

Excision and replacement of nasal septum in aesthetic and functional nose surgery: setting criteria and establishing indications*

Sebastiano Sciuto, Daniele Bernardeschi

Department of Otolaryngology, G.B. Grassi Hospital, Lido di Ostia - Roma, Italy

SUMMARY

Despite the technical details of the excision and replacement of the nasal septum both in aesthetic and functional nasal surgery have been extensively reviewed, in the opinion of the authors a clear and precise definition of the indications of this technique is still lacking.

A simplified classification of the nasal septum deformities, based on the site and the direction of the fracture or bending axis, is proposed to establish reproducible guidelines to nasal septum surgery. On the basis of this classification the post-operative results of 227 patients affected by obstructive nasal septum deviation were evaluated. The surgical treatment consisted of conservative septoplasty in 173 cases, while in 54 cases excision and replacement of the nasal septum were performed. A conservative tension release septoplasty was performed for horizontal fracture or angulation of the septum. The more radical excision/replacement surgical approach was preferred when a vertical angulation or bending axis was observed (vertical = normal to the maxillary ridge). Twenty persisting septal deviations were found at the one year post-operative follow-up. Nineteen of these were the outcome of 173 conservative septoplasty, while only one case with unsatisfactory results was the outcome of 54 excision/replacement procedures. Seventeen out of 19 cases originally classified as horizontal deformity who presented at follow up with persisting septum deviation were reclassified as vertical.

The reason for surgical failure must be probably identified in a preoperative classification mistake where vertical deformities were erroneously evaluated horizontal and operated accordingly. The authors suggest excision/replacement of the nasal septum whenever its fracture or major bending axis is vertical.

Key words: rhinoplasty, nasal septum

INTRODUCTION

Quadrangular cartilage excision and replacement represents a well known procedure both in aesthetic and functional nose surgery. Partial excision/replacement of the caudal septum was originally proposed and practiced by Peer (1937) while extensive excision/replacement of the whole quadrangular cartilage is currently a widely practiced surgical approach to limited septoplasty as well as to complete septo-rhinoplasty.

However, while the technical details of this procedure have been extensively reviewed, a satisfactory classification of septum deformities is still lacking. This is essential to clarify the indications to quadrangular cartilage excision and replacement. Moreover, the lack of a comprehensive classification makes the comparison of surgical outcome impossible, while current indications to this surgical approach refer to poorly defined terms

such as “selected cases” or “difficult noses”. Briant and Middleton (1985) suggested excision/replacement of quadrangular cartilage in “severely twisted septums, caudal deflections”. Gubisch (1989) and Gubisch et al. (1995) considered the procedure appropriate for “difficult septum,...deformities that primarily result from severe nasal trauma or are developmental in nature, e.g. part of a cleft lip palate”. Bessede et al. (1991) similarly referred the indications to “difficult septoplasties ... or when all the septum components are distorted” while Sulseni and Palma (1989) suggested that this procedure should be reserved to those cases where “the quadrangular plate presents complex deviations or is severely irregular”. Planas (1964) and Meyer (1988) advised quadrangular cartilage excision/replacement for secondary rhinoplasties, and Rees (1986), paying specific attention to aesthetic considerations, states that “if the bony

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septum is shifted significantly to one side or the other, efforts to try to achieve a straight external nasal vault by various osteotomy combination may prove fruitless because the nasal bones and upper lateral cartilage cannot be shifted medially in the presence of a high septal deviation". In his opinion, septum excision/replacement "is reserved only for those patients in whom severe obstruction, especially high in the upper vault, exist in combination with severe deviation of the external nose". Toriumi (1994) proposed to reserve this kind of surgery to "selected cases of severe deformities of the supportive segments (dorsal and caudal) of the nasal septum" and Conessa et al. (1994) similarly referred to "complex septum deformities, particularly concerning antero-superior and antero-inferior rims of the quadrangular cartilage".

In an effort to establish reproducible guidelines to nasal septum surgery this study intends:

- A)- to propose a simplified and workable classification of septum deformities and indications for surgery. This classification is based on previous work by all the cited authors;
- B)- to present the long term results achieved in a group of patients treated according to the proposed classification.

Classification of nasal septum deformities

Nasal septum deformities and particularly quadrangular cartilage deformities, both congenital and acquired, although presenting with extremely variable shapes, are amenable to the simplified classification shown in Figure 1 and Table 1, based on the classification proposed by Gomulinski (1982).

Table 1. Classification of nasal septum deformities.

