Preservation Rhinoplasty—Outcomes in Dorsal Preservation Rhinoplasty

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KEYWORDS

• Preservation rhinoplasty • Dorsal preservation • Dorsal hump • Outcomes

KEY POINTS

- In dorsal preservation surgery, the osseocartilaginous vault is mobilized as a single unit to minimize disruption of the nasal keystone.
- There are various preservation approaches to management of the bony vault and septum and a growing body of literature suggests acceptable functional and esthetic outcomes for classic preservation methods, as well as newer modifications.
- The most common reported complications of dorsal preservation surgery include recurrent hump and dorsal axis deviation.
- Comparative and long-term objective studies are still needed to further delineate differences in described approaches.

BACKGROUND

There are 2 distinct approaches for reducing the osseocartilaginous nasal dorsum. In the traditional structural approach, first described by Joseph in 1898, the midvault is opened and the dorsal nasal bones and cartilages are resected. While this has been the primary approach used by most modern rhinoplasty surgeons, resection of this area by nature violates the structural integrity of the keystone junction, which necessitates midvault reconstruction and may lead to a variety of undesirable consequences.[1]

In recent years, there has been a global resurgence of interest in the dorsal preservation approach. These methods were first described by Goodale and Lothrop in the early nineteenth century and further promoted by Cottle in 1946.[2–6] The cornerstone of dorsal preservation rhinoplasty (DPR), in contrast with conventional hump resection (CHR), is preservation of the osseocartilaginous bony vault. In theory, preserving this architecture has several advantages including maintenance of the structural integrity of the keystone area, patency of the internal nasal valves (INV), and natural dorsal esthetic lines.[7,8]

A primary surgical consideration in DPR is the approach to the osseocartilaginous vault. Two classic foundation techniques exist: Push Down (PD) and Let Down (LD). Goodale is credited with development of the PD, in which lateral and root osteotomies are performed to mobilize the nasal vault en bloc into the nasal cavity, with the lateral walls sitting medial to the maxilla in the final position.[2,3] Lothrop pioneered the LD, in which wedge excisions of the bony sidewalls are performed to mobilize the nasal pyramid down onto the maxilla, rather than within it.[4] Deviated or crooked noses

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may be managed with asymmetric bony techniques.[9–13] Surface techniques modulate the hump superficially, without impaction osteotomies. These techniques include Ishida and Ferriera's Spare Roof A and B.[14] Some have combined surface modifications and foundational methods. For example, undesirable S-shaped nasal bones may be converted to ideal V-shaped nasal bones, allowing for the use of preservation methods.[15–18] Indeed, examination of old notes from Cottle reveal that he often rasped the dorsum prior to impaction.

Furthermore, several partial preservation techniques, including surface techniques, have been forwarded. These techniques incorporate surface modifications and some separate treatment of the bony dorsum from the cartilaginous midvault. For example, Ferreira detailed the Spare Roof Technique (SRT) in which the bony vault is treated with ostectomy and osteotomies while the cartilaginous midvault is preserved.[19] Ishida and Ozturk described surface modifications following disarticulation of the upper lateral cartilages (ULC) from the nasal bones.[8,20] Robotti's Modified Dorsal Split (MDS) involves separation of the ULC from the septum but preservation of the flared edges at the septum, followed by PD/LD for the bone.[21] The Dorsal Roof Technique (DRT) described by Tas incorporates similar ULC separation with dorsal lowering permitted by medial osteotomies and a radix osteotomy.[22] These modifications have expanded indications of DPR.

Septal resection is another important consideration in DPR and is a requisite for lowering of the nasal vault. Original descriptions primarily detail a high subdorsal strip resection.[15,23,24] A variety of modifications have been described and can generally be classified by region of resection into high (eg, subdorsal strip), intermediate (eg, modified subdorsal strip method [MSSM], Tetris, subdorsal-Z flap), and low septal (eg, Cottle) methods.[25]

DISCUSSION OF OUTCOMES

Comparison of Conventional Hump Resection and Dorsal Preservation Rhinoplasty

There have been a number of studies comparing CHR and DPR approaches, many of which incorporate patient-reported outcome measures (PROMs). These are summarized in **Table 1**.

