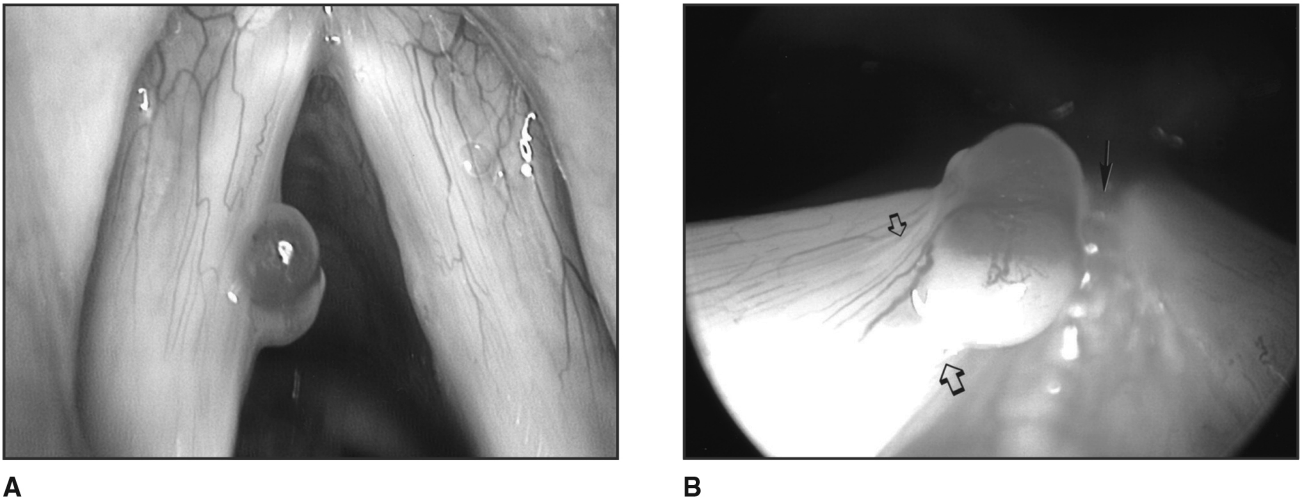


Figure 20–10. **A.** 0-degree telescopic view of left hemorrhagic polyp (10 mm, 0-degree telescope, Karl Stortz, Culver City, California). **B.** The same lesion using a 70-degree telescope (4 mm), illustrating the vertical extent of the mass along the contact surface of the left vibratory margin, defining better the anatomy of its attachment to the vocal fold (*open arrows*). The vasculature also is visualized better than when viewed from directly above. The anterior commissure and its web also can be seen (*arrow*).

Contact endoscopy has been used by gynecologic surgeons for many years. Its value in microlaryngeal surgery was recognized by Dr. Mario Andrea.[18] This technique can use a vital staining agent such as methylene blue. Contact endoscopy permits visualization of the cellular nature and integrity of vocal fold epithelium at any given point along the vocal fold. Cell nuclear characteristics are visible, and specific borders between pathologic, transitional, and normal epithelium can be defined, permitting precise surgical intervention (Figure 20–11A–F). We have found contact endoscopy extremely valuable in selected cases. We also use it (without vital stain) to determine the direction of blood flow in vessels associated with vocal fold masses. They often are draining vessels (flow away from the lesion) rather than feeding vessels, and we do not obliterate the draining vessels. It has little application for neurolaryngological procedures except when secondary lesions are present, as well.

Delicate microsurgery requires sharp, precise, small instruments. The few heavy cupped forceps and scissors that constituted a laryngoscopy tray through the early 1980s are no longer sufficient. It is now possible to obtain microlaryngeal instruments that look like ear instruments on long handles. Instruments should be long enough to be manipulated easily in the laryngoscope, but not so long that they bump into the microscope. They should include scissors (straight up, up-biting, curved left, and curved right), small grasping cupped forceps (straight, up-biting, right, and left), larger cupped forceps (straight and up-biting, at least), alligator forceps (straight, right, and left), scalpel, right-angle and oblique blunt ball-tipped dissectors, spatula, scalpel, retractors, mirrors for reflecting lasers, and suctions (Figure 20–12 and 20–13A–Z). Cutting instruments should be sharp at all times. Suctions should be thumb controlled, of several sizes, and should include both open tip and velvet eye designs. A suction/cautery tip may be valuable occasionally and should be available, as should cotton carriers. Nonreflective instruments with laser-resistant coating may be advantageous in some situations.