- a- "horizontal" horizontal angulation or bending of the quadrangular cartilage (horizontal = parallel to the maxillary ridge).
- b- "vertical" vertical angulation or bending of the quadrangular cartilage (vertical = normal to the maxillary ridge).
 - "b" kind of deformity can be furtherly divided in:
 - b1. "caudal-vertical" angulation or bending axis directed towards a dorsal point distal from the upper lateral cartilage insertion
 - b2. "mid-vertical" angulation or bending axis directed towards a dorsal point below the upper lateral cartilage insertion
 - b3. "high-vertical" angulation or bending axis directed towards a dorsal point corresponding to the bony vault.
- c- "combined" "c" multiple angulations or bending including traits of both "a" and "b".

Horizontal type ("a") is the most common kind of septum deformity, and results from the development of the bony face: it is usually the anomalous palate growth to push from beneath lifting up the vomer, so that the quadrangular cartilage is secondarily bent and displaced and its lower edge is relocated in the nasal fossa. A similar result can be attained by the excessive growth of the quadrangular cartilage itself. This kind of deformity, when resulting from the growth of the bony palate, is frequently associated with teeth malocclusion and dorsal hump. "b- vertical" and "c-combined" type are usually acquired as a result of nasal trauma. Early traumas, occurring before the completion of bone and cartilage growth, are frequently associated with multiple nasal deformities, often including upper lateral

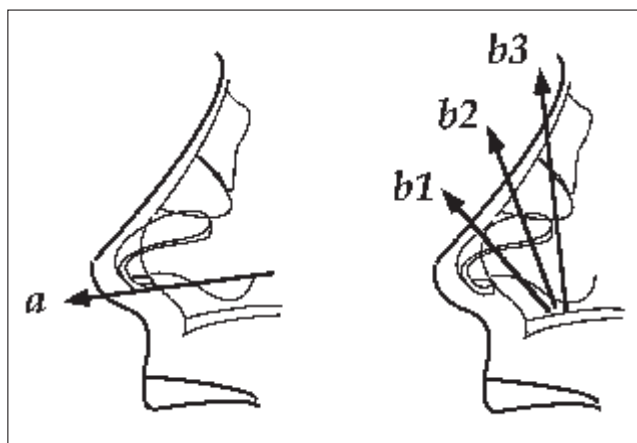


Figure 1. Different directions of fracture line or major bending axis on which the classification of septal deviations is based. Type "a": horizontal fracture or bending of the quadrangular cartilage (left). Type "b": vertical fracture or bending of the quadrangular cartilage divided in: "b1", directed towards a dorsal point distal from the upper lateral cartilage insertion, "b2", directed towards a dorsal point below the upper lateral cartilage insertion, "b3", directed towards a dorsal point corresponding to the bony vault. Type "c" includes traits of both "a" and "b".

cartilages. In some instances, following early trauma, nasal cartilages develop poorly resulting in a displastic and dismorphic nose during adulthood. In other instances the continuing growth of displaced cartilage and bone fragments results in gross subversion of septum anatomy: in the most severe cases gaps, duplications, crossover, folding and bending of the nasal septum can occur in several combinations. Later traumas, occurring after the completion of the growth, are usually easier to be corrected: in such a case even multiple and displaced fractures are not associated with developmental alterations.

MATERIALS AND METHODS

Two hundred and twenty-seven patients were evaluated and treated for septum deformities from January 1993 to December 1995 in our hospital. The indication for surgery was based on clinical grounds. Nasal endoscopy and anterior active rhinomanometry was employed to exclude from this study patients affected by allergic rhinitis, turbinate hypertrophy and nasal valve incompetence. Nasal septum deformities were divided according to the classification shown above (Figure 1 and Table 1). The distribution of nasal septum deviations and type of surgery is shown in Table 2.

Table 2. Distribution of nasal septum deviations and type of surgery.

