

Septum variations, strips and grids

Gerald F. Joseph, Baton Rouge, Louisiana, U.S.A.

SUMMARY

The normal nasal septum is defined and a terminology presented for pathologic variations. The type, location, and extent of septal deformity indicate its effect on nasal function and guide the surgical program of nasal reconstruction. Septum and external pyramid surgery is a continuous integrated operation to correct the whole nose. Three broad variations of septum surgery, strips, grids, and random focal resection, with repair, are described and related to the total surgical objective.

THE NASAL septum is a common partition or "party wall" supporting and dividing the nose, and acting in unison with structures of each lateral wall to create a paired organ. This provides the nose with tremendous reserve function like other paired organs such as the eyes, ears, lungs, and kidneys. Accordingly, the nose can be quite deformed and disabled, yet serve its role without obvious signs of severe functional deficiency. The patient's nasal complaints, often reflections of psychoneurosis, cannot be fully honored, and though objective testing offers great help our final diagnosis still largely rests upon learned clinical empiricism.

The septum is the nucleus about which the whole nose is built, and is intimately involved in all aspects of nasal function. It is essential then to know the normal septum, so that pathological variations may be recognized and correlated with the signs and symptoms which they may be creating. Next, we must have a method for correcting the pathology, to relieve the patient of distress. Some of this is medical rhinology, an important phase of therapy, but this discussion shall consider only some basic principles of surgical septal correction.

The nose has three essential elements in its make-up which must exist in an optimal ratio and relationship to achieve functional efficiency. These are: 1. The rigid framework (bone and cartilage), over which is draped, 2. The soft tissues (skin and mucosa), nourished and controlled by, 3. The trophic elements (nerves and blood vessels). An ideal spatial distribution and quantitative-qualitative balance must exist among them for the nose to be normal. Ethnic dysharmonies, physical trauma, toxic irritations, nutritional deficiencies, hormone imbalances, and the aging process, plus a host of other disturbing influences begin to distort the nose in pre-embryonic life and continue through senility. Our surgery must

rectify the resultant deformities and restore the balance of components necessary for the nose to do its job with ease and comfort.

In order to accomplish this objective it is necessary to recognize that the septum and external pyramid are, and must be surgically treated as, a wholly integrated anatomical and functional unit. They are so united that one can hardly be deformed without some disturbance of the other. Conversely, a deformity of one cannot be corrected without modifying the other. Nasal reconstruction is a concomitant septum-pyramid operation, each procedure on one having an immediate effect upon the other. The surgical aims are directed toward the needs of the septum, and in performing the nose operation, the septum may be dissected first but it is not modified until the external pyramid has been mobilized. This is technically expedient and also imposed by the fact that pyramid manipulation changes the type and degree of septum correction indicated.

SEPTUM ANATOMY

A normal septum is a generally flat wall, pentagonal in outline, equidistant between the lateral nasal structures in all areas. Its thickness, about two thirds mucosa and one third hard tissue, varies from 7-8 mm in leptorrhines, and from 12-15 mm in platyrrhines. It has inferior, caudal, anterior or dorsal, and posterior borders. Segments of, and directions in, the septum are described by relation to the border designations. The inferior portion if often called the base. The septum is composed of the semi-rigid columella behind which is the flexible membranous septum and then the rigid septum deeper within the nose. Infero-caudally the septum rests on the anterior nasal spine (maxilla-premaxilla) behind which the premaxillary crest and wings, the maxillary crests and palatine crests form the inferior bony septum. Antero-superior to this base lies the quadrilateral cartilage plate continuous with the roof cartilages above and attached behind to the ethmoid plate and vomer. Superiorly the frontal spine and processes from the nasal bones contribute to the cephalic septum completing its continuity with the nasal dorsum.

5 AREAS

For clinical reference the nose is divided into five areas. Area 1 is the skin-covered columella and membranous septum of the vestibule. Area 2 is the septal valve region related to the free margins of the upper lateral cartilages. Area 3 is the upper external pyramid region-called the silent area. In Area 4 the septum is related to the turbinates and sinus ostia on the lateral nasal wall. Area 5 is the posterior choanal region where the septum is associated laterally with the sphenopalatine fossa and Eustachian tube orifice. Septal distortion in each area causes characteristic signs and symptoms by disturbing the nasal fossa and associated structures on the lateral wall, specific to that area.

SEPTUM PATHOLOGY

Septal pathology may consist of intrinsic disease, such as infection, neoplasm,

vasomotor upsets, hormone disturbances, and toxic inflammation. These are the medical problems which must be treated accordingly. They demand attention in nasal surgery, but septal operations are primarily concerned with correction of abnormality in size, shape, proportion, and position, imposed by internal stress and external trauma. The stress may be developmental or post traumatic, and the trauma may be accidental force or well intended surgery. A pathologic septum is usually the compound result of multiple factors causing aberrations which coexist in infinite combinations. Each total septum is a specific problem in diagnosis and surgical correction; a number of operative plans might be acceptable, the surgeon choosing that which he best understands and feels best able to perform. For didactic purposes certain single abnormalities of the septum shall be discussed, after once more emphasizing that the surgical septum usually presents a number of them combined.