Tas and colleagues conducted a 50-patient study comparing functional results between LD and open CHR. Both groups showed significant improvement across functional PROMs (Sinonasal Outcome Test-22[SNOT-22], Nasal Symptom Obstruction Evaluation [NOSE], nasal congestion Visual Analog Scale [VAS]) at least 6 months following surgery, with no significant difference observed between the groups.[26] In a matched cohort study (n = 62), Patel and colleagues demonstrated similar findings when comparing structural preservation (LD, MSSM) with CHR. Patients were matched by several parameters including hump size. There were again no differences in functional (Standardized Cosmesis and Health Nasal Outcomes Survey-Obstruction [SCHNOS-O], /VAS-Function [VAS-F]) PROMs between the groups at long-term follow-up. This study additionally evaluated cosmetic outcomes (SCHNOS-Cosmesis [SCHNOS-C], VAS-Cosmesis [VAS-C]) and found equivalent results.[27] Zarei and colleagues conducted a randomized study with 84 patients comparing CHR with DPR (LD, MSSM). Similar to prior studies, they found no significant difference in functional or cosmetic PROMs between the groups at 1 year. They additionally evaluated nasal tip projection and rotation, nasal width, and residual hump and again found no difference between the cohorts.[28]

An article by Alan and colleagues built on these findings with the addition of rhinomanometry data. In this randomized study, 34 patients with dorsal hump less than 4 mm underwent either open CHR or closed DPR (PD). There was no significant difference between the groups in functional or cosmetic PROMs (NOSE, SCHNOS-O, SCHNOS-C). Additionally, rhinomanometry measures of total nasal volume and airway resistance were similar between the groups.[29] Alsakaa and colleagues compared PROMs, Surgeon Rhinoplasty Evaluation Questionnaires, and INV angle and cross-sectional area (CSA) measurements between patients undergoing DPR (PD, subdorsal strip, n = 25) and CHR (n = 25). All measures improved for both groups after surgery, but there was no difference between the groups.[30] In a cadaveric study by Abdelwahab and colleagues, 6 heads underwent either CHR or DPR (PD and LD). INV angle and CSA were measured from preoperative and postoperative radiographs. These measurements did not change following CHR or LD but were both significantly reduced following PD.[31] This finding may support that pushing the nasal walls medially into the maxilla narrows the INV and nasal airway. However, with other studies showing no significant difference in functional outcomes, the clinical importance of this is unclear.

Verkest and colleagues compared DPR with a modified T-bar hybrid preservation technique (n = 110) to a matched cohort undergoing dorsal split component reduction (n = 62). They showed similar improvement in esthetic and functional PROM scores (NOSE, FACE-Q, Utrecht Questionnaire [UQ]) between the groups at 6 months, with

Table 1
Conventional hump resection versus dorsal preservation rhinoplasty outcomes studies

Author (Year)	Design	Population (n)	Outcome Measures	Results	Other
Tas et al,[22] 2020	Prospective cohort	50: Dorsal preservation rhinoplasty (DPR) with let down (LD) (26), open conventional hump resection (CHR) (24)	Functional patient-reported outcome measures (PROMs) (Nasal Symptom Obstruction Evaluation [NOSE], Sinonasal Outcome Test-22 [SNOT-22], Visual Analog Scale [VAS]).	Improvement for both groups at least 6 mo after surgery, *no difference* between groups.	Two patients in each group underwent revision surgery.
Patel et al,[23] 2023	Retrospective matched cohort	163: DPR with LD/ modified subdorsal strip method (MSSM) (81), CHR (82)	Functional (Standardized Cosmesis and Health Nasal Outcomes Survey-Obstruction [SCHNOS-O], VAS-Function [VAS-F]) and cosmetic (SCHNOS-Cosmesis [SCHNOS-C], VAS-Cosmesis [VAS-C]) PROMs.	Improvement for both groups at least 6 mo after surgery, *no difference* between groups.	Short-term VAS-C better in DPR group. Radix grafting more common in DPR group, dorsal only grafting and midvault reconstruction more common in CHR group.
Zarei et al,[28] 2024	Prospective randomized cohort	85: DPR with LD/MSSM (35), CHR (50)	Functional (SCHNOS-O, VAS-O) and cosmetic (SCHNOS-C, VAS-C) PROMs. Nasal tip projection and rotation, nasal width, hump height.	Improvement for both groups 1 y after surgery, *no difference* between groups.	One patient from each group underwent revision surgery.
Alan et al,[29]2023	Prospective randomized cohort	34: DPR with Push Down (PD) (15), CHR (19)	Functional (SCHNOS-O, NOSE) and cosmetic (SCHNOS-C) PROMs. Rhinomanometry.	Improvement for both groups 3 and 12 mo after surgery, *no difference* between groups.	Only included dorsal hump <4 mm.

