HEMORRHAGE DURING AND AFTER TONSILLECTOMY; SURGICAL PRINCIPLES AND METHODS FOR ITS CONTROL.

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HEMORRHAGE during and after tonsillectomy on adults and to a less degree on children is a cause of great anxiety both to patients and to their parents. Most patients over thirty-five years who have infected tonsils requiring operation admit the necessity and desirability of operation, but state that they "are too old," and usually cite one or more instances of severe post operative hemorrhage occurring among friends which makes them reluctant to submit to the operation. When asked whether they would fear hemorrhage as a complication of other surgical procedures such as appendectomy, they invariably say "No." It is our contention that age alone is not a factor to be reckoned with in tonsillectomy any more than in any other surgical operation.

We find it quite customary for many operators to attribute excessive hemorrhage after tonsillectomy to bleeders, but if one carefully questions the patient as to whether they bleed excessively following cuts, bruises, or previous surgical procedures which they have undergone, we find that these patients have not bled excessively. There is also an idea among many physicians that before removing the tonsils in adults, the coagulation time should be taken to ascertain whether it is prolonged. We have operated upon many patients with a coagulation period more than double the normal as ascertained by the several laboratory methods, without finding any increase in hemorrhage either at the time of operation or subsequently, with two exceptions, which might probably be accounted for by a high blood pressure, 160 or more. In the absence of a history of hemophilia we assure our patients that the loss of blood during the operation is negligible, that post-operative bleeding is rare, and that it can and will be detected early, and controlled before serious loss of blood occurs.

In order to be able to control hemorrhage in any operated area, one should have a good knowledge of the local blood supply, both arterial and venous. My associate, Dr James W. Babcock, instructor in Oto-Laryngology in the College

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of Physicians and Surgeons, New York City, has made a very pretty dissection of the vessels supplying the tonsillar region (Fig. 1).

After completing the dissection our attention was called to the very excellent article, "Observations on the Palatine Tonsil," by C. W. M. Poynter, M.D., Department of Anatomy, University of Nebraska College of Medicine, Omaha, Nebraska, and published in the 1920 *Transactions of the American Academy of Ophthalmology and Oto-Laryngology.* If we summarise Dr Poynter's and Dr Babcock's observations it will be noted that all the arterial supply of the tonsil comes from the external carotid.

The superior pole of the tonsil is supplied from the descending palatine branch of the internal maxillary and the middle and external portion from the ascending pharyngeal and the ascending palatine arteries; whereas the lower portion of the tonsil and that part of the lateral pharyngeal wall studded with lymphoid tissue below the tonsillar fossa are supplied from the dorsalis linguæ, branches from which sometimes are distributed to the outer portion of the tonsil as high as its middle. The number of small radicles piercing the so-called capsule of the tonsil varies from three or four to seven or eight (Fig. 2).

The return venous supply is composed of a rather large plexus of veins which seem to be assembled partly between the outer layers of the capsule and partly between the capsule and superior constrictor of the pharynx lying just external to the capsule. "The plexus drains into the internal maxillary vein above, into the lingual anteriorly and into the palatine below." There is a confluence of the veins towards the lower pole of the tonsil. Poynter states that "from this point a large vein leads outward to join the pharyngeal plexus or opens directly into the internal jugular vein. The posterior lower pole area becomes therefore the *danger area* for hemorrhage, on account of the size of the vein and its close relation to the capsule. When the vein opens into the jugular the danger of hemorrhage would naturally be greater and the possibility of jugular thrombosis much increased." In our opinion a direct communication with the internal jugular would easily account for a dislodged septic thrombus entering the circulation, and, being deposited in the pulmonary vessels as an embolus, becoming the source of a future lung abscess.