ABNORMAL DIMENSIONS

Referable to dimension, the septum may be too large or too small, intrinsically, or relative to other nasal structures. Too large a rigid septum tightly stretches the soft tissue allotted for its cover causing mucosal atrophy and tension. The caudal end hangs down, drooping the tip and restricts lobular motion which is essential for valve function. Excessive height in area two extends the upper laterals, narrows the valve angle, and leads to so-called alar collapse obstructing the airflow. Too small a septum in this area is usually the result of cartilage loss and scar retraction after injury. This causes saddling of the dorsum and balloons the upper laterals with consequent open valves that do not function to control pressures. The low, small septum may be too thick or wide from imbrication of fractured cartilage fragments and exuberant scar formation in old organized hematoma. Rigid thickness adds to valve dysfunction, and in area four narrows the fossa bilaterally interfering with the flow and the septo-turbinal reflexes. The high, long, very large septum may be too thin and flexible to serve in proper functional relationship with related structures of the lateral wall. The extreme state of absolute thinning and atrophy is an area of septal perforation, which obviously has totally lost its functional capability.

ABNORMAL POSITIONS AND CONFIGURATIONS

More commonly recognized as septal pathology are the abnormal positions and configurations. These may involve the whole septum leaning to right or left from a dislocated base or rotated from the midsagittal plane about a vertical axis. The whole septum may also be bowed or bent, forced from its flat midline plane by stress or external trauma without fracture of its rigid components. Such a septum may spring back into normal position and shape when the pyramid is mobilized or the septal base is freed by strip removal. Leaning, rotation, or bowing, may involve only a portion of the septum, very often the cartilaginous caudal end where it is mobile and unprotected.

When disturbing forces fracture the septal framework or dislocate the joints between its rigid components, acute localized deflections occur, sometimes called spurs. These may be vertical or horizontal, the latter usually in the inferior septum, the former in areas 2, 4 and 5. A common example is the posterior spur in area 5 from fractured vomer, impinging on the sphenopalatine region and causing neurological symptoms distant from the nose. This spur or any other of these deflections may exist singly or in combination with multiple deformities. The extreme case is a totally crushed septum, deformed in accordian pleat fashion, with cartilage and bone fragments embedded in scar, twisted, convoluted, overlapping, and folding back upon themselves in complicated intricate patterns. Such a septum is no job for strips and grids, but rather, demands meticulous sharp dissection with total resection and replacement, including the upper laterals. Complete examination for septal pathology requires inspection and palpation of the external nose, then inspection and palpation (with probe or applicator) of the internal nose before and after shrinking the membranes. Nasal respiratory movements should be observed without instruments before internal inspection first with the lifter then the nasal speculum. With soft tissues fully constricted, nasal pressures should be recorded.

FUNCTIONAL IMPLICATIONS

In addition to type and location, septal deformities are also described by extent, with a functional implication often reflected in the symptomatology and/or pressure tracings. A bend, thickening, deviation, or deflection, which intrudes upon the nasal fossa but does not reach the lateral wall is called an obstruction. One with soft tissue contact against the lateral wall which disappears on shrinking is called an occlusion. One which has tight impingement of bone or cartilage onto the lateral wall, unrelieved by shrinking the mucosa, without space for passage of a fine probe, is called an impaction. Soft tissue adhesion usually occurs with impactions and may also be seen without contact of rigid tissues anywhere in the septum.

Using this conventional terminology, septal pathology can be described with brief accurate nomenclature conveying a concept of the physical problem, its effect upon nasal function, and its role in producing symptoms. A deflection in area 2 with occlusion implies a valve problem which should be revealed by the pressure tests, cause subjective respiratory difficulty, and be slightly improved by vasoconstrictors. An occluding deflection in area 4 would cause a milder breathing problem, more responsive to shrinking agents. Impaction in area 5 means, without elaboration, a bony spur from septal fracture or maldevelopment, causing throat and ear symptoms and neurological disturbances in the sphenopalatine distribution. Such a rigid spur or deflection, unyielding to palpation, indicates need for area resection and repair. A more flexible bend may spontaneously disappear when the septum is relieved of general stress by strip removal and adjusting the pyramid. There are may clues to the operative plan in an accurate description of septal pathology.