Nasal septum deformities	Cases	Surgical procedure
a horizontal angulation	173(76%)	detensioning septoplasty
b1 caudal-vertical ang.	22(10%)	caudal septum excision/replacement
b2 mid-vertical ang.	32(14%)	complete septum
b3 high vertical ang.		excision/replacement
c multiple angulation		

All surgical procedures were performed by one surgeon (S.S.). Surgical treatment of the horizontal type (a) deformity consisted of detensioning septoplasty. Caudal-vertical (b1) deformities were corrected by excising the caudal septum and by aligning and replacing it in the proper position. Patients with mid-vertical (b2), high-vertical (b3), and combined (c) deformities underwent complete septum excision and replacement after bench remodelling. Long term results were finally evaluated at least 1 year after the procedure according to the following graded criteria:

Functional criteria:

- 1 Patient satisfaction. Scoring: I): complete satisfaction; II): partial satisfaction; III): no change; IV): worse than before.
- 2 Nasal septum: (with special attention to its central position and straight shape). Scoring: I): optimal; II): improved; III): unchanged; IV): worse than before.
- 3 Episodes of postoperative nasal obstruction: analysis of the period between 6 months and 12 months after the surgery and comparison with the 6 months preceding surgery. Scoring: I)- from 0 to 1 episodes; II)- number of postoperative episodes is about half of the preoperative ones; III)- no change in frequency of episodes; IV)- increased number of episodes postoperatively.
- 4 Mucosal lining Scoring: I)- integrity; II)- minor asymptomatic perforation; III)- symptomatic perforation.

Aesthetic criteria:

- 5 Patient satisfaction. Scoring: I)- complete satisfaction; II)- partial satisfaction; III)- no change; IV)- worse than before.
- 6 Nose axis. Scoring: I)- straight; II)- improved; III) unchanged; IV)- worse.
- 7 Regularity of the nose profile.
- 8 Regularity of both columella and naso-labial angle.

The follow-up evaluation was performed by a physician not involved in the operation and unaware of the technical details of the procedure performed. For type “a-horizontal” deformities only functional criteria were considered. For type “b-vertical” and “c-multiple” aesthetic criteria were considered as well, in order to assess whether excision/replacement could have affected the septum support to the nasal dorsum and columella.

Results were scored as follows:

- very good: scoring I in all above criteria or scoring II in one criteria and scoring I in all the remaining.
- good: scoring II in more than one of the above mentioned criteria.
- unsatisfactory: scoring => III in at least one of the above criteria or criteria 7 and/or 8 not achieved.

RESULTS

The incidence of residual septal deviation is shown in Table 3. One hundred and fifty-four patients (89%) with “a-horizontal” deformities had none residual deviation. The outcome was unsatisfactory (major deviation) for 11 patients. The residual septum deformity in these patients was classified as “b-vertical”

in 8 patients, a “c-combined” in 3 patients. Eight patients presented at follow-up with minor deviation; in 2 reassessment of septal deformity resulted in type “a-horizontal” assignment while 4 were classified as “b-vertical” and 2 more cases as “c” type deformity.

Table 3. Surgical results: residual deviations.

	None	Minor	Major	Patients
originally classified as:				
a horizontal angulation	154(89%)	8(5%) (a:2, b:4, c:2)	11(6%) (b:8, c:3)	173
originally classified as:				
b1 caudal-vertical ang.	22	none	none	22
originally classified as:				
b2 mid-vertical ang.	31	none	1(0,5%)	32
b2 mid-vertical ang.				
c multiple angulation				
Total	207(91%)	8(4%) (a:2, b:2, c:4)	12(5%) (a:0, b:8, c:4)	227

The results of complete follow-up assessment is reported in Table 4. In patients with “b-vertical” or “c-combined” deformities results were rated as very good or good in 51/54 patients. One patient presented with both aesthetic and functional problems, related to a substantially unchanged septum and nose lateral displacement. Two patients presented with reduced fossa patency, related to a thick caudal septum. In patients with “b-vertical” and “c-multiple” septal deformity criteria 7 and 8 were always achieved. Three minor asymptomatic septal perforations were observed: all after surgery for “a-horizontal” deformities.

Table 4. Surgical results. Complete follow-up assessment.

	Very good	Good	Unsatisfactory	Total
originally classified as:				
a horizontal angulation	147(85%)	15(9%)	11(6%)	173
originally classified as:				
b1 caudal-vertical ang.	18(82%)	4(18%)	none	22
originally classified as:				
b2 mid-vertical ang.	22(69%)	8(25%)	3(9%)	32
b2 mid-vertical ang.				
c combined angulation				
Total	187(82%)	27(12%)	14(6%)	227

CASE REPORTS

Case 1: Primary Rhinoplasty: Septal Deviation Type “a-horizontal”

This young patient, with no history of trauma, had airway obstruction, left septal deviation (Fig. 2 A+B+C+D+E+F). Septal deformity was classified as “a-horizontal”. Reconstruction involved detensioning septoplasty with conservative resection of the lower edge of the quadrangular cartilage, conservative