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Table 1
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Author (Year)	Design	Population (n)	Outcome Measures	Results	Other
Alsakaa et al[30], 2024	Prospective randomized cohort	50: DPR with PD/ subdorsal strip (25), CHR (25)	Functional and cosmetic PROMs (SCHNOS). Surgeon evaluation questionnaire (SREQ). Computed tomography (CT) measurements of internal nasal valves (INV) and cross-sectional area (CSA).	Improvement for both groups 6 mo after surgery, *no difference* between groups.	
Abdelwahab et al,[31] 2020	Cadaveric cohort	12: DPR with PD then LD (6), CHR (6)	INV and CSA measured from CT radiographs.	Preserved measurements following CHR and LD, and *reduced measurements following PD*.	
Ozuker et al,[34] 2020	Prospective cohort	22: LD/PD asymmetric DPR (10), CHR (12)	Angle of deviation measured from frontal photographs.	Improvement for both groups after surgery, *no difference* between groups.	Only I-shaped crooked nose deformity. Operative time was shorter with DPR technique.
Verkest et al,[32] 2023	Retrospective matched cohort	172: T-bar hybrid preservation (110), CHR (62)	Functional (NOSE) and cosmetic (FACE-Q, Utrecht Questionnaire [UQ]) PROMs.	Improvement for both groups 6 mo after surgery, *no difference* between groups.	Less frequent need for middle third INV grafting in T-bar preservation group.
Ferreira et al,[33] 2021	Prospective randomized cohort	250: Spare Roof Technique [SRT] (125), CHR (125)	Functional (nasal patency VAS) and cosmetic (UQ VAS) PROMs.	Improvement for both groups. However, *SRT group had greater* esthetic *improvement* at 3 and 12 mo, and greater functional improvement at 12 mo.	

less frequent need for INV grafting in modified DPR patients.[32] A study by Ferreira and colleagues is unique in suggesting some possible long-term differences between techniques. In a randomized prospective study, 250 patients underwent either CHR or SRT. Only primary surgeries were included and there were no limitations in hump size. They found significant esthetic and functional improvement in both groups following surgery as measured by the UQ VAS and a nasal patency VAS, respectively. However, the SRT group had significantly greater esthetic improvement than the structural group at 3 and 12 months, as well as greater functional improvement at 12 months.[33] These findings suggest that SRT may yield superior long-term outcomes compared to traditional CHR.

Overall, studies comparing CHR and DPR outcomes are limited. However, most existing literature supports that both approaches yield similar outcomes. As with any procedure, careful patient selection is critical to optimize outcomes. In a case series by Saban and colleagues, 57.2% of primary rhinoplasty candidates were found to have appropriate anatomy for DPR with the remainder being better suited for conventional rhinoplasty.[15] Traditional DPR candidates are those with existing well-shaped dorsal esthetics. Patients with a severely kyphotic bony dorsum or S-shaped nasal bones are considered poor candidates due to increased risk of residual hump. Those with a wide midvault or irregularly shaped bony pyramid are likely to have persistent and unsatisfactory dorsal lines.[15] Patients with a deep nasofrontal angle may have further undesirable drop of the radix with preservation techniques.[25] The positive outcomes published in the presented literature are likely a product of both appropriate patient selection and technical execution, and highlight the value of different techniques in the appropriate clinical context. **Fig. 1** demonstrates outcomes of 2 patients, one undergoing DPR and another CHR for correction of a dorsal hump.

Outcomes in Crooked Noses

Regarding the crooked nose, Ozucer and colleagues published a study evaluating a mixed DPR technique. This article compares results between CHR and asymmetric DPR (PD for deviated and LD for nondeviated side) in a 22-patient group with I-shaped crooked nose deformity (CND). Preoperative and postoperative photographs were evaluated by a blinded reviewer for angle of deviation and both groups were found to have similar improvement after surgery.[34] Of note, the authors state that anectodatly, operative time was significantly shorter with DPR even despite a technical learning curve.