Powered laryngeal surgery is a relatively new concept, although powered surgery for other areas of the body has been utilized for many years.[19] Acoustic neuroma surgeons have used powered instruments such as the House-Urban Rotary Dissector (Urban Engineering, Burbank, California) for more than 4 decades; arthroscopic knee surgeons use powered instruments regularly; and powered instruments have been important to functional endoscopic sinus surgery. Powered laryngeal surgery is clearly useful in the treatment of some conditions such as selected papillomas and neoplasms. It also may be helpful in revision surgery for patients who have retained too much injected filler after the medialization surgery.

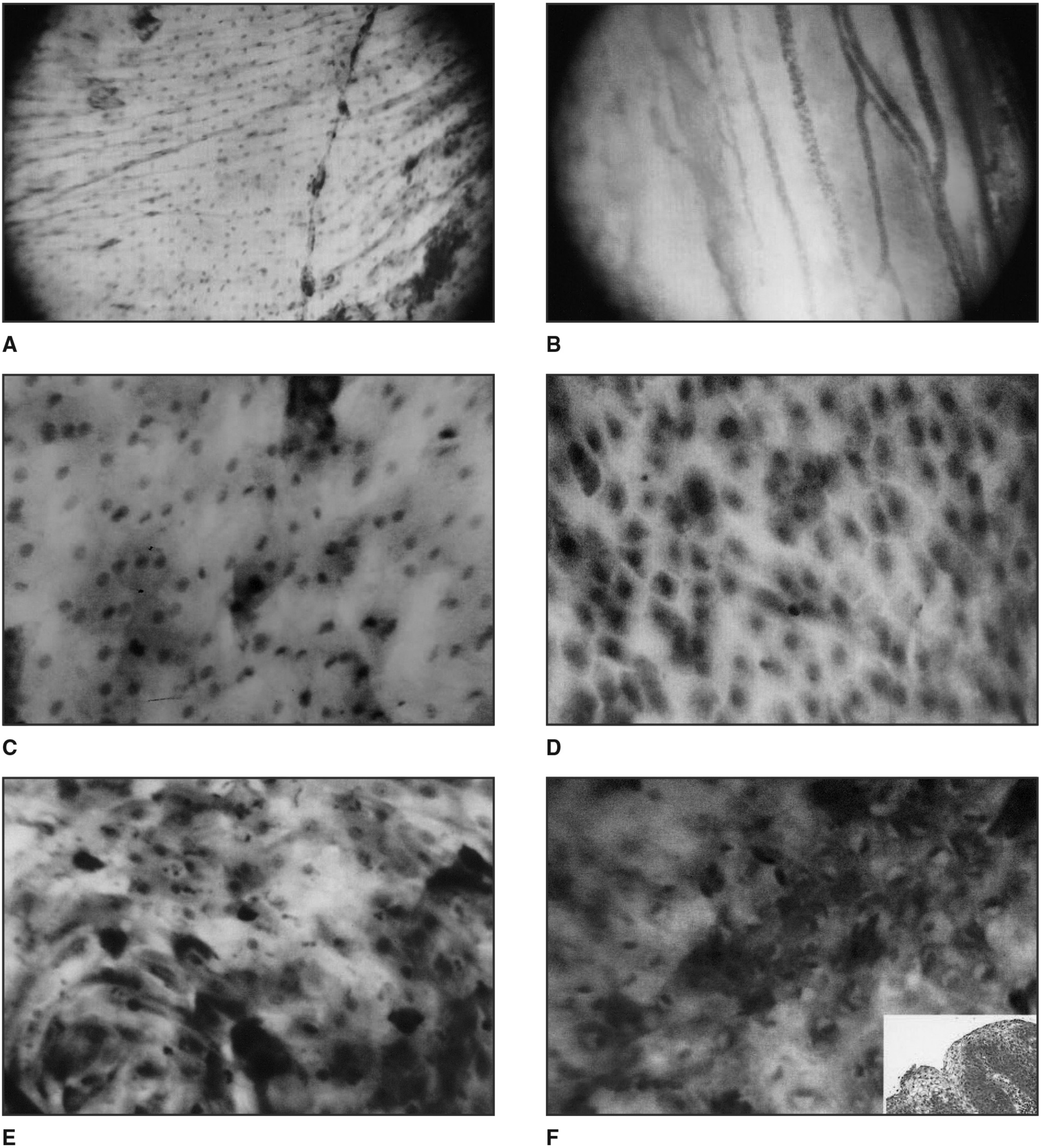


Figure 20–11. **A.** Contact endoscopy of the vocal folds (60×) revealing regular cellular characteristics, and epithelial folds. **B.** Contact endoscopy (60×) showing the normal pattern of the microvascular of the vocal fold. **C.** Contact endoscopy of normal vocal fold epithelium (150×) showing nuclear characteristics in greater detail. **D.** Contact endoscopy revealing dysplasia (150×) illustrated by the heterogeneous appearance of the epithelium, and the increased dimensions and irregular staining of the nuclei. **E.** Contact endoscopy (150×) of carcinoma, illustrating marked irregularity in the epithelial cellular pattern and nuclei with abnormalities of shape, size, staining characteristics, and nucleus/cytoplasmic ratio. **F.** Contact endoscopy (150×) of papilloma showing ballooning of the cells and cytoplasmic vacuoles pushing the nuclei toward the periphery of the cells. Also seen are inflammatory cells with regular, large nuclei. The insert shows a histological section of papilloma. Contact endoscopy may be helpful in identifying the boundary between papilloma and normal mucosa. (Reprinted from Andrea and Dias,[18] with permission.)