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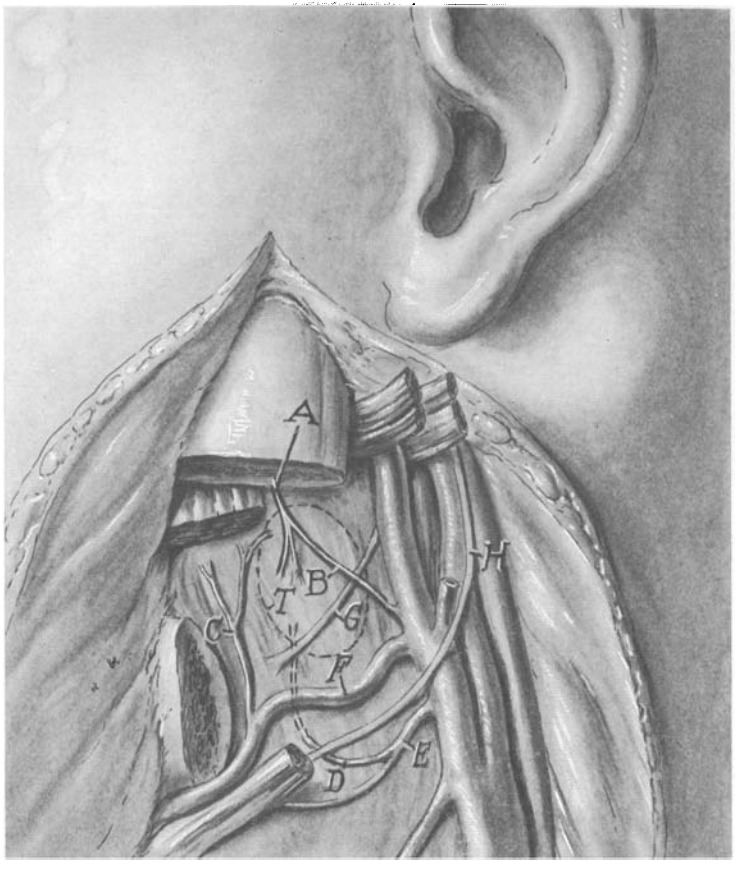


Fig. 1 (*Babcock*).—Dissection of the neck, showing blood supply of tonsil and close proximity of glosso-pharyngeal nerve to operated area. Anæsthesia of pharynx occasionally complained of is due to trauma to this nerve.

A = Anastomosis, with desc. palatine. *B* = Ascending pharyngeal. *C* = Ascending palatine. *D* = Dorsalis linguae. *E* = Lingual. *F* = Facial. *G* = Glosso-pharyngeal N. *H* = Hypoglossal N. *T* = Tonsil.

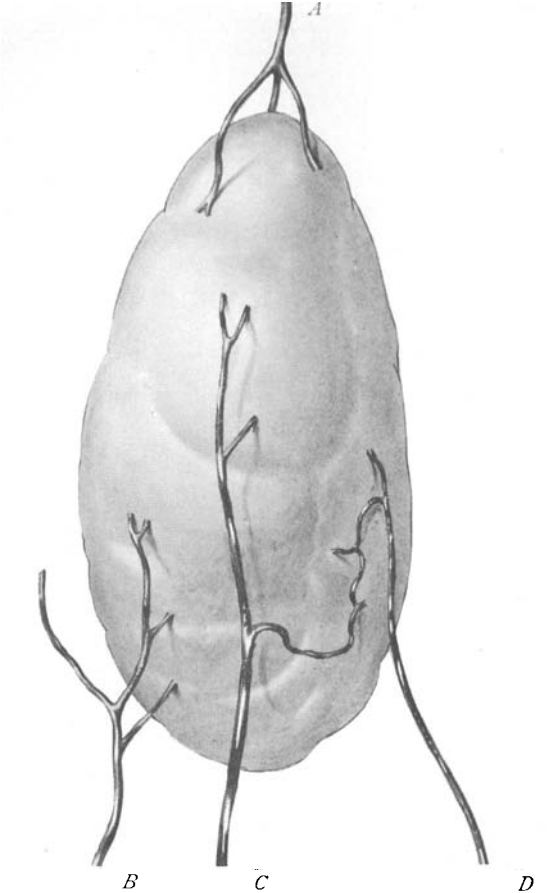


Fig. 2 (*Poynter*) —Outer surface of enucleated R. tonsil, showing average distribution of arteries and source of supply.

