Use of cartilage grafts for internal septal support of the crooked nose

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The repair of a crooked nose relies on the successful straightening of the crooked septum. Failure to align the septum properly can compromise the final result. The versatility and effectiveness of using an open approach to repair the septal deformity are examined. The technique involves an extensive degloving of the septum, with a release of all extrinsic tethering attachments. This is followed by a direct repair of the intrinsic angulations of the septum, with cartilage splint grafts being applied to support and straighten the septum, and cartilage spreader grafts used to camouflage deviations and elevate segments of upper lateral cartilage collapse. Thirty-two patients were managed with this approach. The exposure is excellent, and the procedure is not difficult to perform because the steps are logical and anatomically based. The enhanced precision of repair results in greater predictability and an improved final result.

Key Words: *Cartilage grafts; Crooked nose; Open rhinoplasty; Septoplasty*

Greffons cartilagineux : soutien interne du septum du nez crochu

RÉSUMÉ : La correction du nez crochu repose sur le redressement du septum. Son non-alignement peut compromettre le résultat final. Sont examinées dans le présent article la souplesse et l'efficacité de l'intervention ouverte pour corriger la malformation du septum nasal. La technique nécessite un dégantage étendu du septum et le relâchement des attaches de fixation extrinsèques. Il y a d'abord correction directe de la déviation intrinsèque du septum, puis pose de greffons cartilagineux servant d'attelles pour soutenir et redresser le septum et de greffons cartilagineux servant d'écarteurs pour camoufler les déviations et élever les segments cartilagineux latéraux supérieurs qui sont affaissés. L'intervention a été exécutée sur trente-deux patients. Elle offre une excellente exposition et n'est pas difficile à pratiquer parce que les étapes sont logiques et fondées sur l'anatomie. La précision accrue de la correction permet une plus grande prédictibilité et un meilleur résultat final.

The repair of the crooked nose is a challenging procedure in nasal surgery, and the postoperative result can be a disappointment to both the patient and the surgeon. Proper alignment of the septum is the key to managing this complex deformity. All angulations within the basic L-shaped support structure of the septum need to be straightened or camouflaged. Failure to do so can lead to a recurrence of the deformity.

When the septal deviation is situated inferiorly along the maxillary crest, a simple release and conservative excision of the offending septum are adequate. When the deviation in-

volves the dorsal or caudal pillars of the L strut, the repair is more complicated. Surgery performed on these support pillars can cause irregularities or the collapse of the dorsum and columella.

The present article examines the role of cartilage support grafts in the repair of septal deviations. The exposure is through an open septoplasty. The angular deformities of the septum are incised and held straight by the application of splint grafts. Angularities not corrected by splint grafts are camouflaged by spreader grafts. Splint and spreader grafts can be used alone or in combination.

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Figure 1) Diagram showing septal repair with a septal splint graft

PATIENTS AND METHODS

During a six-year period, septal support grafts were used in 32 patients (21 males and 11 females) with crooked noses. Follow-ups ranged from seven to 28 months after surgery, with an average follow-up time of 13 months.

Surgical techniques

Open septoplasty is ideal for the repair of any significant angular deformity within the dorsal septum. The approach provides unsurpassed exposure, and permits repair and grafting of the septum with relative ease. However, if the tilt of the septum is minor and continuous with a deviation of the nasal bones, a simple endonasal release of the inferior and posterior aspects of the septum, combined with osteotomies, may be all that is required.

Following standard open techniques, the skin is elevated from the nasal tip and dorsal cartilages. The plane of dissection is kept directly on the perichondrium, maintaining good skin flap thickness and viability. Because most noses have experienced previous trauma, abundant scar tissue is frequently present. The dissection is performed in a cutting fashion with fine scissors, while gentle traction is applied to the skin flap. Blind spreading of the scissors is avoided because this tears the skin superficially and leaves vital soft tissue remnants on the cartilages.

