A Grading System for Nasal Dorsal Deformities

Matthew A. Kienstra, MD; Holger G. Gassner, MD; David A. Sherris, MD; Eugene B. Kern, MD

There is no uniform grading system for nasal dorsal deformities currently in general use among surgeons who perform rhinoplasty. Given the popularity of this procedure among both the general public and surgeons, it is time that there was a uniform system describing dorsal deformities. Such a system has value in the education of students of rhinology and cosmetic nasal surgery. We have developed one such system, and applied it to 100 cases. In all cases it accurately describes the major pathological conditions of the dorsum, if present, as noted on physical examination. We have found application of this system to be facile.

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A GRADING SYSTEM FOR NASAL DORSAL DEFORMITIES

There is no uniform grading system for nasal dorsal deformities that is generally accepted. As noted by one author,¹ “most descriptions of the dorsum are qualitative and anecdotal.” Commonly used descriptors such as “saddle,” “hump,” “twisted,” “S-shaped,” and “C-shaped” do not adequately describe anatomic irregularities. For instance, a saddle nose is generally defined as one in which there is a dorsal deficiency, but whether this deficiency is bony, cartilaginous, or both is not specified. For surgical planning, it is imperative to know which portion(s) is involved, as it affects what the surgeon will do to correct the deformity. Similarly, the term hump does not adequately describe the dorsal abnormality present. The hump could involve the bony or cartilaginous dorsum, or both. Furthermore, a hump could be due to an overprominence of the bony and/or cartilaginous dorsum, or a deficiency in one or both of these areas. In the case of overprominence, dorsal resection is the surgical method by which the abnormality is corrected, while in the case of deficiency, the area of abnormality is built up with graft material to yield a straight dorsum. Note that a deficiency in the dorsum can result in the saddle nose appearance as well as in the hump nose appearance. Twisted, S-shaped, and C-shaped are also inadequate descriptors, again because they do not describe the portion (bony and/or cartilaginous) of the dorsum involved. Therefore, they are not helpful in planning a surgical procedure.

For experts to accurately discuss cases, it is necessary for all discussants to agree on and understand the terms used. This also is extremely valuable for the education of surgeons as a tool aiding understanding of the anatomic anomalies of the nasal dorsum and their surgical correction. For these reasons, we have designed a grading system for dorsal deformity that is easy to use and accurately describes nasal dorsal pathology.

The term “dorsum” is used in this article to describe the region from the nasojugal or nasofacial groove to its opposite counterpart horizontally, and from the depth of the nasofrontal angle (nasion) superiorly to the base (caudal end) of the upper lateral cartilage inferiorly (Figure 1).

From the Division of Rhinology and Facial Plastic Surgery, Mayo Clinic, Rochester, Minn.

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THE GRADING SYSTEM
Kienstra-Sherris-Kern (KSK) Classification of Nasal Dorsal Deformities

The classification is as follows:

- **W+**: wide dorsum
- **W−**: narrow dorsum
- **WD**: normal width
- **D+**: deviation to the right
- **D−**: deviation to the left
- **D0**: no deviation
- **C+**: convex on lateral view
- **C−**: concave on lateral view
- **C0**: no curvature (straight)
- **P+**: overprojected (prominent)
- **P−**: underprojected (pushed in)
- **P0**: normal projection

**Description of Terms**

**Width (W).** Dorsal width describes the horizontal dimension of the dorsum. The bony and cartilaginous portions are examined separately. The bony dorsum includes the frontal processes of the maxillae, nasal portions of the frontal bones, and the nasal bones. The cartilaginous portion is composed of the upper lateral cartilage. They can coincide (e.g., both too wide, too narrow, or normal) or differ (e.g., wide nasal bones, normal or narrow upper lateral cartilage, or wide upper lateral cartilage but normal or narrow bony dorsum).

**Deviation (D).** Deviation describes variance of the dorsum from the midline. The dorsum should be straight to give the best aesthetic result. Deviation to one side or the other results in asymmetry and a cosmetic deformity. The bony and cartilaginous portions of the dorsum, again, are examined separately. They both can deviate to the same side, one may deviate while the other is midline, or both may deviate in opposite directions. In general, when dorsal deviation is present, the opposite side of the dorsum is longer than the side to which the dorsum is deviated.

**Curvature (C).** In profile, the dorsum can be straight, or it may be concave or convex. The variance from straight can be primarily bony or primarily cartilaginous, or it can involve both parts of the dorsum nearly equally.

**Projection (P).** Dorsal projection describes the dorsum from its origin on the face to its outermost point in profile. Projection can be excessive, with the dorsum extending too far off of the face, or it can be insufficient, not extending far enough off the face. The cartilaginous...
and bony portions of the dorsum must be examined separately, as the projection of each may coincide or differ. Either can be overprojected, underprojected, or normally projected.