SEPTUM SURGERY

Restoration of the optimal septum in the midsagittal plane is accomplished by exposure of its hard parts which are then mobilized and resected or modified in situ. The maxilla-premaxilla approach provides access to all areas of the septum from any direction along anatomical planes of separation with maximal ease and minimal trauma. It proceeds beneath the periosteum from bone onto cartilage allowing the perichondrium to be lifted without mucosal laceration at the joints, which may be pathologically angulated and scarred. Mucosa may be elevated safely in any portion of the septum or allowed to remain adherent on one or both sides with adequate exposure for surgery at the indicated site. Sharp spurs, wherever they occur, can be removed by lifting the membrane from the concave side, mobilizing the hard part, and gently rocking it away from the thin adherent mucosa on its sharp convexity.

RESECTIONS - STRIPS - GRIDS

Resected hard parts may be excessive in the general plan of surgery or they may leave empty space which must be supplied with implants to restore support and prevent scar retraction. Resections are done focally when the septal pathology is exposed, or in planned vertical and/or horizontal strips after the pyramid is mobilized. Random focal removal of grossly deformed bone and cartilage to correct a local septal problem usually requires repair by replacement. Strips, removed to accomplish a total surgical objective in the whole nose, may be excessive hard tissue that needs to be eliminated from the septum. The strip removed may be well shaped normal bone or cartilage or it may be possible to plan its removal from a distorted area of the septum and serve two purposes of the operation at one time. Removed strips may or may not need replacement or repair.

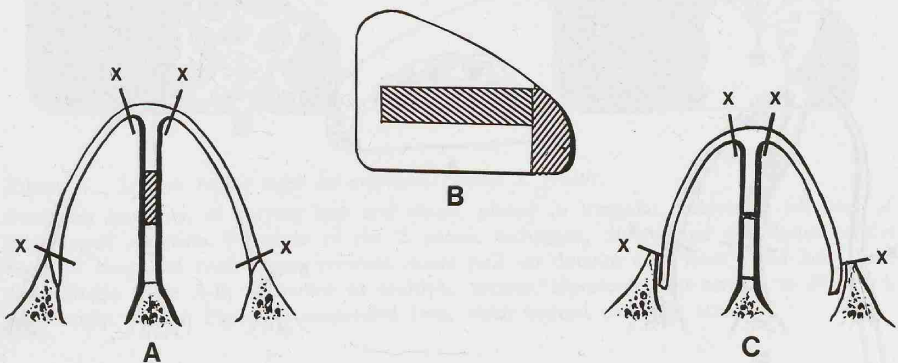


Figure 1. Large straight nose, thin high septum.

Removal of mid-septal strip (shaded) and osteotomies at x's with push down. Large nose (A) made smaller (C); relieves mucosal tension, corrects narrow valve, preserves dorsum. Combined septum-pyramid operation improves total nose function and appearance. No need for replacement in area of strip removal.

Strips may be removed or "taken" inferiorly, dorsally, posteriorly, caudally, or from the mid septum. They may be quadrangular or triangular and often one side is curved if they come from the dorsal or caudal border. The whole strip may be curved, T or L, shaped, or irregular as demanded by the operation, but use of such complicated patterns is only for the accomplished expert.

The gridding method is used to modify hard parts of the septum in situ. It is designed for moderate general angulations rather than acute deformities. Grids may be single or multiple, vertical, horizontal, oblique, criss-crossed, straight, curved, sinuous, or angular. Proper gridding is done with full thickness incisions though the term is often used to designate shallow multiple cuts into cartilage intended to increase flexibility. There is justified doubt that the latter method is adequate, either initially or permanently. By true definition a grid is composed of spaced bars of rigid material such as a vent cover or sewer drain. To effectively grid septal hard parts then they must be fully cut through and separated. Often in the process of gridding, it is necessary to remove thin slivers to attain the desired degree of malleability. These slivers may be triangular in cross section when cuts oblique to the surface plane are indicated to facilitate movement in a specific direction.

In a sense, complete gridding of a septal part for full mobilization may be considered a complex variation of strip removal, but there is a fundamental difference in concept and technique. Strips, removed to readjust the whole septum, are taken from areas where mucosa has been elevated from hard parts bilaterally. Gridding is used to modify the shape of a limited area which has been left in position with the mucosa adherent to one side. An alternative to gridding, often more efficient, is total removal of the misshaped segment and replacement with separated irregular implants after packing the nose. This is the septal Z plastic tech-