The nasal tip is separated from the upper lateral cartilages because there is frequently a vector force connection between the two. A caudal curvature of the septum tends to push the tip away from the midline. Similarly, after surgery, attachments to the nasal tip can pull the repaired septum back to its original deformity. The alar cartilages do not have to be spread apart for the septoplasty, but are retracted caudally with double hooks to facilitate exposure. At times, a columellar strut is needed for nasal tip support, and it is particularly useful to have maintained the connection between the two crura because it allows the creation of a suitable graft pocket.

The anterior septal angle is exposed dorsally in the supratip region, distal to the caudal attachments of the upper lateral

Figure 2) Intraoperative photographs showing a splint graft being attached to the left side of the dorsal septum after the release of extrinsic forces and full thickness cartilage incisions into the angular deformities (**Top left, Top middle, Top right, Bottom left**). A vertical splint graft is also attached to the right side of the caudal septum to correct angular deformity of the columella (**Bottom middle, Bottom right**)

cartilages. Fine-pointed scissors are used to tease the mucosa away from the sides of the septum until the perichondrium is exposed. It is incised with a scalpel blade, and after the subperichondrial plane is established, a cottle elevator is passed generously along both sides of the septum, from the upper lateral cartilages to the vomerine crest. A scalpel blade held flush against the septum cuts on each side through the junctures between the septum and the upper lateral cartilages. The integrity of the mucosa is carefully preserved. When a dorsal hump reduction is planned, the mucosa is also freed extensively from beneath the upper lateral cartilages. The loosened mucosa falls from the cartilages, reducing the chance of damage during hump removal. Preservation of the mucosa limits contamination of the cartilage grafts, and also lessens the scarring of the internal valves.

A cartilage width of 8 to 10 mm is required for the septal L strut. When a splint graft is used, the strut can be somewhat narrower because the additional cartilage increases the overall strength. The lines of incision into the septum are determined by both the angularities within the septum and the graft requirements for the repair. The first cut parallels the dorsal line, starting at the perpendicular plate and stopping 10 mm short of the caudal edge. The second cut angles 90° from the first cut, following the anterior curvature of the septum. It is essential that the dorsal attachment to the perpendicular plate be carefully preserved to prevent dorsal collapse. The inferior attachment to the nasal spine is also important. If dislocated laterally, it should be released and re-

Figure 3) Diagram showing septal repair with a spreader graft and a splint/spreader graft

attached to the midline nasal spine through a transfixion or gingivobuccal incision.

At this point, the pillars of the septal L strut are free from extrinsic forces, aside from the key attachments at either end. When there is a severe deformity to the septum, much of the offending cartilage outside of the basic L strut has to be removed. The necessary lengths of grafts can be harvested from that cartilage. With a minor septal angularity, a more generous L strut can be preserved, combined with a more conservative cartilage excision.

Intrinsic straightening of the septal L strut is carried out next. Gentle curvatures within the septum may be softened by vertical cross-cuts along the concave side of the C-shaped deformity. Angular deformities of the septum, however, are best released through direct full thickness incisions, extending to within 2 to 3 mm of the cartilage edge. These cuts are made as necessary in both the dorsal and vertical struts. The weakened pillars are then reinforced with splint grafts, which also maintain the corrected alignment (Figures 1,2).

A splint graft should be as straight as possible. It is unwise to use a C-shaped graft to mirror the existing concavity. Because the extrinsic and intrinsic forces have been released, such a curved splint may over-correct the septal deformity and cause a reverse shift of the nose. The graft is secured to the L strut with mattressed 4-0 PDS (Ethicon Inc, USA) sutures, 3 to 4 mm below the dorsal line. It is a hidden graft. Bilateral splints are not normally required but can be used if extra support is needed.

In some situations, a spreader graft is better suited than a splint graft for a septal deformity. In contrast to the splint graft, it is placed along the dorsal line and functions as a lateral spacer. Its most common application in the crooked nose is in a cephalic septal angulation, caudal to the bony cartilaginous junction. At this level, it is difficult to use a splint graft because of the awkwardness in trying to affix and suture it beneath the nasal bones. Camouflaging the deformity with a spreader graft is more effective (Figure 3). It masks the septal angulation, elevates the upper lateral cartilage and selec-

Figure 4) Patient who had a splint graft to correct a post-traumatic deformity with a 50° angulation in the mid third of the septum

tively widens the dorsum on the depressed side. Layered grafts may be required to achieve the desired degree of dorsal spread.

