XXXV.

THE RESECTION OF BONY DEFLECTIONS OF THE
NASAL SEPTUM.

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In almost all deflections of the nasal septum bone must be removed in order to obtain perfect breathing after a sub-mucous resection; nevertheless, experience has shown me that many operators take away only the cartilaginous portions of an osseocartilaginous deflection and leave its bony part to continue to obstruct the nostril. Before I appreciated the need of a complete removal of all deviated or thickened bone, I, too, sometimes contented myself with cutting out only the bent cartilage, always regretting my conservatism, and in several instances being obliged to perform an extensive bony resection in a second operation in order to obtain a satisfactory result.

The chief reason why bony deviations are so often left untouched is the difficulty of their removal, a difficulty increased by the insufficient access to the operative field obtained in some methods of operation. In addition, the fear of making a perforation during the denudation of the bone deters many from resecting it, especially that portion called the ridge, after the cartilage has been successfully removed. The thick periosteum which envelops the ridge may hide it so completely that operators may, as I have seen, fail to find it at all.

While my earlier bony resections proved difficult, changes in the technic have made those of my later work so uniformly satisfactory and free from perforations that I have been impelled to describe in this article my present method of the removal of bony deflections.

Much of the difficulty experienced by operators in taking away the bony portion of deviations lies in an imperfect conception of the often confusing anatomic peculiarities of the skeleton of deflections, and for this reason the surgical portion

of this paper is preceded by some anatomic description of the chief divergences from the normal presented by bony deflections in my series of 428 cases.

ANATOMIC PECULIARITIES OF BONY DEFLECTIONS.

In this description, for the sake of convenience, the bony wall arising from the nasal floor created by the blending of the anterior portion of the vomer, the incisor crest and superior maxillary crest is designated collectively by the customary term of "the ridge," used above.

One of the most striking of the anatomic divergences found is the displacement of the septal cartilage from its proper position on top of the ridge to an attachment to its side (Fig. 1), so that the cartilage overlaps the bone. In the normal straight septum the inferior angle and posterior inferior border of the quadrangular cartilage of the septum rest vertically upon the narrow, rough and often channelled anterior border of the vomer and superior border of the incisor crest, which form the top of the ridge, the quadrangular cartilage, growing in proper proportion to the bony frame containing it, standing centrally and vertically upon an upright ridge (Fig. 2¹). In nontraumatic deflections, however, the cartilage either grows too fast for its bony frame, and so becomes too large for it, or else the frame stays too small. Under both these conditions the cartilage distorts the frame by pressure, bending out its margins by the wedging force of its growth, so that the vomer, incisor crest and perpendicular plate, with which the cartilage articulates, are bent outward, the ridge becoming inclined toward the nasal floor and, in curving over, causing the rough articular surface upon which the cartilage rests to look to the side, instead of upward. At the same time, the pressure of the growing cartilage spreads this articular surface by forcing downward the one of its margins which comes lowest in its new position, the osseocartilaginous synarthrosis between the cartilage and ridge thus becoming not only displaced from the top to the side of the ridge, but also greatly widened (Fig. 2^{3b}). The lower boundary of the so displaced and broadened rough articular surface develops into the sharp bony ledge so often sawed off as an exostosis, this ledge being overlapped and covered by the cartilage which ends inferiorly in a sharp angle (Fig. 2, ^{3c}), corresponding to the apex of the ledge of bone. The overlapping of the cartilage

in the displacement and broadening of its synarthrodial articulation with the ridge is thus the cause of the cartilaginous covering found upon bony crests and ledges which have been sawed away, and it is my experience that almost all bony and cartilaginous ledges and crests are thus merely the horizontal angle of deflections in the naris of the convexity.

The tilting over of the articulation between cartilage and ridge, together with its broadening, necessarily places the sharp horizontal angle or crest of the deflection in the naris of the convexity at a lower level than the groove of the concavity in the other nostril (Fig. 2^g). For this horizontal angle corresponds to the lower margin of the laterally displaced articular surface, while the groove of the concavity marks exactly its upper margin—that is, the position of the anterior border of the vomer. For this reason even after the cartilaginous deflection, including the cartilaginous overlapping described, has been entirely extirpated, the groove of the concavity indicating leaning over of the ridge into the other nostril will nevertheless be found to persist until, in addition to the cartilage, the deflected ridge, together with its tilted articular surface, is cut away to the bottom. Only when this has been done will the groove of the concavity be found effaced. It is my experience that until it be effaced, the obstructed naris of the convexity has not been sufficiently freed to insure perfect breathing after the healing is complete. Very often the bent-over ridge in the naris of the convexity lies so near the nasal floor that it is overlooked, unless the operator heed the indication of its presence given by the persisting groove of the convexity higher up in the other nostril. If he finds the groove present, he should, therefore, seek and resect the concealed ridge.