A = Descending palatine artery. *B* = Ascending pharyngeal artery. *C* = Ascending palatine artery (tonsillar branch of facial artery). *D* = Dorsalis linguae artery.

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Hemorrhage during and after Tonsillectomy

From a study of the blood supply of the tonsil, it will be seen that there are no large arteries supplying the tonsil, nor with proper surgical technique is there any possibility of wounding any of the larger vessels of the neck, as the distance that these vessels are from the tonsils is well shown in Poynter's cross section of the head (Fig. 3).

For a proper understanding of the question of tonsillar hemorrhage, the following classification is given :—

First — Immediate or operative hemorrhage. Second— Recurring hemorrhage, i.e., bleeding usually within twelve hours after the time of operation. *Third— Secondary hemorrhages*, which seldom occur before the fifth day, and may appear at any time up to the third week following operation, when the fossæ are completely healed.

First — Operative Hemorrhage. — Various procedures are resorted to by operators for controlling immediate or operative hemorrhage. It is a very common practice for many surgeons to disregard entirely the operative hemorrhage, and trust to luck that after a greater or less loss of blood the hemorrhage will stop. This practice is to be severely condemned, for while it is true that in most children and in some adults spontaneous cessation of bleeding does occur, it is only after an unnecessary amount of blood is lost.

Others resort to pressure within the tonsillar fossæ, keeping up the pressure for a few moments, replacing the gauze sponge with another, and so on for several minutes until the bleeding is stopped. This is a better procedure than the first, and while sufficient to control the hemorrhage in a very large percentage of cases, yet it is unreliable as a preventative of recurring hemorrhages. During the process of gagging and vomiting the thrombus may be dislodged and hemorrhage of considerable amount frequently ensues.

Others advocate suturing the anterior and posterior pillars together, but this procedure is difficult to perform accurately, and is apt to leave a dead space into which hemorrhage may recur. Some have resorted to placing a gauze plug in the fossa and stitching it to the pillars. Such a plug cannot be kept aseptic in the foul cavity of the mouth, and is a most unsurgical procedure. Others again have resorted to the use of the Mikulicz clamp, the large oval portion being placed in the

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tonsillar fossa, and the other part of the clamp on the inferior maxilla, the two being then screwed together to control the hemorrhage. This is also an unsurgical procedure, and of very doubtful efficacy for making pressure on the bleeding vessel.

The proper surgical treatment of hemorrhages from the tonsil should be the same as that used by surgeons in operating elsewhere in the body, namely—by seizing the bleeding points with suitable hemostats and ligating the vessels. The technical difficulty of passing a ligature round the hemostat in a tonsillar fossa, owing to the depth of the wound and the cramped working space, has led but few surgeons to adopt this procedure. There has been developed at Bellevue Hospital Ear, Nose, and Throat Service, a method of ligating the tonsillar vessels which is so simple and easy that were it generally known it would be more universally adopted. Before demonstrating the method, however, I wish to describe our entire surgical procedure in tonsillectomy.

If a general anæsthetic is administered the patient is placed in the recumbent position with the head resting level on the table. It is very necessary that excellent illumination of the parts be obtained, and, for this purpose, we find nothing as good as M'Intosh's headlight which may be attached to the street current. A Jenning's mouth gag is inserted, and the jaws widely opened; a tongue spatula is used to depress the tongue so as to obtain a full view of the tonsil from the supra-tonsillar fossa to its base. The grasping forceps are inserted into the tonsil, the upper member at the supra-tonsillar portion, the lower member near the lower pole. The forceps are closed and traction made upon the tonsil. A long-handled, slightly curved, sharp-pointed bistoury is employed to incise the mucous membrane, beginning posteriorly at the junction of the upper and middle third, and continuing over the supra-tonsillar portion and down the anterior third, care being taken not to pierce the capsule. A blunt, slightly curved scissors is then introduced along the line of incision, and with blunt dissection the tonsil is freed from its bed, first posteriorly then superiorly, and finally anteriorly over an area of half or more than half of the upper portion of the tonsil. A cold wire snare is passed over the forceps and down over the freed half of the tonsil. The wire loop is closed, the wire completing the dissection. During all of this procedure a metal tube from the