When a cephalic angulation of the septum is seen in addition to a caudal angulation, both a spreader and a splint graft are required. Cartilage depletion may be a problem when previous surgeries have failed. In such situations, conchal cartilage, which is soft and thicker, can be used as a spreader graft, while the more rigid septal cartilage can fulfill the splint graft requirements. Ear cartilage has little or no splinting capacity; however, a splint graft made of septal cartilage can be raised to the dorsal line to provide a modest degree of spread.

RESULTS

Of the 32 patients examined for the present review, nine patients had pure splints grafts (Figure 4) and four patients had pure spreader grafts (Figure 5). The majority of patients had a combination of splint and spreader grafts or splint grafts that also served as spreaders (Figure 6).

All patients received prophylactic intravenous cephalosporins, and there were no postoperative infections. Initially,

Figure 5) Patient who had a spreader graft to correct a post-traumatic deformity with a cephalic deviation of the septum to the left

Figure 6) Patient who had a spreader graft and a splint-spreader graft to correct a tertiary cosmetic deformity with a cephalic deviation of the septum to the left and a caudal deviation to the right

nylon was used to secure the grafts, but this was changed to PDS (Ethicon, USA) after two patients noted that they could palpate persistent small knots on the nasal dorsum. These knots were not visible and, therefore, did not have to be removed.

DISCUSSION

There is a great tendency to undercorrect the septal deformity of the crooked nose. Revision surgery frequently involves more radical excision of the septum, without treatment of the extrinsic tethering forces or intrinsic septal angulations. Gradual weakening of the septum can cause nasal collapse.

The increased popularity of the open approach has resulted in a better appreciation of nasal septal anatomy and support. The exposure provides an unobstructed view of the septum with easy access. The problem that remains is how best to correct the angular deformities and at the same time maintain stability.

Sheen and Sheen (1) emphasized the value of spreader grafts in splinting the dorsal septum and correcting upper lateral cartilage collapse. These endonasally placed spreaders, however, are difficult to position precisely along the dorsal

line. Also, they shift easily, even with small mucosal pockets. Gunter and Rohrich (2), Rohrich and Hollier (3), Byrd et al (4) and others (5-7) have shown how much simpler and more effective these grafts are when inserted through an open dorsal approach. Once the septum is released and straightened, these supportive grafts can be affixed precisely and held securely with sutures.

Some authors (4,7) recommend scoring the concave side of the cartilage to make it curl to the opposite direction. This ability of the cartilage to curl was originally described by Gibson and Davis (8), and the procedure certainly has validity. However, in my experience its usefulness is limited to minor curvatures, and even then the results are inconsistent. One also has to be cautious about scoring cartilage in the presence of support grafts because the mattress sutures holding the grafts pull through the weakened cartilage much more easily.

Some advantages of an open exposure can be obtained indirectly when the septum is completely excised endonasally. The externalized septum is straightened through incisions, sutures and/or morcelization, and is reinserted into the nose. The technique has been described by Rees (9) and Gubisch

(10). Unfortunately, there is little stability to this structure, with few, if any, sutures holding the septum in place.

The successful repair of the crooked nose requires a detailed preoperative assessment, an organized repair plan and a carefully executed procedure. A favourable result may be achieved through an endonasal approach, but in my experience, it is more easily attained with open exposure surgery. The operation has a logical basis, it is not difficult to perform and its success can be judged intraoperatively in a step-wise manner. There is a clearly defined anatomical end point; if the nose and septum are not straight at the end of surgery, they will not be straight afterwards.

CONCLUSIONS

Open approach septoplasty, in combination with cartilage support grafts, provides an opportunity for improved results in the management of the crooked nose. The nose and the septum are intrinsically interrelated, and regardless of whether the deformity is approached openly or endonasally, it is important that the two be treated simultaneously.

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