Several other studies have reported positive outcomes for DPR in CND, but these are not compared to CHR. Alan and colleagues published on the above asymmetric DPR, using PD on the shorter and LD on the longer nasal bone to correct I-shaped deviations. SCHNOS and rhinomanometry data improved at 12 months in 23 patients.[9] Jasso-Ramirez et al. described an LD modification for C-shaped or I-shaped twisted noses with unilateral or asymmetric bony wedge resections. Deviation angle improved by 81% for C-shaped and 79% for I-shaped noses, suggesting that this modification may also be effective for C-type deviations.[13] Ozturk described improved outcomes following both the mix-down and hybrid preservation techniques for hump reduction in the deviated nose.[10,11] Rodrigues and colleagues reported on outcomes of 54 patients with CND, and found functional (nasal patency VAS) and esthetic (UQ) outcome measures improved significantly after SRT.[35]

Comparison of the Push Down and Let Down Foundational Techniques

Very few studies compare results between PD and LD. Wells and colleagues published a systematic review assessing the indications for and complications of the classic techniques. Across 30 studies, they identified 307 who underwent PD and 529 patients who underwent LD. They found a significantly lower rate of dorsal hump recurrence (1.3% vs 4.6%, $P = .02$) and revision surgery (0% vs 5%, $P<.001$) in the PD compared to the LD cohort, possibly suggesting superior results with PD surgery. However, the authors note that PD is generally indicated only for patients with smaller dorsal humps (<4 mm), which may have confounded the results.[15,36]

A proposed benefit of LD over PD is a lesser degree of nasal airway obstruction, as the bony pyramid is released to rest on the maxilla rather than medially into it. As previously discussed, Abdelwahab and colleagues performed a cadaveric experiment showing INV angle and CSA to be significantly reduced following PD but not LD, possibly confirming this theory.[31] However, the significance of this has yet to be confirmed in the clinical setting. Stergiou and colleagues performed a similar radiographic study with 30 DPR patients measuring radiographic change in INV angle following surgery. They found overall widening of the average INV ($20.77 \pm 3.2^\circ$ preoperatively to $21.82 \pm 5.7^\circ$ postoperatively), but did not stratify results by surgical method.[37]

Fig. 1. (*Left*) Preoperative and 8-month postoperative photographs after patient underwent structural rhinoplasty with septoplasty, osteotomies, septal extension grafting, cephalic trim, and dome sutures. This patient's anatomy, with a khypotic, largely bony hump and wide nasal bridge, made her dorsum less favorable for dorsal preservation techniques. (*Right*) Preoperative and 6-month postoperative photographs after patient underwent dorsal preservation rhinoplasty with asymmetric letdown maneuver, septal extension grafting, cephalic trim, mini lateral crural struts, and dome sutures. Notably, this patient has a more gentle convexity to the dorsum than the patient on the left. In addition, there is a slight leftward axis deviation preoperatively. The tip was managed with structural techniques while the dorsum was treated with preservation methods. Notably, both patients have good frontal and profile outcomes, highlighting the potential success of both structural and preservation techniques. An understanding of indications for preservation rhinoplasty is essential to these outcomes.

Modified or Hybrid Preservation Outcomes (including Surface Techniques)

As previously mentioned, classic methods of bony vault management include the LD and PD. However, several modifications in the treatment of the osseo-cartilaginous vault exist. These methods have been detailed in the literature with overall positive outcomes. Most reports are case series studies with limited objective outcomes data. Key publications are highlighted here and summarized in **Table 2**.

Santos and colleagues shared a case series of 100 patients undergoing primary rhinoplasty for nasal hump and/or CND correction with SRT. There was significant improvement in all evaluated PROMs (esthetic VAS and Likert scale, functional VAS) at 1 year.[38] The same group more recently published a study in which 125 patients underwent SRT with significant esthetic and functional improvement as measured by the UQ VAS and a nasal patency VAS, respectively.[33] They also separately show the utility of this technique for management of the crooked nose.