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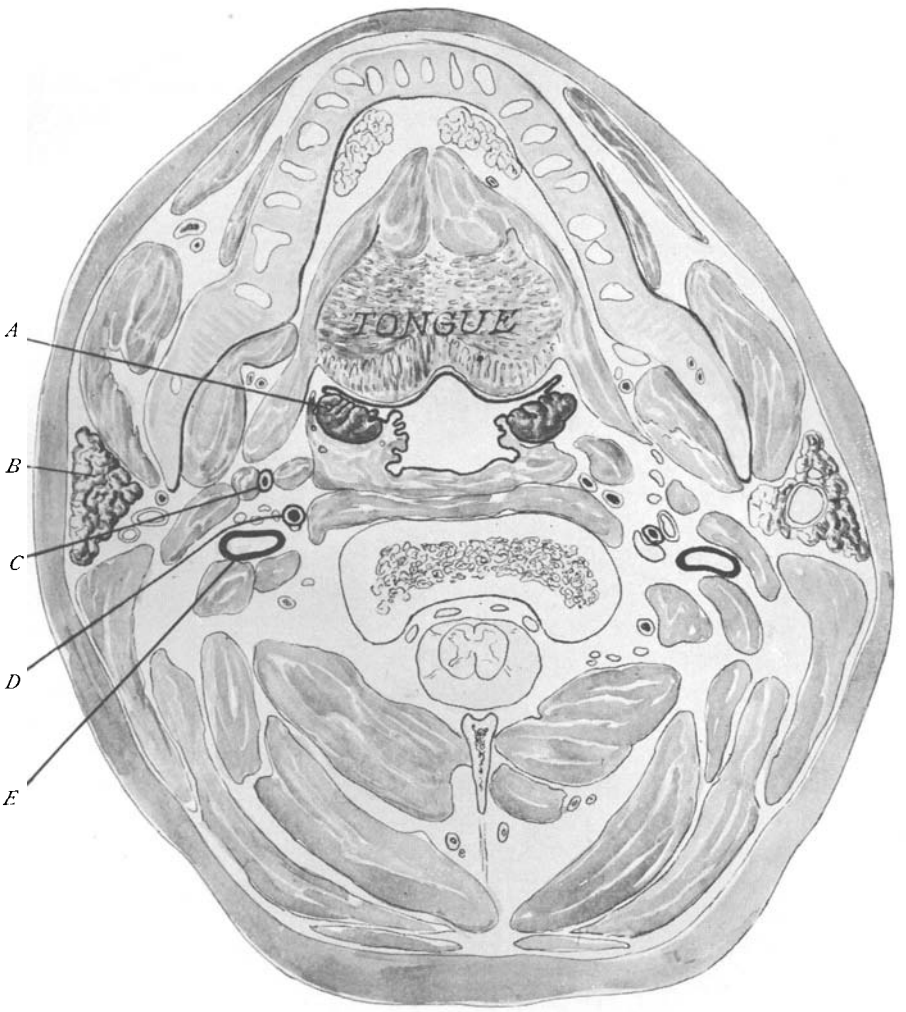


Fig. 3 (*Poynter*).—Cross section of head, showing relation of tonsils to the large vessels.
A = Tonsil. *B* = Parotid gland. *C* = External carotid.
D = Internal carotid. *E* = Jugular vein.

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suction apparatus is held in the pharynx, or temporarily employed along the line of incision, so that the operative field is at all times kept free from blood, and no blood allowed to pass into the hypo-pharynx or larynx.