The overlapping of the ridge by the cartilage almost always takes place in the naris of the convexity of the deflection; but I have found a few instances where the overlapping occurred in that of the concavity, the cartilage, in forcing over the ridge, tilting its synarthrodial junction with it into the opposite nostril (Fig. 2⁴).

It is obvious that the placing of the cartilage beside the bone in the overlapping process doubles the width of the septum, which thus obstructs the nares by its thickness as well as its deviation. The removal of this excessive thickness, in

the submucous resection, is one of its greatest advantages over the fracturing operations, which leave it.

The overlapping of the cartilage, unless understood, is confusing; for the operator, expecting to find the yielding mucosa of the opposite naris underneath the cartilaginous deviation after its removal, is surprised when confronted by the resistance of the invisible bony wall of the ridge, hidden in its envelope of periosteum. The resection of this concealed bone may seem so difficult as to tempt him to leave it intact, to the detriment of his patient.

The arrangement of the periosteum and the perichondrium in bony deflections is also complex. These membranes do not merely form a continuous sheet upon one side of the septum, like paper on a wall, but both the ridge and the cartilage have their own periosteal and perichondrial envelopes, the periosteum of one side of the ridge crossing over its top into the other nostril, while the perichondrium also forms a separate compartment for the cartilage which envelops its lower border, thus making the perichondrium likewise continuous from one nostril to the other. (Fig. 2.) Externally the envelopes of the ridge and of the cartilage are united where they are in contact, and they are covered by a continuous sheet of mucous membrane in each naris. On account of this complicated arrangement of the two envelopes described, the elevation of the covering of one side of the septum may often be easily made with a dull elevator as far downward as the cartilage extends, but becomes impossible below this without a keen blade, because the bottom of the envelope of the cartilage has been reached, and that of the ridge has not been opened. To, therefore, attempt to forcibly bare the entire side of the septum with a dull elevator results in tearing the coverings of the septum along the line of the crossing of the periosteum into the other nostril.

While a deflected ridge almost always arches over and overhangs the nasal floor, this overhanging may be absent and the hollow space under the bent-over ridge may be filled out with bone, so that on the convex side of the deflection the ridge forms a straight wall, and yet the usual groove, indicating its leaning over, exists in the naris of the concavity. (Fig. 3b.) A ridge of this kind is necessarily wedge-shaped, and of great breadth at its base, thus depriving the bottom of

the naris of the convexity of a great part of its normal width. The condition is a very confusing one; for while the naris of the concavity presents the usual horizontal groove, or hollow, seen in a deflection involving the ridge, there is no evidence of the deflection in the form of a projecting angle in the other nostril, which seems very narrow, but has a straight bony septum. Ridges of this kind must be extirpated to the very bottom, in order to give normal width to the narrowed naris and place the septum in the median line.

A more frequent peculiarity, the opposite of a deflected ridge which does not overhang at all, is found in a ridge which leans over so excessively that it lies almost flat upon the nasal floor, so that the side which comes uppermost may even be taken for the latter.

While the ridge is commonly buried in tough, thick, firm, adherent periosteum, the posterior part of the bony deflection, formed by the junction of the vomer and perpendicular plate of the ethmoid bone, is usually easy to denude of its coverings. This posterior part forms a horizontal angle, which I have called the horizontal bony V (Fig. 4c, 5c), whose apex projects into the naris of the convexity toward the lower turbinated body, sometimes pressing firmly into it. The upper plane of the angle is created by the bent-out perpendicular plate, and below this usually by the broad articular surface of the displaced osseocartilaginous synarthrosis described, while the lower plane of the angle is created by the portion of the vomer arching over the nasal floor below the articular surface. (Fig. 4.) Attached to the rough articular surface, and following the side of the vomer, often far back toward its posterior border, is the overlapping portion of the cartilage of the septum, which appears in the form of a long strip characteristically indented on the surface which is united to the bone. (Fig. 4d.)

Instead of forming the acute angle of a horizontal V, the posterior part of the bony deflection may appear bowed, as a vertical capital C. The bone of the V or the C may be very thick and strong in front, but usually, some distance behind, the operator comes upon very thin, paper-like bone, into which the V merges.

The perpendicular plate of the ethmoid bone may be vertical in front and only deviated behind, where it joins the vomer

in the V. Not rarely, however, the deflection of the perpendicular plate reaches forward, projecting outward into the middle meatus and against the middle turbinated bone, along their whole length.

