The Removal of Acoustic Neurinomas

HERBERT OLIVECRONA, M.D.
Karolinska Sjukhuset, Stockholm, Sweden

I always operate with the patient in the face-down position. The head is rotated slightly towards the side of the tumor and fixed with tape in this position (Fig. 1A).

Fig. 1B shows the incision and the size and location of the bone defect. The latter is extended laterally as far as the mastoid cells will permit. If extensive pneumatization of the mastoid is present it may be necessary to open a number of cells which are then covered with pieces of hampered muscle. If several large cells have been opened it may be prudent to postpone opening the dura for 10 to 12 days and thus leave the rest of the procedure for a second session. After the bone removal has been completed, the table is rotated around its horizontal axis to the left in a right-sided tumor, and to the right in a tumor of the left side. The posterior surface of the cerebellum on the side of the tumor is thus brought into an almost horizontal position and the approach to the tumor will be in a vertical plane.

The dura is opened in stellate fashion and the cerebellum gently elevated, exposing the tumor (Fig. 1C). Resection of the lateral third of the cerebellar hemisphere is rarely necessary for a good exposure of the tumor. The ninth, tenth, and eleventh cranial nerves are identified but left undisturbed for the time being and protected by a piece of cotton. In the operation from which this drawing was made, the tumor projected below the ninth nerve which was slightly elevated by the lesion; but usually the ninth nerve lies below the inferior pole of the tumor.

Blood vessels visible on the exposed surface of the tumor are coagulated and the capsule of the lesion incised.

The contents of the tumor are removed with a fairly large long-handled spoon (Fig. 1D). As this procedure usually is accompanied by fairly brisk hemorrhage, time is saved by reducing the blood pressure to about 60 or 70 until the intracapsular part of the procedure is finished. When sufficient neoplastic tissue has been removed, the ninth, tenth, and eleventh nerves become slack and can then be dissected free from the capsule of the tumor. They should then again be protected by a piece of cotton.

When the intracapsular removal has been carried as far as appears possible and safe, the remaining shell of the tumor is compressed with a spatula and pushed away from the ninth, tenth, and eleventh nerves (Fig. 1E). During this part of the procedure one or more small arteries may be seen entering the tumor near the lower pole; these should be clipped and divided as close to the tumor as possible. When this has been accomplished a search is made for the facial nerve. This nerve is most easily identified as it runs as a flat band on the lateral side of the pons. It can then be followed along the inferior surface of the tumor. The nerve usually disappears about halfway between the pons and the porus as it curves around the tumor in order to enter the porus, in the lower part of the upper anterior quadrant. In small tumors the nerve may be followed all the way to the porus. The nerve is somewhat adherent to the capsule of the tumor and must be dissected free with great care. Occasionally the nerve is separated from the tumor by a thin sheath of arachnoid; this of course makes dissection of the nerve much easier.

In larger tumors the facial nerve cannot be followed all the way and it becomes necessary to divide the stalk of the tumor anchored in the porus (Fig. 1F). Before this is done the superior pole must be partially mobilized and the petrosal vein which runs between the tentorium and the superior surface of the tumor coagulated. The actual division of the stalk is best done slightly lateral to the porus with blunt dissectors, occasionally using a knife when necessary. The dissection should be kept as close as possible to the capsule of the tumor. One must constantly be looking for the facial nerve where it enters the porus.

If the porus is only slightly or moderately enlarged it may not be necessary to divide the stalk of the tumor; instead, with the help of a blunt dissector, the neoplastic tissue
Fig. 1A. Face-down position. Surgeons at head of table. B. Diagram to show size and location of skin and dural incision and the bony opening. C. Retraction of cerebellum to expose tumor. D. Intracapsular removal of tumor with long-handled spoon. (Drawing by Lynch, after Duvernoy, M.D.)
Fig. 1E. The shell of tumor is shown compressed with a spatula, while the capsule is being dissected away from the ninth, tenth, and eleventh cranial nerves. Dissection of the facial nerve. F. Division of the stalk of the tumor porus acusticus; attempt at preservation of the seventh nerve. G. Anatomical appearance after removal of the tumor. (Drawing by Lynch, after Duvernoy, M. D.)
present in the porus can be tilted out more or less intact. Sometimes it may be helpful to chisel away the posterior margin of the porus before trying to tease out the tumor. Faradic stimulation may also be helpful in identifying the facial nerve, particularly in distinguishing it from other strands of tissue that might look like a nerve.

After its entrance into the porus has been identified, the facial nerve is followed in a medial direction until it has been entirely freed from the tumor. It is then covered with a piece of cotton and attention may now be focused on the removal of the tumor.

Before removal of the tumor is attempted, its superior pole should first be freed from the cerebellum; any blood vessels entering this part of the tumor are clipped and divided. When this has been accomplished the lateral part of the tumor is grasped either with Brüning’s nasal clamp or, if the neoplastic tissue is fragile, with a small sharp retractor and cautiously pulled in a lateral direction. Thus the tumor is gradually freed from the pons and inferior surface of the cerebellum; again, blood vessels entering the tumor must be clipped and divided close to the tumor.

After the bulk of the tumor has been removed, the cavity is temporarily packed with cotton strips moistened with hydrogen peroxide. When the pack has been removed, any bleeding points on the undersurface of the cerebellum or lateral side of the pons are coagulated or clipped.

If it has not been possible to tilt out the complete nubbin of tumor in the porus, all remaining neoplastic tissue in the porus must now be removed with small sharp curettes or spoons. There is usually a good deal of hemorrhage from the porus and this must often be stopped by coagulation which may also be necessary in order to destroy whatever may remain of the tumor. This of course will destroy any remaining function of the facial nerve, but the nerve regenerates in at least 50% of such cases. When the nerve is inspected at this stage, it usually looks badly contused; but experience shows that if the anatomical continuity of the nerve is intact, regeneration is likely to occur. Preservation of facial function is possible only in small tumors; in most medium-sized and all large tumors one must rely on regeneration of the nerve. If no signs of regeneration have appeared within 1 year after operation, there is practically no hope for recovery of facial function.

Fig. 1G shows the anatomical conditions after removal of the tumor. The dural closure is made as water-tight as possible. No drain is used.