Immediately after the tonsil is enucleated a gauze sponge of size sufficient to fill the fossa, held on a sponge holder, is placed in the tonsillar fossa, and by pressure temporarily controls the hemorrhage. At the end of a couple of minutes the capillary oozing has ceased, and on removing the sponge a few bleeding points will be noted. Each bleeding point is grasped with a hemostat. Surgeons always have their preference for the kind of hemostat to be used, but after experimenting with several, we find that the Allis hemostat with four mouse teeth is, in our hands, the most serviceable. As the ordinary Allis hemostat has a handle so short that the operator's hand obscures his view, we have had Messrs Tieman & Co. construct one, the length of which is 7 in. A straight hemostat is used for picking up vessels on the posterior wall of the tonsillar fossa, whereas we find a slightly curved hemostat more useful for seizing vessels in the supra-tonsillar fossa on its external wall, and at the bottom of the fossa adjacent to the tongue and lateral pharyngeal wall. In order to more accurately find these bleeding points, we employ the Hurd pillar retractor to lift upwards the margin of the wound in the supra-tonsillar region, and to displace externally the anterior pillar, while the tongue depressor is used to push the tongue downwards and mesially, so as to seize the very important bleeding points at the lower pole and on the lateral pharyngeal wall below the tonsil. If the bleeding is very active, it is necessary to use the suction tube *in the fossa* in order to keep it sufficiently free from blood to locate the bleeding points.

When all bleeding points have been secured we proceed to ligate the vessels. We have experimented with many kinds of ligature material such as catgut, twisted surgical silk, braided surgical silk, which is usually too coarse, and linen thread, but have found nothing equal to the small black silk braided fish-line, having a breaking strength of from 8 to 14 lbs. This material does not twist or break as do the others. A piece of braided silk about 14 in. long, sterilised by boiling, has a slip-knot tied in the middle of it, the loop being large enough to pass over the handle of the hemostat on the vessel

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(Fig. 4). The knot of the loop should be drawn sufficiently tight to let the free part slide with slight friction (Fig. 5). The non-slip part of the loop is grasped close up to

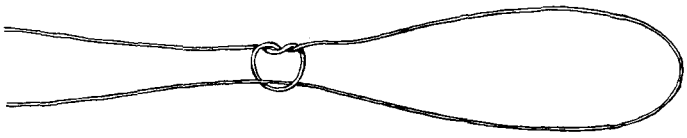


FIG. 4.

the knot with the end of a pair of slightly curved, long-handled forceps (Fig. 6). The grasping forceps should be serrated to prevent the ligature slipping in its jaws, but the serrations must not be sharp or they will be found to cut the

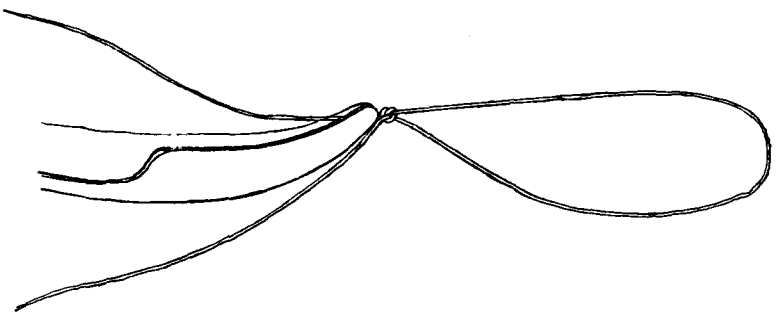


FIG. 5.

ligature when traction is made. The loop is placed over the hemostat, and carried down the shank and over the end of the hemostat, so as to engage the vessels. During this manipulation the loop is gradually lessened in size by pulling

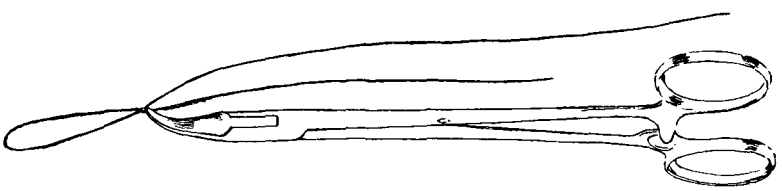


FIG. 6.

lightly upon the sliding part (Fig. 7, positions 1, 2, 3). The placing of the loop is done entirely with the forceps until such time as the loop is over the end of the hemostat, when the free end is drawn tight and the vessel ligated (Fig. 8).