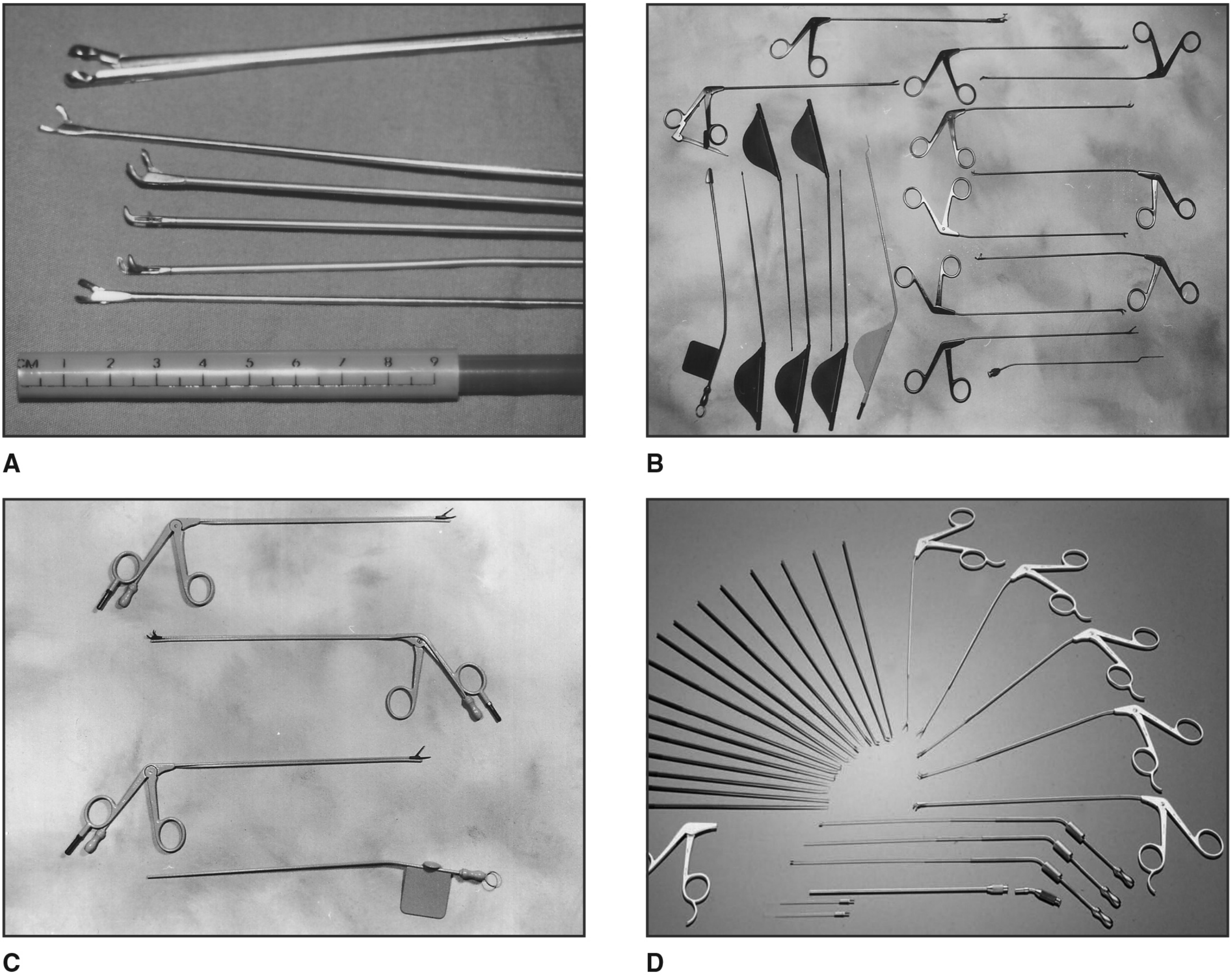


Figure 20–12. A. Traditional laryngeal cupped forceps (*top*), compared with more modern instruments designed by Dr Marc Bouchayer (Integra, Vancouver, Washington). **B.** Additional delicate Integra instruments used routinely by this author. **C.** Extremely useful Integra suction cautery instruments designed by J Abitbol. **D.** Selected instruments designed by the author (RT Sataloff), manufactured by Integra.

