,常用的“2+1”或“4+1”技术往往难以实现较好的鼻畸形整复。因此我们增大鼻中隔延伸移植体的体积,使用 $3\text{ cm} \times 1.5\text{ cm}$ 的单片肋软

骨,使其同时承担鼻小柱支撑和鼻中隔延伸的联合功能,为偏曲的鼻中隔以及后续的移植物提供坚固支撑。鼻翼缘移植体大小为 $2.5\text{ cm} \times 0.6\text{ cm}$,覆盖于外侧脚软骨之上,搭建自然的鼻翼弧度,纠正鼻翼塌陷。盾形移植体前端向头侧弯曲约 $30^\circ \sim 45^\circ$,使之与帽状移植体贴合,形成预想的鼻尖下小叶形态。通过对肋软骨复合体支架进行改良,使其更适合唇裂继发鼻畸形患者。

在鼻整形术中,鼻中隔延长移植术得到了广泛的应用,然而很少有研究报道其用于继发性鼻裂整形术。Saito等^[9]使用鼻中隔延长移植体实现鼻尖精细化整形,使唇裂鼻畸形患者的鼻子更接近正常轮廓。Erol等^[25]提出了一种肋软骨弹簧移植来矫正单侧鼻裂。与以前的研究不同,本研究使用了坚固的肋软骨和足够的体积作为间隔延长移植体。另外,由于柱状软骨与鼻中隔软骨刚性固定,并位于下外侧软骨的两个内侧脚之间,因此与传统的鼻中隔延伸软骨相比,改良肋软骨复合柱状移植的偏差显著减少。Wang等^[26]提出通过调整鼻中隔延长移植体的方向,可以修改鼻长和鼻尖投影以适应个体。该复合体支架可以精确定位在医生想要的位置,且可以防止传统的柱状移

植手术后的鼻尖旋转,并且可以有效地改善短鼻或鼻翼后缩^[27]。

研究人员通过比较中西方人鼻子形态发现,中国人鼻孔多表现为水滴型,鼻孔轴线与面中线的夹角多位于上象限区,鼻尖圆钝,皮肤组织厚。而单侧唇裂鼻畸形由于跨过裂隙的肌肉力量不平衡,造成鼻中隔偏曲,鼻翼顶部和鼻翼外侧脚向外偏斜,形成严重的双侧不对称。基于此特征,中国人唇裂鼻畸形的重建应当包括鼻尖和裂隙侧鼻翼穹窿顶的重建,即“二焦点整复理论”,不再将鼻小柱高度的恢复作为最重要和唯一的内容^[28]。本研究通过肋软骨复合体支架,在恢复鼻小柱高度的同时,恢复了鼻翼上缘的高度,充分打开上下外侧软骨之间的连接,重建附着关系,将鼻翼缘移植与皮肤、鼻翼软骨与黏膜组织贯穿缝合固定,矫正并减少继发鼻畸形的程度。术后长期随访效果稳定。

鼻背增量是SCR中的另一难点。鼻背移植弯曲、显形、吸收和供区并发症等问题一直是外科医生面临的困难和风险。供体部位并发症使自体肋软骨隆鼻术后的并发症发生率增加了22%^[29]。自Erol提出“土耳其软糖”技术(Turkish delight),此后软骨颗粒和筋膜移植在鼻整形手术中被广泛采用,其中腹直肌筋膜被认为是包裹肋软骨颗粒的首选材料^[30]。研究发现,包裹在筋膜移植中的软骨颗粒没有翘曲的风险,且软骨颗粒在术后几个月稳固成团,存活率与实心移植相当^[31]。软骨颗粒游离移植后吸收主要发生在没有被骨膜覆盖的部位。这样有差异的软骨吸收和颗粒异常分散可能最终导致鼻背部形态不规则甚至凹凸不平。筋膜包裹可以避免软骨颗粒显形,更加贴合鼻背部受床,且组织学显示其似乎以类似于软骨膜的方式表现,促进软骨细胞存活,防止移植吸收,并保持软骨颗粒的整体再生潜力^[32-33]。同时,筋膜包裹的软骨颗粒具备术中和术后早期的调整与塑形能力。术中筋膜套处于半封闭状态,利于术者调整鼻背软骨用量,术后早期(10~14 d)患者可在医师指导下对鼻背进行按摩塑形,同时建议患者术后佩戴低温热塑鼻夹板辅助塑形和维持鼻背形态至少4周,并在术后6周内避免佩戴框架眼镜。本课题组前期研究中并未观察到鼻背畸形复发与供区并发症^[34]。且研究报道使用腹直肌筋膜手术和住院时间更短,患者满意度更高。除了术后感染的患者外,没有观察到移植物的严重