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The hemostat and clamp are removed, and the two free ends of the ligature are picked up and cut off close to the knot; although this knot is the famous slip-knot, when pulled tightly it does not slip, and the ligatures may be found in the fossa from six to twelve days later. If several forceps are threaded with the slip-knot at the beginning of the operation, the

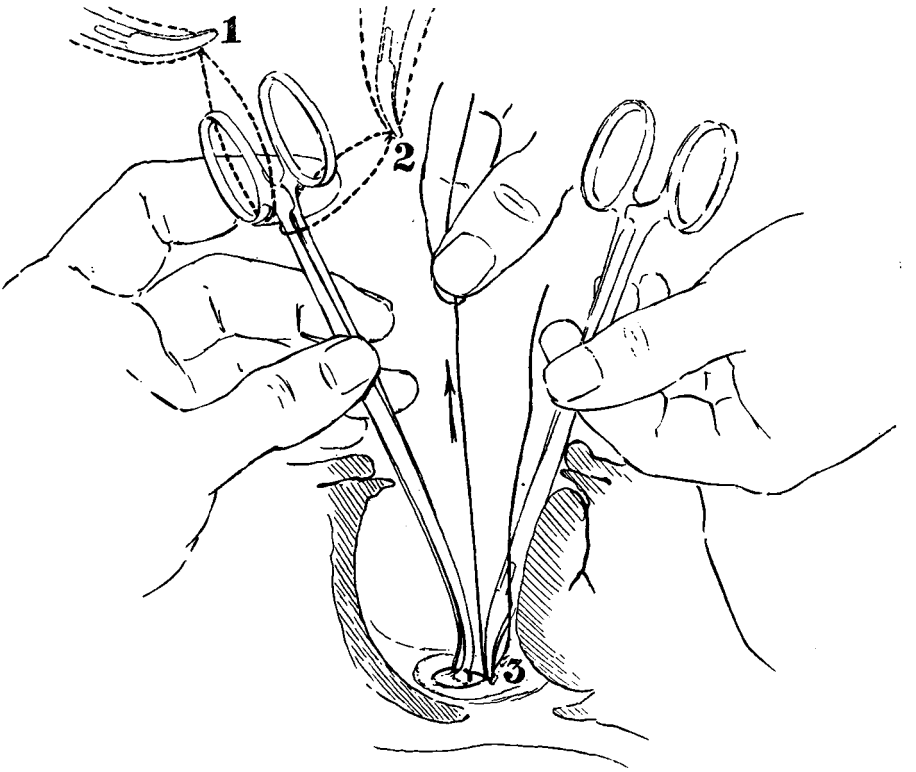


FIG. 7.

ligatures may be applied over the hemostat round the seized vessels as quickly, if not quicker, than a surgeon would ordinarily tie the vessels in an open wound. When the vessels are tied a small gauze sponge on a sponge holder is used to gently wipe the fossa, so that one may see that the operative field is absolutely dry, just as is done by surgeons in an open wound before sutures are introduced. The amount of blood lost in children by this method averages less than a dram per tonsil, while in adults it averages less than three

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drams per tonsil. The employment of styptics such as gallic acid, Monell's solution, etc., for the arrest of hemorrhage during or after a tonsil operation cannot be considered good surgical technic any more than they would be so regarded by the general surgeon.