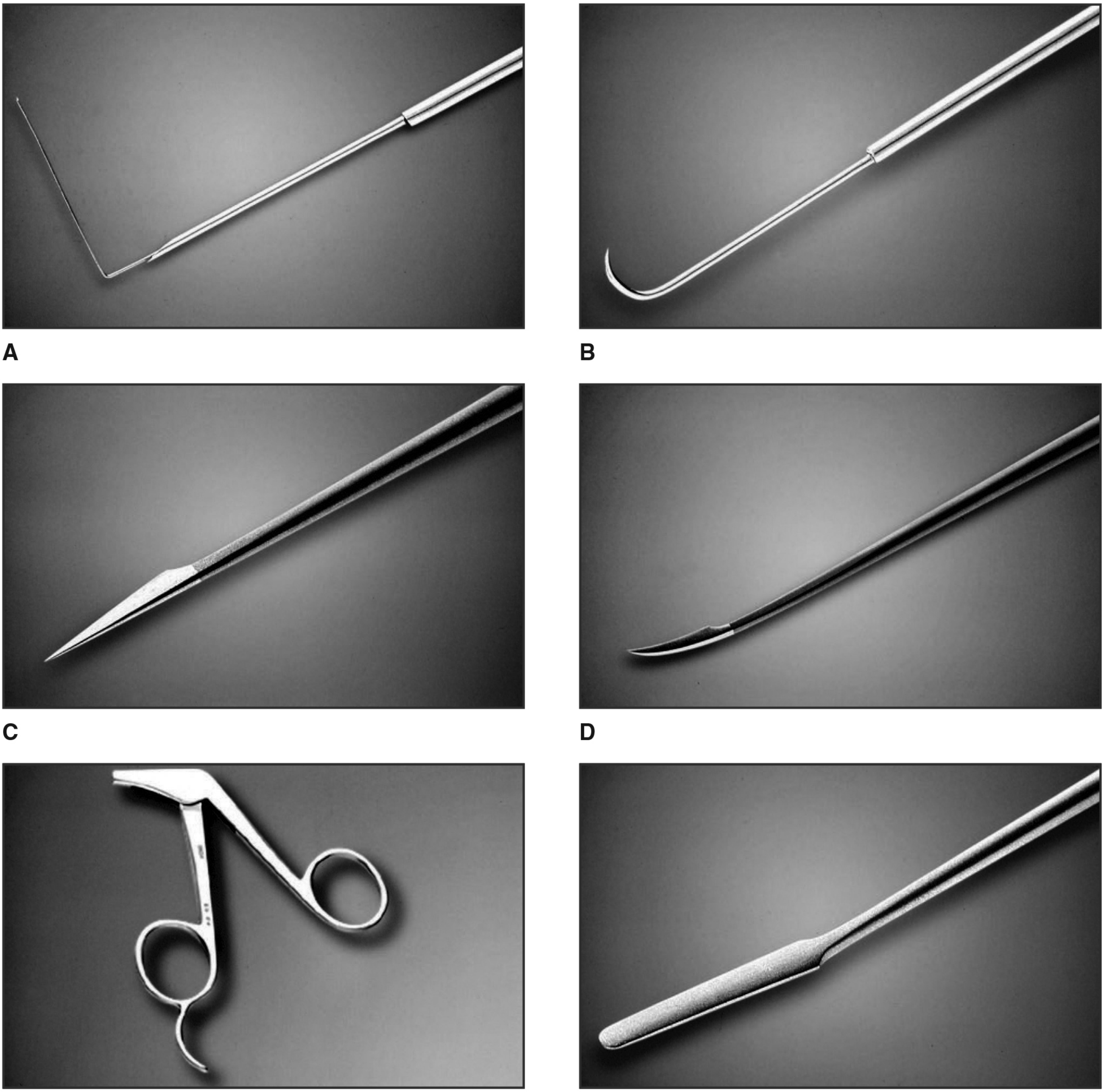


Figure 20–13. Selected microlaryngeal instruments (A-W are Sataloff Instruments, Integra, Vancouver, Washington). **A.** 30-gauge straight disposable needle (with cleaning stylet in place) for submucosal infusion or collagen injection. **B.** 30-gauge right-angle disposable needle with cleaning stylet in place. **C.** Sharp microknife. This and the sickle knife are disposable and screw into a handle. The vascular knife and selected other sharp instruments are designed similarly. They are intended for single use so the instruments are optimally sharp for each patient. **D.** Sickle knife. **E.** Universal scissor handle. All of the straight-handle Sataloff instruments are designed to fit in the universal scissor handle. This not only allows the instrument tip to be positioned at any angle, but it also permits case-by-case adjustments of instrument length from the handle to the tip. This allows the tip of the instrument to be on the vocal fold, while the handle is close enough to the laryngoscope to permit the surgeon's fingers to be placed against the head or laryngoscope for stabilization. **F.** Straight spatula. *(continues)*