Unusual thickness of the bony parts of the septum may cause quite as much obstruction to breathing as their deflection. I have encountered ridges one-half of an inch, and perpendicular plates three-sixteenths of an inch in thickness. Even if straight, a very broad ridge should therefore be taken away, as after the resection of the cartilage it supports nothing, and its removal gives great space.

The proportionate area occupied by the cartilage and bone in a septum varies greatly. In some rare cases the septum is almost entirely of bone, the ridge rising to a great height above the nasal floor, the large perpendicular plate descending low, and the anterior border of the vomer being steep and coming far forward. The converse of this condition is presented by other septa, less rare, where the cartilage occupies an unusually large area, the margins of its bony frame receding before it, so that the anterior border of the vomer is found far back in the naris, and the perpendicular plate high up, while the ridge may be scarcely indicated.

Only the typical anatomic peculiarities of bony deflections have been mentioned here, the unusual ones not being described. The latter, however, all show in some measure their relation to the typical conditions.

THE RESECTION OF BONY DEFLECTIONS.

The surgical description in this article presupposes the completed resection of the cartilaginous portion of the deflection and the use of the author's reversed L mucosa-perichondrium flap, which gives the free access to the field of operation which is indispensable for the exact excision of the bony deviation. While foreign to the subject of this paper, the difficulty others have had in uplifting this flap and the fact that most operators do not understand its advantages, make a word in regard to its creation seem advisable, especially as I have improved upon the method of making it, previously described by me.

The making of the flap is begun with a horizontal incision, which follows the base of the septum close to the nasal floor, from a point to which it is intended the vertical incision shall

descend, well forward into the nasal vestibule, usually into the cutaneous portion of the septal covering. The uplifting of the flap (Fig. 6a) is begun from this horizontal incision by means of keen, round-bladed knives of suitable form, found in my set of instruments; for the coverings are always adherent along the bottom of the septum, so that a dull elevator should not be used. Often it is not possible to uplift the perichondrium together with the mucous membrane at the bottom of the intended flap, and in this event a little of the detached mucous membrane is uplifted alone at first in order to expose to view the perichondrium upon the cartilage, the perichondrium being then cut through with the blade and its elevation started. This permits the introduction of a dull elevator under the perichondrium and its ready detachment upward and backward to the intended site for the vertical incision, which is thus made after the detachment of the flap. The dull elevator is then withdrawn and a keen-edged one is introduced under the perichondrium in its place, and passed backward underneath it to the intended site for the vertical incision, which should be placed as far back on the septum as possible, regardless of the presence of a vertical angle of deflection in the cartilage. The sharp elevator is then punched through the covering at the site selected from beneath and made to cut up and down until the vertical incision is completed. This method of making the flap is preferable to the one of my older descriptions, as it permits the creation of a very large and untorn flap, which gives the widest access to the operative field. When completed the flap is uplifted forward to its base and then held out of the way with one of my retractors used by an assistant, who, with another retractor, pulls the wing of the nose outward. A third retractor, held by the operator, opens the nostril downward, the three acting as a trivalve speculum, as shown in the illustration.

After the resection of the cartilaginous deflection its remains, clinging to the ridge along the bottom of the septum, are to be pared away with the thin spatula blade of a sharp elevator, in order to expose to view all of the periosteum of the ridge on the side of the convexity. The cartilaginous strip described as extending backward upon the rough articular bony surface of the osseocartilaginous synarthrosis upon the side of the vomer must also be freed from its attachments and

removed. For this purpose a long, sharp elevator is used to separate the cartilage from the bone, and also to cut around the outer surface of the cartilage, to detach it from the mucous membrane of the convex side of the deflection, to which it is usually firmly united, a dull elevator being rarely able to free it. When disconnected from its surroundings, the cartilaginous strip may be drawn out with dressing forceps. It often extends very far back, and its removal may require patience.

The next step in the operation is to find the concealed ridge by feeling for it through its periosteum with a dull elevator, palpating with this upward from the floor of the nose until the position of the upper border of the ridge is made evident and outlined by the elastic yielding of the mucous covering of the side of the concavity of the deflection above it. The line of the upper border of the ridge having been thus determined, a cut following it is made down upon it from above to the bone (Fig. 7) with the round-bladed knife E of my set of septum instruments. (Fig. 8E.) This splits the periosteum along the whole length of the top of the ridge. The periosteum in the naris of the convexity is then pushed away from the ridge down to the nasal floor with a little raspatory (Fig. 8), whose blade is curved on the flat. This instrument is described in the *Journal of the American Medical Association*, December 4, 1909.