We have noted two very different appearances of tonsillar fossæ at the completion of an enucleation—in one the tonsillar fossa is smooth, lined by the fascia separating the tonsil from the superior constrictor muscle. In such cases the bleeding points are easily seen and one not infrequently notices the unwounded plexus of veins underneath this smooth fascia (Fig. 9). In other cases the tonsillar fossa looks ragged, irregularly striated, and in such cases one usually finds a

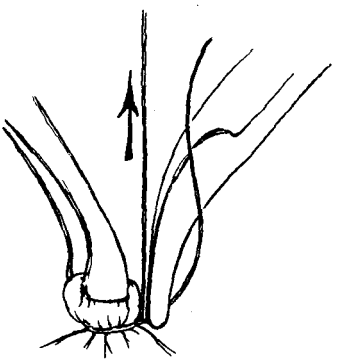


FIG. 8.

greater amount of hemorrhage owing to the wounding of the venous plexus (Fig. 10). One can liken the difference in these two fossæ to the difference between a pine board, one surface of which is planed, and the other remains roughened. It is much easier to see the bleeding points, and there are usually fewer vessels to ligate in the smooth glistening fossa than in those where the constrictor of the pharynx is exposed and a portion of the muscle amputated. The dissection in the latter condition opens the large plexus of veins that are extra capsular, and greater care is demanded in securing and ligating these to prevent recurring hemorrhage.

When the operation is completed the patient is put to bed, lying on the right side in Sims's position, with the head low. The nurse is instructed to carefully watch for bleeding. As little or no blood passes into the stomach during the

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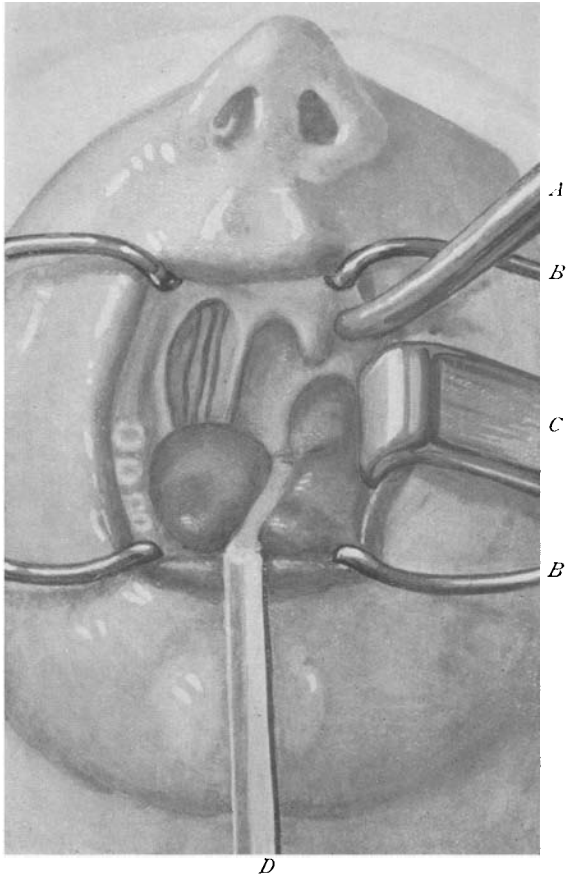


Fig. 9.—Smooth Right Tonsillar Fossa, showing plexus of veins in and beneath capsule.