Tas reported on outcomes of DRT and showed 90% in a 44-patient cohort were satisfied with the form and function of their nose 1 year after surgery. An average of 85% of surgeries were deemed successful and 15% acceptable, as determined by surgeon assessment of preoperative and post-operative images. There were no cases of residual hump.[22]

Table 2
Hybrid preservation outcomes

Author (Year)	Technique	Design	Population (n)	Results
Santos et al,[38] 2019	Spare Roof Technique	Prospective case series	100	*Significant improvement* in esthetic (Visual Analog Scale [VAS] and Likert) and functional (VAS) outcomes at 3 mo and 12mo after surgery.
Ferreira et al,[33] 2021	Spare Roof Technique	Prospective randomized cohort	125	*Significant improvement* in esthetic and functional outcomes (VAS) at 3 mo and 12 mo after surgery. Compared against SR, esthetic improvement was significantly greater in the SRT group at both 3 and 12 mo. Functional improvement was also better in the SRT group, but not significant.
Rodrigues et al,[35] 2022	Spare Roof Technique	Prospective case series	54, all with crooked nose	*Significant improvement* in esthetic (UQ) and functional (VAS) at 12 mo after surgery.
Tas et al,[22] 2020	Dorsal Roof Technique	Retrospective case series	44	*90% of patients satisfied* with form and function after surgery (Rhinoplasty Outcome Evaluation [ROE] questionnaire). Average of *85% of surgeries were successful and 15% were acceptable* (surgeon assessment of post-operative images). No cases of revision surgery, post-operative nasal obstruction, or residual hump.
Robotti et al,[21] 2019	Modified Dorsal Split	Case series	41	All patients had *favorable outcomes* (surgeon assessment), with progressive *improvement in results over time*. There were no surgical complications.

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Table 2
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Author (Year)	Technique	Design	Population (n)	Results
Robotti et al,[39] 2023	Modified Dorsal Split	Retrospective case series	100	*Significant improvement* in esthetic (SCHNOS-C) and functional (SCHNOS-O) scores at 6 mo, with even further reductions in esthetic outcomes at 12 mo.
Ozturk et al,[20] 2020	Modified PD without osteotomy	Retrospective case series	62	*Significant improvement* in patient satisfaction (ROE) 1 year after surgery, with 90% of patients having high postoperative satisfaction. No surgical complications and no cases of revision surgery.
Ishida et al,[40] 2020	Cartilaginous PD with bony cap preservation	Case series	48	*High surgical success rate*, with 95.8% of patients having adequate hump reduction.
Azizli et al,[41] 2023	Cartilaginous PD with bony cap rasping	Case series	300	*Very high satisfaction ratings* among both patients and their surgeons.

Robotti and colleagues published a description of 41 patients with bony hump <3 mm who underwent MDS. There were no surgical complications and all patients had favorable outcomes based on surgeon assessment. The authors here note progressive improvement in results over time with mastery of the learning curve.[21] Robotti and colleagues also described the modified high-middle MDS with cartilaginous PD or full LD in 100 cosmetic and combined functional rhinoplasty patients. Both SCHNOS-C and SCHNOS-O scores improved by 6 months, with even further reductions in SCHNOS-C at 12 months.[39]

Additional descriptions of cartilaginous PD techniques are worth noting. Ozturk described a modified PD rhinoplasty without osteotomy. Here, the superior dorsal cartilage is pushed down contralateral to the septal deviation, and the nasal dorsum is rasped rather than undergoing osteotomy. A series of 62 patients underwent this surgical method with a significant improvement in median Rhinoplasty Outcome Evaluation (ROE) questionnaire at 1 year follow-up.[20] Ishida and colleagues forwarded a variation of the cartilaginous PD with bony cap preservation. Here, 48 patients underwent this technique, with 95.8% having adequate nasal hump correction.[40] Azizli and colleagues published their experience performing a variation of the Ishida method, which had very high satisfaction ratings among both patients and their surgeons.[41]

Santos and colleagues conducted a survey-based study evaluating the practice patterns of 117 preservation rhinoplasty surgeons. They found that in general, surface techniques were considered more stable, predictable, and easier to learn than classic foundational techniques. Self-reported revision rates for surface and foundational approaches were similar and less than 20%.[42] Although to our knowledge there are no studies directly comparing modified approaches to classic foundational techniques, this study highlights the anecdotal experiences of surgeons worldwide and suggests several benefits of newer modified partial preservation surgery.