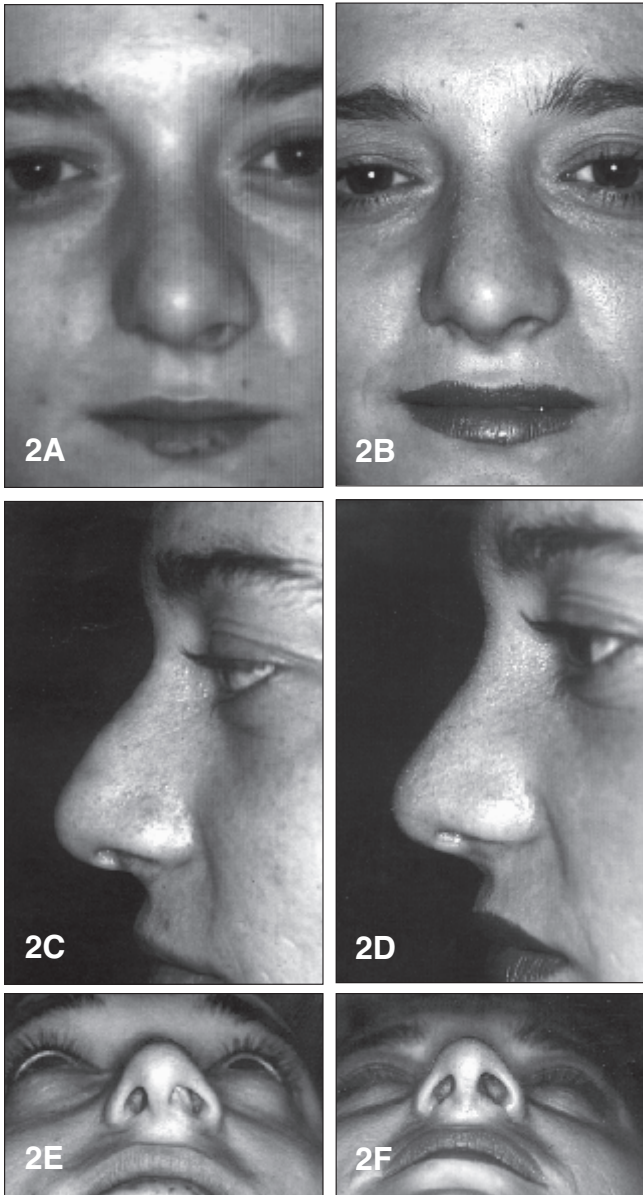


Figure 2. Patient with Type “a” septal deformity. Reconstruction consisted of conservative detensioning septoplasty, slight dorsal reduction, cartilaginous strut graft into the columella, left alar base resection, osteotomies. Preoperative and 1-year postoperative views.

resection of the caudal septum, conservative resection of the vomer bone, slight dorsal reduction, cartilaginous strut graft into the columella, left alar base resection and osteotomies.

Case 2: Primary Rhinoplasty: Septal Deviation Type “c-combined” (a+b1+b2)

A 43 year old male patient presented with bilateral nasal obstruction and no history of trauma (Fig. 3 A+B+C+D+E+F). The caudal septum was dislocated in the left nasal fossa, the remaining of the quadrangular cartilage was severely distorted, the vomer bone was bulging toward the right side. Septal deformity was classified as “c-combined”. Reconstruction involved excision of the quadrangular cartilage, tayloring on the bench, and replacement of the cartilage in its proper position.