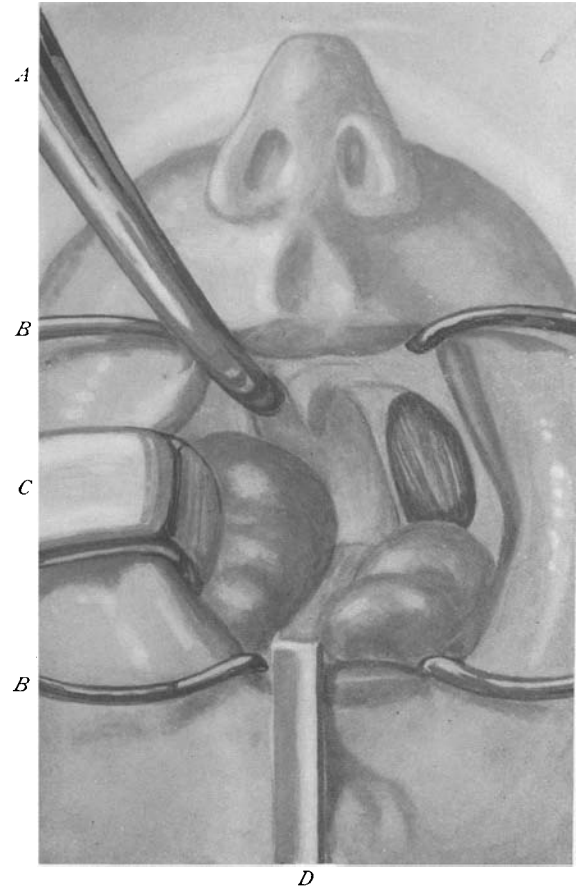


Fig. 10.—Illustrating rough Left Tonsillar Fossa with muscle striations exposed.

A = Suction tube. *B* = Mouth gag. *C* = Ether tube. *D* = Tongue spatula.

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operation, and as all bleeding is controlled before the patient leaves the table, there is usually little or no blood in the vomitus. The nurse is instructed to report at once in case of any bleeding, and either I myself or one of my associates immediately proceed to the hospital to investigate the cause.

Second—Recurring Hemorrhage.—Recurring hemorrhage is due entirely to bleeding coming from vessels not properly secured at the time of operation. Formerly we were content with the crushing of some of the smaller vessels with a hemostat, but our experience has taught us that this is not a reliable process, and it is much safer to ligate than to crush even these small vessels. The tonsillar fossæ differ from the small areas elsewhere in the body operated upon in that they cannot be kept quiet. The action of the constrictor muscles and the tongue during gagging, vomiting, crying, and talking causes a reopening of the cut ends of the vessels and hemorrhage occurs. There is great need, therefore, of the watchfulness of a trained attendant to report any evidence of recurring hemorrhage. It is our custom to visit the patient four or five hours after the operation and inspect the fossæ to see if they still remain dry and free from clot. An appearance of a black clot partially or completely filling a tonsillar fossa should be regarded as certain evidence that some vessel has given way and in all probability hemorrhage is still going on. Should such a condition be found we advocate the removal of the clot with a piece of gauze on a sponge holder, to locate the bleeding vessel, which should be seized with a hemostat, and a ligature applied as at the time of operation. If the recurring hemorrhage is severe, we have sometimes found it necessary to administer an anæsthetic in order to locate and ligate the offending vessel. Formerly it was our custom to remove the clot and sit alongside of the bed with a piece of gauze on a sponge holder in the fossa for half or three quarters of an hour. This will control the hemorrhage as long as pressure is maintained, but bleeding is so apt to recur soon after we leave the patient that we believe that pressure should only be resorted to in cases of very slight hemorrhage. Our experience has taught us that the nurse should be particularly on the watch, and warned to look for recurring hemorrhage in patients having cardiac or renal disease, or a high blood pressure, 160 mm. or over.

Third — Secondary Hemorrhage.—Secondary hemorrhage,

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that is hemorrhage coming on about the fifth day or later, is due to sloughing taking place in the fossa involving the thrombosed ends of the vessels. It is usually more difficult to grasp the bleeding vessels in these cases because of the brittleness of the tissue in the repaired area, and pressure has in most cases been sufficient to control the hemorrhage.

In conclusion we would urge the same surgical care of bleeding from vessels during and after tonsillectomy that is employed by surgeons operating on other parts of the body. The technical difficulty of applying ligatures in the tonsillar fossa is entirely overcome by the Bellevue method of applying ligatures. Recurring and secondary hemorrhages will occur in a certain percentage of cases, and only the vigilance of the nurse in attendance, and the proper attention on the part of the surgeon, are necessary in order to securely tie the bleeding vessel before any great amount of blood is lost. No one should perform a tonsillectomy unless he or some properly qualified person can be quickly made available to arrest the hemorrhage.

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