Figure 2. The grading system. Photographs depict examples of abnormalities in each of the categories. See “The Grading System” section for classification and description of grades.
Case Examples

General examples of abnormalities in each of the categories can be seen in the photographs in Figure 2. As can be surmised from the descriptions, in each category the bony and cartilaginous portions of the dorsum are examined separately. We use “B” to represent a bony ab-
normality, if present, and “C” for a cartilaginous abnormality. We use “BC” if both are present. Thus, for an overprojected dorsum with only bony overprojection, the descriptor would be “P+B.” A rating is given in each case in each of the aforementioned categories. If no abnormality is present in a given category, a rating of

Figure 3. Sample case (A and B, profile view; C and D, frontal view). For detailed explanation of this case, see the “Case Examples” section of the text.
“0” is given in that category (to signify absence of abnormality). To illustrate, examine the case presented in Figure 3.

In Figure 3, note the profile view. There is a dorsal convexity present (C+). This involves both the bony and cartilaginous dorsum (C+BC). The dorsal projection appears to be normal (P0) in profile, except where the convexity is present. In frontal views, there is deviation of the bony portion of the dorsum to the left, while the cartilaginous portion deviates back to the right (D−B+C). Dorsal width appears to be acceptable in the bony portion, but the cartilaginous portion appears wide (W+C). Thus, this patient’s KSK grade would be W+C, D−B+C, C+BC, P0.

In using this system, focus should be maintained on cosmetically significant deformities. Many patients have subtle isolated abnormalities, but have an overall excellent cosmetic appearance.

**METHODS**

To examine the utility of the grading system, 2 of us (M.A.K., D.A.S.) independently graded 100 (50 male, 50 female) uniform sets (6 views, including frontal, left and right profile, left close-up, base, and left smiling) of $5 \times 7$ in nasal photographs. The grades given in each case were compared.

**RESULTS**

Results of photographic evaluation are presented below:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Agree/Disagree, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>71/29</td>
</tr>
<tr>
<td>Deviation</td>
<td>78/22</td>
</tr>
<tr>
<td>Curvature</td>
<td>78/22</td>
</tr>
<tr>
<td>Projection</td>
<td>65/35</td>
</tr>
<tr>
<td>Average</td>
<td>73/27</td>
</tr>
</tbody>
</table>

There was an average agreement over all categories of 73%. There was 78% agreement in the deviation and curvature categories, 71% agreement in the width category, and 65% agreement in the projection category. There were no complete disagreements where opposite abnormalities were thought to have existed (eg, one evaluator grading a “+” while the other graded “−” in the same category).

**COMMENT**

We believe that the disagreements reflect subtle differences that are not highly significant. We expect improvement in agreement between surgeons when results of the physical examination can be added to the evaluation (all grading in this comparison was by photograph, which is a 2-dimensional medium). In addition, because of the subjective qualitative nature of this grading system, a certain amount of disagreement is to be expected. Even among experts, there are differences in the concept of aesthetic beauty.

In our experience, the most difficult categories to grade are dorsal width and projection. This is supported by our comparison data (see above) in which the lowest percentage of agreement occurred in these categories. Width is especially difficult to judge in the presence of deviation. Similarly, projection is difficult to judge in the presence of curvature. In both situations, accurate grading requires the evaluator to attempt to visualize the dorsum as if the deformity were absent. Note the profile view with the convexity in the photograph series of the example patient (Figure 3). The dorsum is overprojected at the convexity. However, the remainder of the dorsum has acceptable projection. If the convexity were removed by resection, the remaining, now straight, dorsum (in profile) would have acceptable projection (figure with convexity shaded out). Therefore, this patient’s projection grade is P0.

Each of the portions of the grading system has surgical implications. The wide nose requires narrowing. The narrow nose requires widening (eg, with spreader grafts). The deviated nose requires careful osteotomy placement, resection, rasping, cartilage shaving, and/or onlay grafting for correction.2–5 The convex or concave dorsum requires straightening by resection, rasping, and/or grafting.6,7 The overprojected dorsum requires removal of tissue, while the underprojected dorsum requires buildup.6 Attention to each of these areas is crucial in surgical planning to ensure the best cosmetic result. This is not to say that other factors do not play a role. Obviously, the nasal tip must be examined and any deformity corrected. The nasofrontal angle, in addition, must be noted and corrected if overwide or over-narrow, or maintained if aesthetically pleasing. This system addresses nasal dorsal deformity by itself. It is not an attempt to describe all nasal abnormalities that must be addressed during rhinoplasty, and should not be viewed as such.

The advantages of having a uniform grading system are myriad. It provides a common ground for intelligent discussion between experts. It assists education of future surgeons by providing a uniform teaching system that covers most, if not all, aspects of pathology and provides the basis for logical decision making. It aids surgical planning and therefore decreases risk of poor results.

We believe the KSK system is accurate and facile and can yield these advantages if generally adopted.

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Corresponding author: Matthew A. Kienstra, MD, Division of Facial Plastic Surgery and Rhinology, Department of Otolaryngology, University of South Florida, MCC-HN PROG, 12902 Magnolia Dr, Tampa, FL 33612-9497.

**REFERENCES**