Outcomes of Different Septal Techniques in Preservation Rhinoplasty

As with osseo-cartilaginous vault management, most of the literature regarding septal management and modifications is descriptive. These are summarized in **Table 3**.

High-septal or subdorsal strip

Original reports describe a high subdorsal strip resection, a popular method which many modern surgeons continue to use. Saban and colleagues published a series of 320 patients who underwent DPR with subdorsal strip removal. In their cohort, a definitive improvement in nasal breathing was reported by 309 patients, and 90% of patients (in a 30-patient subgroup) had improvements as evaluated by the NOSE questionnaire.[15] Qaradaxi and colleagues described their results with 113 patients who underwent subdorsal strip resection, and found significant improvements in SCHNOS scores following surgery.[43] They additionally stratified their results by dorsal shape and found that with this method, V-shaped nasal bones had significantly better outcomes than S-shaped nasal bones.[44] Stergiou and colleagues evaluated quality of life measures, and found excellent patient satisfaction and significant improvement in ROE scores after DPR with high septal strip excision.[45]

This technique has also been performed with good results reported by other groups including Gola and Tuncel. Gola provided a comprehensive description of DPR with subdorsal septal resection technique and stated that he has had immense success in a series of greater than 1000 patients, but did not include any subjective or objective data.[24] Tuncel reported on 520 patients who underwent DPR with subdorsal strip excision, and found an overall hump recurrence rate of 14% and revision surgery rate of 5.6%. They suggest subperichondrial/subperiosteal dissection and scoring the resting upper part of the septum to prevent hump recurrence.[24,46]

Mid-septal or intermediate strip

There have been several described variations of mid-septal resections between the subdorsal and inferior septal strips. Following removal of an intermediate region, the remaining subdorsal cartilage is anchored to the lower septal cartilage, thereby lowering the nasal dorsum.

Patel and colleagues published their experience with 22 patients who underwent DPR (PD or LD) with MSSM, an intermediate septal variation. For combined functional and esthetic rhinoplasty, all evaluated PROMs (SCHNOS-O, SCHNOS-C, VAS-F, VAS-C) were significantly improved. For purely esthetic rhinoplasty, cosmetic measures improved with no significant change in functional scores.[47] As aforementioned, a cohort study done by the same group also showed good results using the MSSM method.[27]

There are several other noteworthy publications detailing operative techniques with different mid-septal/intermediate or subdorsal septal flap approaches. Neves outlined a Tetris concept of septal resection, in which a trapezoidal subdorsal block is designed and excised to the final rhinion height and then suture fixated at the caudal and posterior borders to allow reduction of the hump. Descriptions suggest positive outcomes with this method, although objective data have not yet been published.[48,49] Kovacevic detailed a subdorsal Z flap modification. Here, a subdorsal bony keel is removed posterior to a maintained cartilaginous triangular wedge. The dorsum is then lowered, and the triangular wedge is overlapped and suture fixated with the stable septum below. They report good outcomes with this method in a series of 100 patients, although validated outcome measures were not utilized in this work.[50]

Sozansky and colleagues published results of 52 LD procedures with either the MSSM (n = 33) or subdorsal Z flap (n = 19), and found no significant difference in functional (NOSE, SNOT-22, Epsworth Sleepiness Scale [ESS]) or cosmetic (SCHNOS) outcome measures up to 1 year. However, they note that in the senior author's hands, the subdorsal Z flap technique is generally more versatile and requires less use of cartilage grafting compared with MSSM.[51] The same group published an updated study of 71 patients undergoing LD with either MSSM (n = 35) or subdorsal Z flap (n = 36) and again had similar results.[52]

While most DPR literature has been limited to the Caucasian nose, there have been a handful of recent studies evaluating outcomes in non-Caucasian noses. Anco and colleagues specifically evaluated these techniques in Andean mestizo noses. In a study of 14 patients, there was a significant improvement in esthetic satisfaction (ROE). Multiple techniques were used including the PD or LD maneuvers for bony vault management, and subdorsal strip, tetris method, and subdorsal Z flap for septal management.[53] Jin and colleagues published results of 9 Asian patients who underwent either the PD or LD techniques or a modified mid-septal method. They show this to be a viable option for correcting Asian hump noses, with no major complications and all patients having successful hump reduction. There was significant improvement in nasal breathing (NOSE).[54] This group recently published an updated study with a total cohort of 17 patients and showed good results with significant