吸收^[31,35]。

自体软骨,尤其是肋软骨因材料充足、支撑力强且生物相容性好而成为SCR的首选材料^[13]。但近些年来,肋软骨隆鼻的术后并发症也逐渐引起人们的重视,包括翘曲、显形、吸收,以及供区的瘢痕等。研究人员通过改进软骨支架搭建方式,使用软骨颗粒,对软骨块做雕刻处理,供区微创切口以及术前的三维评估与测量等方式避免术后并发症的发生。除此之外,人工异种材料如硅胶、e-PTFE等也常做为辅助材料用于鼻背增高与鼻尖整形。异种材料无需开辟第二术区,且通常有更强的支撑性。但研究发现,由于异种材料的特性,可能会造成形态僵硬,表情不自然,且相比于自体软骨会有更高的感染风险,在后续的二次手术中带来更大的畸形,而成功的自体软骨移植拥有更稳定的长期效果,且二次手术的翻修率更低^[36-38]。目前有许多学者尝试使用异种材料辅助自体软骨移植,以达到更好的手术效果^[21-22]。在唇裂鼻畸形患者的鼻整形中应当注意其软组织量不足、肌肉附着不对称、面中部发育缺陷等问题,并关注患者心理,与患者充分沟通,适当选择移植材料,来更好地实现患者需求,符合患者审美。

Hamdan团队^[39]提出了一种全面的继发唇鼻畸形的分类体系,该体系根据缺陷的程度分为4个不同的类别,涉及皮肤、黏膜、口轮匝肌和鼻子,随着缺陷波及的部位和结构增加,其严重程度随之增加。随后Hamdan等^[40]意识到上颌骨发育程度的重要性,并将其纳入现有的分类体系。本研究所使用的改良肋软骨鼻中隔-鼻小柱复合体支架移植方法对于轻、中度唇裂继发鼻畸形,即不涉及明显上颌骨发育异常的患者有明显的改善效果。轻中度唇裂继发鼻畸形表现为鼻尖扁平,同时伴有鼻翼塌陷畸形,鼻小柱轻度偏曲,以及鼻中隔偏曲。其整复重点在于恢复患者稳定的“三脚架结构”,与鼻尖及鼻翼肌肉形成稳定牵拉效果,恢复鼻孔对称性,实现鼻尖精细化整复。而重度唇裂继发鼻畸形则涉及鼻背或骨组织畸形。其自身的鼻软骨发育不足,鼻梁短小,甚至存在上颌骨发育异常或骨组织移位,整复基础差,若直接行肋软骨复合体支架移植可能存在鼻部组织量缺乏,创口闭合困难,且缺乏搭建稳定“三脚架结构”的条件,往往建议先行唇鼻整复手术,为肋软骨复合体支架移植创造条件。此外,该研究的局限性在于病例数量少,且使用自身对照,采用照片间接测量和

主观评价的方法进行效果评估,其结果可能会因为光线、患者配合差等因素产生误差,从而导致数据分析不准确,且主观评价结果会受到包括评价人数、评价时间、照片整体或量表相关因素等多种因素影响^[41]。对于术后鼻部外形的长期稳定性还需要进一步随访和跟踪。

综上,改良肋软骨鼻中隔-鼻小柱复合体支架移植是一种可靠、有效的单侧唇裂继发鼻畸形鼻尖整复技术,可显著改善单侧唇裂继发鼻畸形患者鼻尖偏斜及塌陷的问题,且术后长期效果较为稳定。

【Author contributions】 Dong Z designed the study, wrote the manuscript, and created the figures. Dong Z, Li QQ, Yang JG contributed to data collection and analysis. Yang JG, Li J performed the surgical procedures and participated in manuscript revision. Fu YC, Li J supervised the research, provided critical intellectual input, and revised the manuscript for important content. All authors reviewed and approved the final version of the manuscript.

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(编辑 张琳, 刘曙光)



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