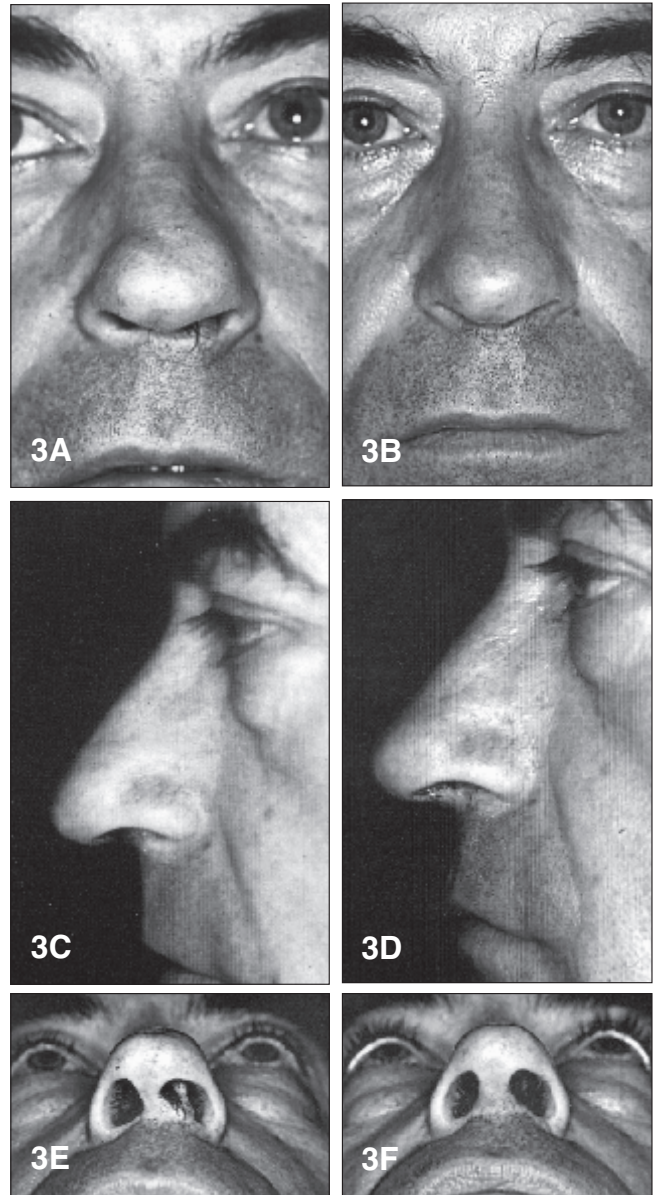


Figure 3. Patient with Type “c” septal deformity. Reconstruction involved excision/replacement of the entire quadrangular cartilage, conservative resection of the vomer bone, strut graft into the columella, asymmetric alar cartilages resection, left alar base resection. No dorsal reduction, no osteotomies. Preoperative and 3-year postoperative views.

In addition conservative resection of the vomer bone, strut graft into the columella, asymmetric alar cartilages resection and left alar base resection were performed. No dorsal reduction or osteotomies were required.

Case 3: Primary Rhinoplasty: Septal Deviation Type “c-combined” (a+b3)

Despite the post-trauma appearance of the nose, this 17 year old girl had no history of trauma (Fig. 4 A+B+C+D+E+F). The inferior edge of the quadrangular cartilage was dislocated in the left nasal fossa, and a vertical fracture was observed directed towards the bony vault. Septal deformity was classified as “c-combined”. Reconstruction involved excision of the quadrangular cartilage, its tayloring on the bench, and replacement in its