When this instrument has detached the periosteum from the top of the convexity of the ridge, it is directed backward along the base of the septum in order to denude upon the same side the lower plane of the convexity of the horizontal angle of the bony deflection, or V, this lower plane being represented by the deflected vomer overlying the nasal floor.

The next step is the detachment of the periosteum from the ridge and V on the side of the naris of the concavity. This must be done cautiously, for it is this portion of a submucous resection which, in my experience, is the most apt to create a perforation, the penetration into the other nostril occurring unexpectedly somewhere along the top of the ridge. Since employing the raspatory mentioned, I have been able to avoid this type of perforation entirely, and I regard this implement as a safeguard against the accident. In order to bare the side of the ridge in the naris of the concavity (other nostril) the raspatory, held firmly close to its cutting end, that it may not

slip, is made to progress cautiously over the top of the ridge and down its other side to the floor of the nose, the cutting edge hugging the bone. (Fig. 9.) The operator may always know from his sense of touch that he is maintaining bony contact, and, so long as he feels it, he may be sure that no perforation can occur. The raspator climbs over and down the other side of the ridge in a direction which crosses it as nearly as possible at right angles. When the ridge has been thus denuded upon both sides and lies bared to view, the raspator is directed backward into the hollow of the bony V, and the usually easy denudation of its concavity is completed. When the entire bony deviation seems detached from its coverings and ready for removal, the denudation should be carefully revised with the raspator and a dull elevator, in order to make sure that there are no regions where the coverings are still adherent. Such places are especially apt to exist near the nasal floor on the side of the concavity of the deviation and, if overlooked, generally lead to the tearing out of the attached piece of mucosa, and a perforation when the bone is removed.

The open view of the operative field offered by the reversed L flap, recommended by me, makes the freeing of the bony deflection under the guidance of vision possible everywhere, except along the invisible bottom of the ridge on the side of the concavity, and this perfect inspection of the line of advancing denudation is the best safeguard against tears and perforations. All the work requires minute and close seeing. The illumination is obtained from the Kirstein light, the only one I have found suitable for the near approach of the eye required.

While the periosteum of the ridge is, with rare exceptions, intimately united to it, that in the hollow of the bony V is generally very easy to uplift.

For the removal of the bone I employ the reinforced Freer-Gruenwald forceps (Fig. 8), described by me in previous articles, and the small chisel of my set of septum instruments. Many of the chisels suggested for the resection of the bone are too large, hence obstructing the view during their use, and their excess in width makes them liable to cut through the mucous coverings beyond the limit of the bony cut they are making. A V shape for the chisel blade is unnecessary, as the simple flat blade may be better controlled, may be kept sharp, and requires less propelling force.

Since I have reinforced the forceps I have never met with bone in the septum which it will not cut through with ease, the thickest I have used it upon being three-eighths of an inch thick.

The removal of the ridge I now always begin with the chisel, cutting along the floor of the nose, through the incisor crest and back under the vomer as far as it has no bony connection with the perpendicular plate above. Then by lifting the shank of the chisel the undercut fragment of bone breaks off at the rearmost end of the cut. In this manner all of the deflected or thickened ridge, as far back as the bony V, is taken out in one piece. I know that the chisel is also used back of this anterior portion of the bony septum to detach the bony V above and below, this detachment being followed by breaking out of the thus partly severed fragment with dressing forceps. But I regard this as a dangerous practice. The frail perpendicular plate in this portion of the bony septum is liable to be shattered by the chisel, and far-reaching fissures may be created by the breaking away of the fragment still attached behind. That this is no imaginary danger is shown by a case related to me by Professor Bernhard Fränkel and Professor Edmund Meyer, of the Charité clinic, in Berlin, in which blindness of one eye followed the breaking out of such a fragment in a submucous resection, a fissure having evidently traversed the sphenoidal sinus into the optic foramen. In another instance, of which Professor Koschier, of Vienna, told me, the entire vomer was twisted out of the nose, and recently I have heard of still another instance of this accident. It is permissible, in my judgment, to break out fragments of bone posterior to the junction of the vomer and perpendicular plate, if the bony V has been completely severed from its connections above by means of the punch forceps, and when the thus partly detached bone is found to be movable and obviously almost severed from its surroundings. In this manner I often remove the entire bony V in one piece. In the majority of cases, however, it is easy to cut out the V, piece by piece, with the punch, in a few minutes. Firm bone should never be broken out with seizing forceps. The fixed blade of the punch forceps is used as a guide in applying the forceps for its bite, this blade entering into narrow places, as where the bony V described presses into the inferior turbinat-

ed body, and must be wedged away from it with the forceps blade before the instrument may be applied to the bone. For this reason I regard both a right and a left opening forceps as a necessity in the operation.