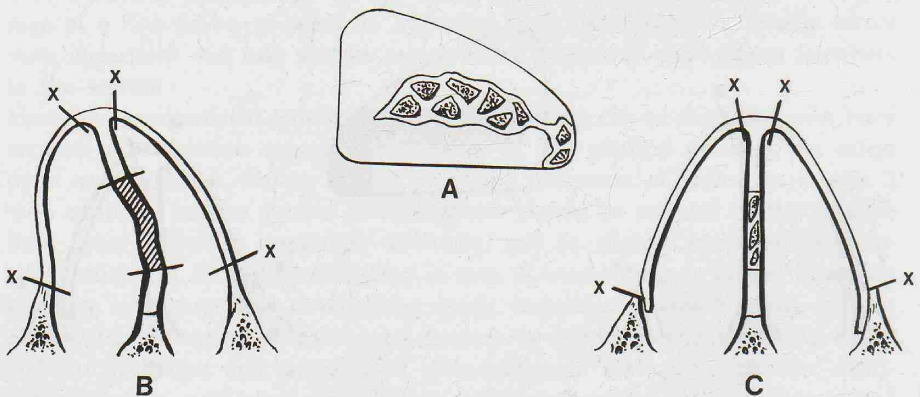


Figure 2. Deformed external nose and septum with obstruction.

Random resection of irregular deflected septal areas with repair by bit replacement, and canted osteotomies to allow replacement of nose in midline. Relieves obstruction and stress, corrects deformity of whole nose, maintains nasal support. A combined septum-pyramid operation; improves function and appearance of total nose.

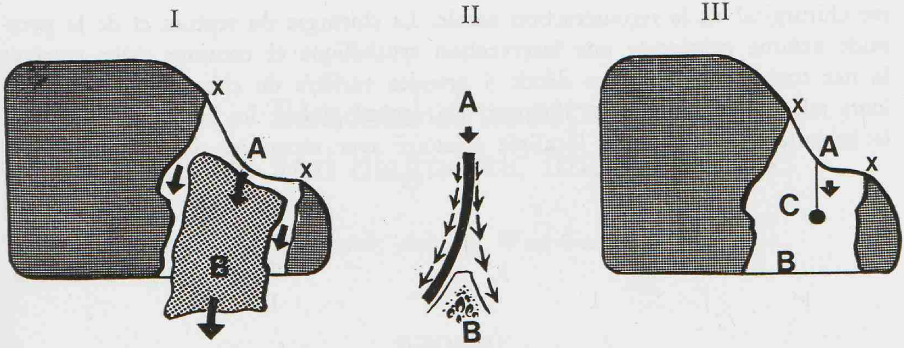


Figure 3. *Septum resection without proper repair.*

Loss of septal support between dorsum and base (A and B), without repair, allows cicatricial contracture in area to exert direct tensile force (Weight C) and depress dorsum. Causes saddling, with wide nose and ballooning upper laterals in valve area. Large single piece for replacement can also be pulled from position (Figures I and II) and create same complication. Bone better than cartilage for this purpose if large replacement necessary, as with perforation.

nique which demands intact perichondrium and periosteum. These essential trophic structures must be meticulously preserved and elevated from bone and cartilage in dissecting the septum. Left adherent, they will be lost when the hard parts are removed, leading to localized atrophy despite efforts at repair and replacement. This is a common cause of septal perforation.

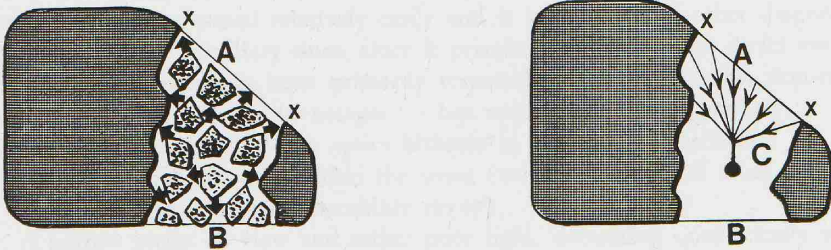


Figure 4. *Septum repair with bit implants: septal Z plastic.*

Small bit implants, of varying size and shape, placed in irregular fashion to fill area of total septal resection. Principle of the Z plastic technique, diverts and distributes tensile force of cicatricial contracture, prevents direct pull on dorsum (A) from fixed bony base (B). Single force A-B, converted to multiple vectors, represented by arrows in Figure I, and weight (C) in Figure II suspended from webb instead of single strand.

RESUME

L'auteur décrit l'anatomie du septum nasal normal et présente une terminologie des variations pathologiques. Le type, la localisation et l'extension de la déformation septale déterminent son effet sur la fonction nasale et guident le program-

me chirurgical de la reconstruction nasale. La chirurgie du septum et de la pyramide externe représente une intervention synthétique et continue pour corriger le nez tout entier. L'auteur décrit 3 grandes variétés de chirurgie septale avec leurs relations par rapport à l'objectif chirurgical global: les bandes de cartilage, le hachurage, et l'ablation localisée aléatoire avec réparation immédiate.

Gerald F. Joseph, M.D.,
3622 Government Street,
Baton Rouge, Louisiana,
U.S.A.