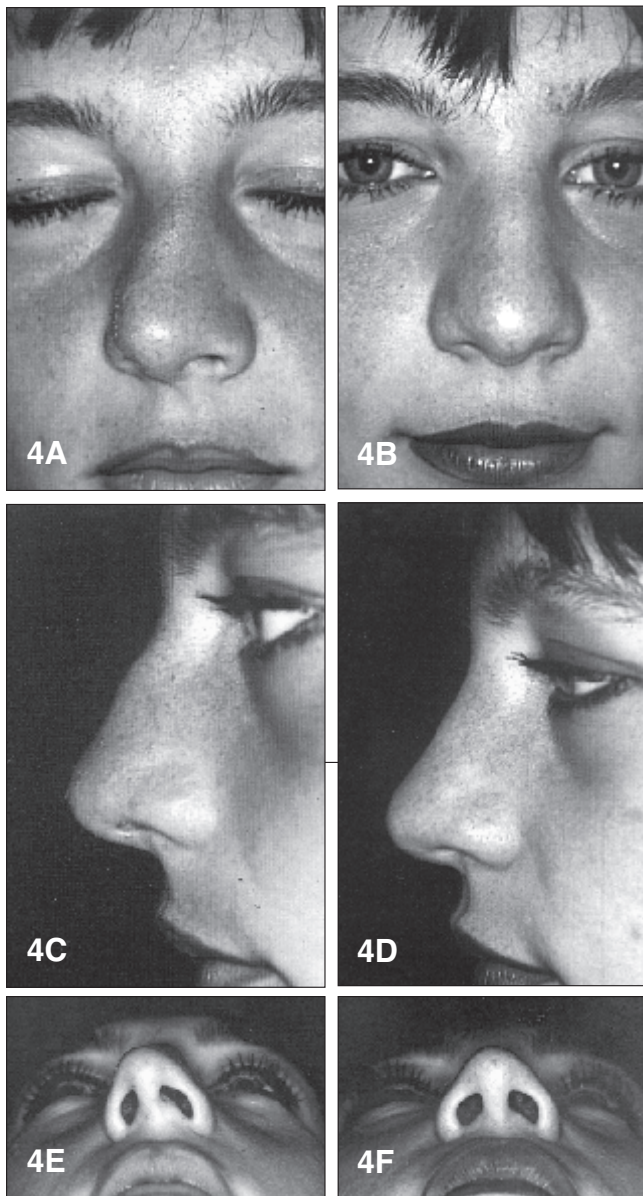


Figure 4. Patient with Type "c" septal deformity. Reconstruction consisted of excision/replacement of the entire quadrangular cartilage, dorsal reduction, osteotomies. Preoperative and 14-month postoperative views.

proper position. In addition dorsal reduction and osteotomies were performed.

DISCUSSION

This article demonstrates the importance of a proper classification of nasal septum deformities in order to choose the appropriated surgical approach and achieve adequate cosmetic and functional results.

Repair of "a-horizontal" deformities, when properly classified, can be easily attained in most cases with extremely conservative surgical technique. In these types of deformity the quadrangular cartilage is distorted as if it is under tension. The end-result of this deformity is similar to a fibroelastic lamina which takes a distorted shape being restrained in an inadequate space. Size reduction is usually enough to correct this abnormality and can be attained by

cutting the excess cartilage from the lower edge close to the chondro-vomer junction. Similarly, when needed, a very conservative shortening of the caudal septum may be indicated. Reduction of the horizontal fractures can usually be obtained by appropriate mobilization and realining of the dislocated fragments, possibly after slight resection of the margins. If the horizontal fracture is situated in a low position, close to the maxillary ridge, a simple submucous resection of the inferior fragment can be effective.

Type "b" and "c" deformities, i.e. those deformities where the fracture or bending axis is vertical, are less amenable to repair as the fracture or bending axis moves towards or reaches the dorsal edge of the quadrangular cartilage. In these instances the different parts of the cartilage are maintained in a non aligned position by the existing adhesions with the dorsal nose frame, i.e. mainly with the upper lateral cartilages but also, at least partly, with the bony vault and the alar cartilages. These structures impose to the dorsal edge of the quadrangular cartilage a distorted position which is transmitted to the rest of the quadrangular cartilage. This anatomical configuration generates an intrinsic "memory" (10) of the nasal septum which takes it back to the previous distorted position after conservative surgery. In these instances not even a Killian's submucous resection of the nasal septum, dangerously extended close to the dorsal edge of the quadrangular cartilage, is effective. For this reason the two mucosal linings will remain distorted as before surgery even without the interposed cartilage.

Whenever the fracture or major bending axis is vertical, i.e. the deformity is classified as a "b" or "c" deformity, the excision/replacement procedure is, in our opinion, the procedure of choice. This approach should be maintained regardless of the dorsal edge of the quadrangular cartilage being reached or not by the fracture or bending. In general terms, the more the fracture line gets close to the dorsal edge of the quadrangular cartilage the more an unpleasant cosmetic appearance of the nose is associated with functional impairment. Conversely, if the fracture is not close to the edge of the quadrangular cartilage impairment is generally limited to the breathing function of the nose. Our results seem to support the above concept.

It must be stressed that the great majority of the patients with deformities originally classified as type "a-horizontal" who presented at follow up with persisting septum deviation were post-operatively reclassified as having type "b-vertical" or "c-combined" deformities. Accordingly the most likely reason for surgical failure must be identified in a preoperative misclassification where case "b" and "c" patients were erroneously assigned to the "a" deformity. On the contrary, and confirming the previous remark, only one patient among type "b-vertical" and type "c-combined" deformities presented at follow up with persisting septum deviation in spite of these conditions being commonly regarded as more severe and more difficult to correct than type "a-horizontal" deformities.

The main objective of this study was to assess the results after surgery and particularly to evaluate the position and the shape of the nasal septum. Rhinomanometry was not considered help-

ful for this study as the position of the nasal septum is not necessarily correlated with an impairment of nasal flow.

In conclusion, we believe that excision/replacement of the quadrangular plate should be reserved to a selected number of patients with complex deformities of the nasal septum that have in common a vertical angulation or bending of the quadrangular cartilage. The systematic preoperative classification of septum deformities, according to standardized criteria, makes possible the choice of the most appropriate surgical approach, and makes surgical experiences amenable to meaningful comparisons.

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Dr Sebastiano Sciuto
Via M. Mencatelli 24
00128 Roma, Italy