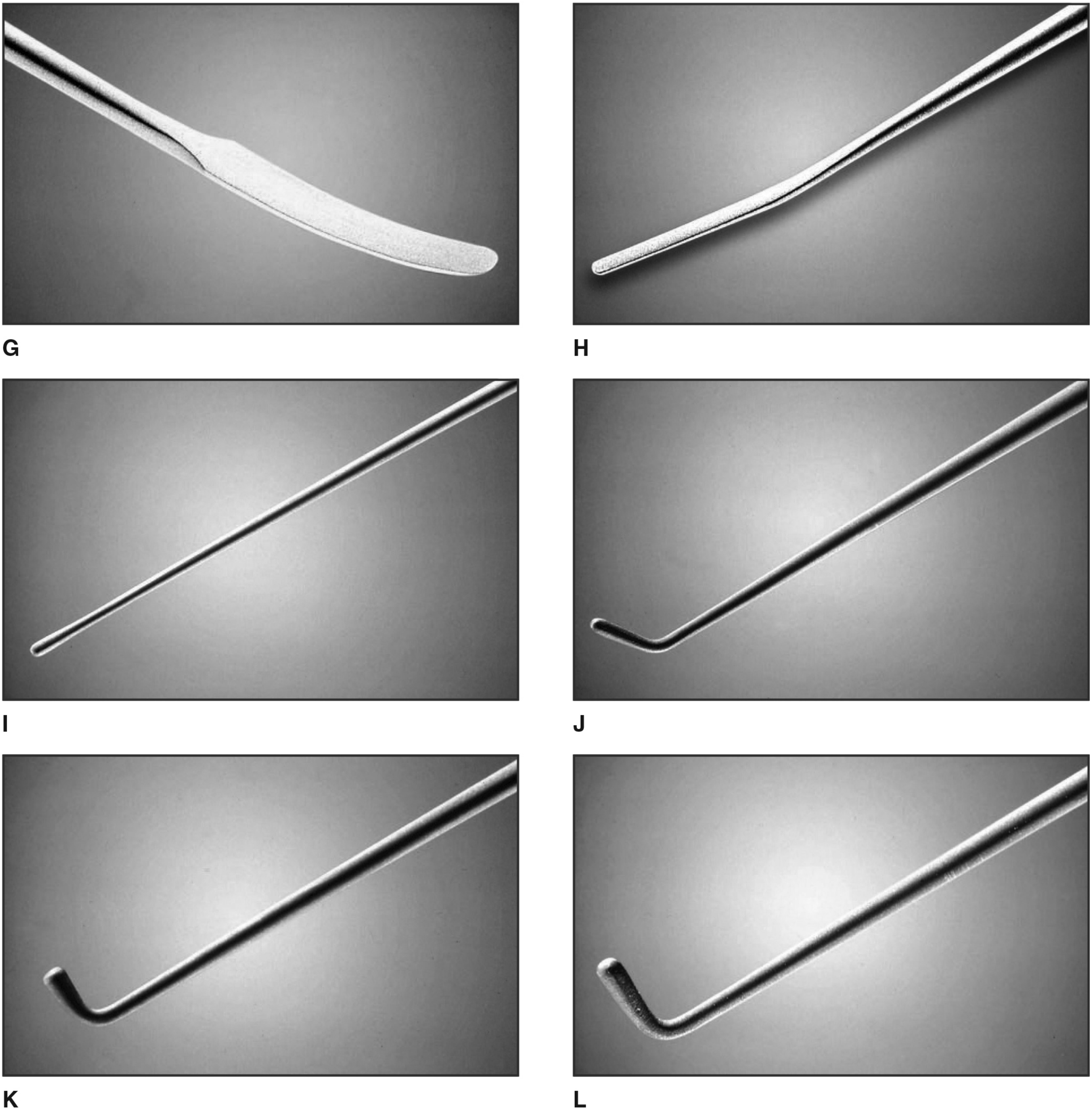
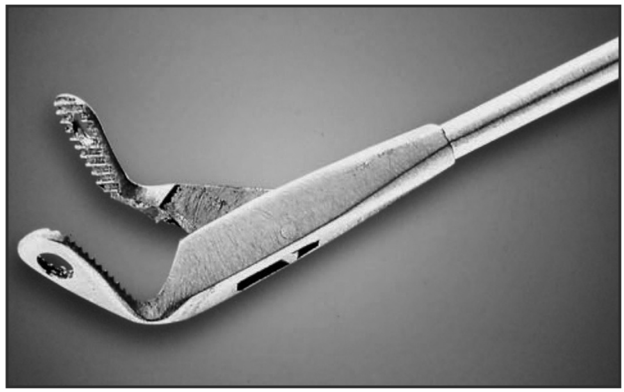


Figure 20–13. *(continued)* **G.** Curved spatula. **H.** Fine-angled spatula. **I.** Straight blunt ball dissector. **J.** Oblique blunt ball dissector. **K.** Small right-angle blunt ball dissector. **L.** Long right-angle blunt ball dissector. *(continues)*

M

N

O



P

Q

R

Figure 20–13. *(continued)* **M.** Sharp right-angle hook. **N.** Vascular knife. This 1-mm instrument is sharp on the point and blunt on the bottom. It is used for dissecting varicose blood vessels off the vocal fold. It is essential that it not be confused with the flap knife. **O.** The flap knife is similar to the vascular knife, except the flap knife is sharpened on the bottom, as well as at the tip. This allows it to be placed within a mucosal pocket and to cut tissue vertically sharply through a small access incision. If it is inadvertently confused with the vascular knife and used for vascular dissection, the sharp inferior surface of the flap knife can damage the vocal fold. **P.** Small heartshaped forceps (comes in right and left directions, left only shown). **Q.** Left alligator forceps. **R.** Down-bitting forceps. *(continues)* their tendency to use the largest possible tube. There are very few procedures that cannot be performed safely through a size 6.0 or smaller endotracheal tube, and many can be performed with mask anesthesia or a laryngeal mask without intubating the larynx at all. When possible, alternatives to general anesthesia should be considered such as local or topical anesthesia, spinal blocks, regional blocks, and acupuncture. Many procedures commonly done under general anesthesia with intubation can be performed equally well using another technique. After surgery, postoperative voice assessment by the anesthesiologist, patient, and operating surgeon is essential. If voice abnormalities are present (other than very mild hoarseness that resolves within 24 hours), prompt laryngological examination should be arranged.