Deflections of the perpendicular plate outward should be followed as high up as they extend toward the nasal roof. They are easy to excise with the punch, and their removal clears the middle and superior meatuses.

The actual excision of bony deviations seldom takes more than a few minutes; it is their denudation which requires time and care. The cutting away of the ridge is sometimes followed by free bleeding from the cut vessels of the bone. In all but rare cases, however, the hemorrhage during even the most extensive bony resections is insignificant, and sometimes almost absent. Bleeding hiding the field of operation is best controlled by an application of the flake crystals of pure cocaine, on a swab moistened with adrenalin, according to the method I employ for the local anesthesia.

In men the ridge is often very broad and thick, and strong blows of the mallet may be needed to chisel it away. The angle of the V and the perpendicular plate may also be very thick; but after these parts have been removed, a thin, egg-shell-like continuation of the deflection is usually found in the posterior part of the vomer, which may generally be taken away by twisting it out with the dressing forceps.

When all the bony deviation seems cut away, the flaps are to be replaced. If they lie down flat, the resection is complete; if not, the projecting fragment holding them away must be sought for and removed.

I have never known harm or a permanently flaccid septum to result from even extensive resections of the bone of the septum, and have never felt the need of inserting pieces of cartilage between the replaced coverings in order to stiffen the partition, as is recommended by Max Halle. In concluding this article, I advise a complete extirpation of bony deflections, to prevent the disappointment following an incomplete resection. For the after-treatment, I refer to my other articles on this subject. Much of what I have written here concerning the removal of bony deflections represents my later technic and is not to be found in my previous publications, a list of which is subjoined.

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FIGURE 1.

Lateral view of the skeleton of the nasal septum. 1, Perpendicular plate of the ethmoid bone; v, Vomer; c, Cartilage of the septum overlapping the vomer upon the displaced articulation and ending in a sharp cartilaginous ridge, d.

FIGURE 2.

Vertical section of the nasal septum about its middle. 1, A straight septum, showing the cartilage resting vertically upon the ridge; 2, A view of a horizontal angle of deflection as it would occur if the articulation between cartilage and ridge remained unaltered; 3, Actual changes in the articulation and structures of the deflected septum as they are commonly found; a, Overhanging ridge enveloped in its periosteum; b, The articular surface displaced into the naris of the convexity with the cartilage; c, Overriding the bone. The individual perichondrial and periosteal envelopes of the cartilage and bone are shown; g, Groove of the concavity of the deflection; 4, Exceptional overriding of the ridge by the cartilage in the naris of the concavity instead of the convexity, creating a ledge, e and d, in each naris.

FIGURE 3.

a, Cartilage of the septum laterally attached to ridge, b, which does not overhang. The dotted line shows median position the septum should occupy after the resection. l, Inferior turbinate body; m, Middle turbinate; s, Vertical wall of ridge in narrowed naris; c, Groove of concavity in open naris; i, Inferior turbinate.

FIGURE 4.

View of the horizontal bony V, or angle of deflection, pressing into the right inferior turbinate. a, Anterior reversed L flap; b, Inner surface of mucous covering of the concavity; c, The bony V; d, Overlapping portion of the cartilage of the septum extending backward upon the side of the vomer as a cartilaginous strip; e, Detached portion of the mucosa of the convexity, which lies behind the L shaped flap.

FIGURE 5.
Horizontal bony V, c, denuded ready for cutting away.

FIGURE 6.

The right nostril is held open with retractors. The reversed L flap, a, is being elevated from the cartilage from its bottom with the roundbladed knife.

FIGURE 7.

The left nostril is held open with retractors. Ridge, a, concealed in its envelope of periosteum; the dotted line shows the incision which splits the periosteum along the upper border of the ridge; b, Cut edge of the uplifted mucous covering of the posterior part of the deflection; c, Perichondrial surface of the mucous covering of the opposite nostril (naris of the concavity of the deflection); d, Retractor holding forward the anterior (reversed L) flap.

FIGURE 8.

E, Roundbladed knife, for splitting periosteum along top of ridge; O, Raspatory, for denuding ridge; reinforced Freer-Gruenwald forceps.

FIGURE 9.

The left nostril held open with retractors; the entire bony deflection including the ridge, a, has been bared of its covering by the raspatory, which may be seen working towards the nasal floor on the concave side of the deflection; b, Mucous membrane of the opposite nostril uncovered by the removal of the cartilage and uplifted from the bony deflection; c, Cut edge of the uplifted covering of the posterior part of the deflection held away with a long retractor; d, Retractor holding forward the anterior (reversed L) flap.