Table 3
Septal management outcomes

Author (Year)	Technique	Design	Population (n)	Results
High Strip				
Saban et al,[15] 2018	Subdorsal strip with PD (hump <4 mm) or LD (hump >4 mm)	Retrospective case series	320	No surgical complications. *Low revision rate* (3.4%). In a subset of 30 patients, 90% had *definitive improvement in nasal breathing* (NOSE).
Qaradaxi et al,[43] 2023	Subdorsal strip with PD (hump <4 mm) or LD (hump >4 mm)	Prospective case series	113	13.3% of patients had residual hump. *Significant improvement* in esthetic and functional scores (SCHNOS) after surgery. *V-shaped nasal bones with significantly better outcomes* than S-shaped nasal bones.
Stergiou et al,[37] 2022	High septal strip	Prospective case series	58	Excellent patient satisfaction after surgery, with *significant improvement* in quality of life measures (ROE). Revision rate 8.6%. Overall widening of INV.
Tuncel et,[46] 2019	Subdorsal strip with PD (hump <4 mm) or LD (hump >4 mm)	Case series	520	Hump recurrence rate of 14%. Revision surgery rate of 5.6%.
Intermediate Strip				
Patel et al,[47] 2020	MSSM	Case series	16	*Significant improvement* in esthetic and functional scores (SCHNOS, VAS) after surgery. No short-term complications.

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Author (Year)	Technique	Design	Population (n)	Results
Sozansky et al,[51] 2023	MSSM or Z flap with LD	Cohort	52 (33 MSSM, 19 Z flap)	*Significant improvement* for both groups in functional (NOSE, SNOT-22) and cosmetic (SCHNOS) outcome measures, except Epsworth Sleepiness Scale [ESS] scores. *No significant difference between the groups* in any scores up to 1 year.
Barrera et al,[52] 2024	MSSM or Z flap with LD	Retrospective cohort	71 (35 MSSM, 36 Z-flap)	*Significant improvement* in both groups in functional (NOSE, SNOT-22, ESS) and cosmetic (SCHNOS) outcome measures. *No significant difference between the groups*.
Anco et al,[53] 2023	Multiple techniques	Case series	14, Mestizo noses	*Significant improvement* in esthetic measures (ROE).
Jin et al,[54] 2024	Modified mid-septal technique with PD or LD	Retrospective case series	17, Asian noses	*Significant improvement* in nasofacial and rhinion angles and nasal breathing (NOSE). *Improvement* in function and cosmesis (SCHNOS).
Low Strip				
Celik et al,[57] 2024	Low septal strip or modified low septal strip with PD, LD, or mixed	Retrospective cohort	231	Overall complication rate of 3.5%. *Significantly higher complication and recurrent hump rate for the low septal strip* group compared to the modified low septal strip group.

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Author (Year)	Technique	Design	Population (n)	Results
Dewes et al,[58] 2021	Septum pyramidal adjustment and repositioning (SPAR) method B with PD	Case series	1412	Good results. In a greater 3283 patient cohort of patients undergoing SPAR methods (A-C), revision rate was 9.5%.
Ozturk et al,[59] 2023	High and low septal strip with PD or LD	Retrospective case series	69	Recurrent minor hump rate of 5.8% and persistent minor septal deviation rate of 7.2%. No cases of revision surgery. *Significant improvement* in quality of life measures (ROE) at 1 year after surgery.

improvement in nasofacial and rhinion angles. They additionally evaluated esthetic and functional PROMs and show significant improvement in nasal breathing (NOSE) and function and cosmesis (SCHNOS).[55]

Low-septal strip

Low septal strip resection describes removal of an inferior strip of septal cartilage above the maxillary crest. Cottle described a classic low-septal strip technique in 1946.[56] However, while well-established and frequently described in overviews and the literature, outcomes data are limited.