Instrumentation

Microlaryngeal surgery utilizes magnification, usually provided by an operating microscope, which is used through a laryngoscope (laryngoscope placement is discussed above). Many surgeons are not familiar with formulas that determine accurately the amount of magnification used, and it is often recorded incorrectly in operative reports. It is not unusual for surgeons to assume that the number on the indicator on the zoom control correlates with the number of times the image is magnified, but accurate determination is more complex than that. This author usually works with a Zeiss operating microscope (Oberkochen, Germany), and the information in this discussion refers specifically to Zeiss instruments. However, the principles are the same for microscopes manufactured by other companies. To determine the amount of magnification, the focal length of the binocular tube is divided by the focal length of the objective lens, and then multiplied by the magnification of the eyepieces.[17] That number is then multiplied by the indicator on the magnification (zoom) control of the microscope, if present. The focal length of the binocular tube is usually a number such as F125, F160, or F170. For example, the Zeiss OPMI-6 microscope has a binocular tube with a focal length of F160, and the newer design with the wider angle of view has a focal length of F170. The focal length of the objective lens varies depending on the surgeon's preference. For ear surgery, it is usually 250 or 300 mm. For laryngeal surgery, a 400-mm lens is used most commonly. The usual eyepiece magnification is either 10× or 12.5×. The indicator number on a Zeiss operating microscope can be read through a small window next to the zoom control knob, and the number ranges from 0.4 to 2.4. The OPMI-6-S, for example, provides a continuous magnification range of 1:4. Older Zeiss operating microscopes (such as the OPMI-1) have magnification changes that are steplike rather than continuous and have numbers that range from 6 to 40 next to the dial. These provide five magnification steps in a range of 1:6. These numbers should not be used in the formula noted above, but they can be converted as follows: 40 corresponds to 2.5; 25 corresponds to 1.6; 16 corresponds to 1.0; 10 corresponds to 0.6; and 6 corresponds to 0.4. So, for example, if a surgeon is using an OPMI-1 microscope with 10× eyepieces, a 400-mm objective lens, and the magnification set at 40 (maximum), image magnification is 7.8× (125⁄400 × 25 × 10 = 7.8×), not 40×, as misstated commonly.

Simply changing the eyepieces from 10× to 12.5× increases the magnification from 7.8× to 9.8×, and using 20× eyepieces increases the magnification to 15.6×. Utilizing an objective lens with a shorter focal length also increases magnification but brings the microscope closer to the operating field. Although this approach is used during ear surgery, it is not suitable for laryngeal surgery because the decreased space between the microscope and direct laryngoscope is not sufficient to permit unimpeded manipulation of long-handled laryngeal instruments. It is important for surgeons to be familiar with these principles to optimize surgical conditions for each specific case and to document surgery accurately.

Magnifying laryngeal telescopes are also invaluable for assessing vocal fold pathology and mapping lesions for surgery. Most commonly, the author uses 10-mm 0° and 4-mm 70° telescopes (Karl Storz, Culver City, California); and 30° and 120° telescopes are useful in some circumstances. Laryngeal telescopes allow the surgeon to visualize lesions in great detail, to appreciate the limits of lesions in 3 dimensions better than can be accomplished through a microscope, and to visualize obscure areas such as the laryngeal ventricle (Figure 20–10). Sometimes, surgery is performed using a telescope for visualization rather than a microscope. For example, if it is impossible to expose an anterior commissure lesion with any laryngoscope due to patient anatomy, the lesion may be visible with 70° telescope passed through a suspended laryngoscope. This technique allows surgery that might be impossible otherwise. Such lesions sometimes also can be addressed in the operating room or in the office more easily and safely with indirect approaches and instruments than through microdirect laryngoscopy.