Celik and colleagues recently published on results of 231 patients who underwent DPR and compared results for conventional low septal strip with a modification. In this modification, the authors describe maintaining a 2-mm strip of cartilage on the maxillary crest and vomer with specialized suture techniques to minimize hump recurrence. They found the modified method to have significantly lower complication and recurrent hump rate than the conventional group.[57]

Dewes and colleagues reported their experience with the septum pyramidal adjustment and repositioning (SPAR) method. They classify this technique into 3 variations, A-C, with type A following a high strip concept and type B following the low strip concept. They suggest that type B is ideally suited for cases with septal deviation, and report overall good results among 1412 patients who underwent surgery with this method. The overall revision rate in this cohort was 9.5%.[58]

Ozturk described 69 patients who underwent PD or LD for concomitant hump and septal deviation correction. They detailed a new method for septal management, the high and low septal strip excision. In this group, 4 patients had minor hump recurrence and 5 patients had residual slight septal deviation. However, no revision surgery was required. There was significant improvement in quality of life (ROE) scores at 1 year, and 88.8% of patients reported satisfaction with their surgery.[59]

Challenges and Limitations

The most frequently reported limitations of DPR include recurrence of the dorsal hump and persistent dorsal axis deviation that may require revision surgery. Two recent systematic reviews summarize these complication rates. The most recent, published by Wells and colleagues in 2023, combines data across 30 studies to pool outcomes for 5967 preservation rhinoplasty patients. They found the overall hump recurrence rate to be 4%, dorsal flaw rate to be 0.3%, and revision surgery rate to be 6.6%.[36] An article published by Tham and colleagues the year prior includes many of the same publications to identify 5660

DPR patients across 22 studies. They report similar rate of hump recurrence (4.18%) and slightly lower revision rate (3.48%). They additionally evaluate for postoperative axis deviation and found occurrence to be low (1.13%).[60]

Guyuron and colleagues performed an image-based systematic review, collecting published photos from 59 patients who underwent DPR. Photographs were evaluated by 3 reviewers with excellent interrater agreement for esthetic factors such as dorsal irregularity, dorsal deviation, and residual hump. The authors note high rates of imperfections, reporting 78% of patients to have dorsal irregularity, 54% dorsal deviation, and 42% residual hump. These numbers are significantly greater than those reported by other publications, possibly due to study design with objective third party review. The authors also note these flaws were detected with careful focus on esthetics, and that most images had acceptable or great appearance at first glance.[61]

Esthetic or functional imperfections may not always warrant intervention, and in many cases may be noted and simply observed. In a review article, Saman and colleagues explore the indications for revision surgery following 672 DPR (PD, superior strip) cases. The overall revision rate in this series was 6.85%. The most common reasons for revision included persistent bony hump (26.1%), cartilaginous hump (19.6%), and dorsal axis deviation (30.4%).[62] The most cited obstacle by surgeons for transition to DPR methods is concern for recurrent hump.[38]

SUMMARY

DPR has garnered significant global attention in recent years due to the theoretic benefits of keystone preservation including more natural postoperative dorsal lines, maintained structural integrity, and preserved patency of the internal nasal valve. However, despite the described benefits, there are limited studies that report objective surgical outcomes. The current body of literature describes acceptable patient-reported functional and esthetic outcomes of DPR in comparison with CHR. Appropriate patient selection likely plays a large role in ensuring positive outcomes. The most common reported complication and concern preventing surgeons from adopting DPR techniques is recurrence of dorsal hump. Despite this, published rates of recurrent hump and revision surgery are overall low. There are several modified techniques for bony vault and septal management that have expanded DPR indications. However, comparative studies across these methods are limited.

CLINICS CARE POINTS

- The current literature supports acceptable and equivalent outcomes of DPR in comparison with CHR. Appropriate patient and technique selection is critical in ensuring positive rhinoplasty outcomes.
- Ideal DPR candidates have existing well-shaped dorsal esthetics. Those with severely kyphotic bony dorsum or S-shaped nasal bones are at increased risk of residual hump. Those with a wide midvault or irregular bony pyramid are at risk of unsatisfactory dorsal lines.
- Surface modifications/modified preservation methods can be used to convert those patients with unideal anatomy into good DPR candidates.
- Asymmetric DPR techniques can be effective in management of I-shaped and C-shaped CND.
- Survey-based studies show a rise in use of partial preservation surface techniques amongst surgeons worldwide. With this change in surgical trend, it would be beneficial to incorporate DPR methods and principles in training programs.

DISCLOSURE

The authors have nothing to disclose.

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