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CONTROL OF PAIN AND HEMORRHAGE IN ELECTRO-SURGICAL TONSILLECTOMY *

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Markedly conflicting opinions still exist with reference to the problem of pain and hemorrhage occurring in electrosurgical extirpation of the tonsils. There are some, who while acquiring the complicated technic, prematurely condemn the method as inefficient and even more dangerous than surgical tonsillectomy. They have evidently forgotten the time and effort needed to overcome the hazards of classic tonsillectomy. There are others, however, who like Ground,⁽¹⁾ have no compunction in "introducing electrocoagulation as the method of choice for the sterilization and removal of tonsils in the adult."

To imply that perfect control of pain and bleeding is possible in every case of electrosurgical tonsillectomy, means either an allusion to good fortune of the operator or an acknowledgment of ignorance of the anatomy and physiology of the tonsil and its adjacent structures. It is now possible, with a modification of the coagulation technic, which I introduced in 1930,⁽²⁾ so to control pain and bleeding that its incidence may be considered as negligible. Experience with approximately two thousand electrosurgical tonsillectomies covering a period of twelve years and including a large group of physicians amongst whom were some nose and throat specialists, causes me to feel more strongly than ever in favor of a modified tonsillar electrocoagulation as the method of choice in the adult.

As explained in an analysis of one hundred routine cases,⁽³⁾ pain is a factor in the extirpation of the tonsil independent of any reaction that may occur following each treatment. The "immunity reaction" that ensues is apparently dependent upon the type and virulence of the organism infecting the tonsils. Pain on the other hand depends on the damage done to normal epithelialized structures. To avoid pain we must first re-evaluate the importance of the

anatomical structures surrounding the tonsil from the electrosurgical point of view. A scientific appraisal of the morbid lymphatic structure which requires removal and of the innocuous epithelialized tissue to be avoided is essential to success in this field. The tonsil alone must be coagulated and the palatoglossus and palatopharyngeal muscles or pillars as well as the plica semilunaris above and the plica triangularis below should be strictly avoided. This is made possible by the use of special pillar retractors and an improved set of biterminal and monoterminally active electrodes.

Examination of the throat enables the experienced operator to determine at once if a given case is simple or difficult to manage. The size of the tonsil, redundancy of pillars, adherence of plical folds and the depth of the faucial cavity may all be surveyed at a glance. The large, infantile, highly lymphatic tonsil non-adherent to surrounding structures is the easiest to remove. The small, deeply imbedded, fibrous tonsil adherent to its plical folds and bound down by repeated exudative inflammation requires considerable skill to avoid undue pain. Topical application of 2 per cent pantocain for a period of 10 minutes is necessary to avoid the pain which accompanies the contact of the active biterminal electrode with the plical folds covering the deeply imbedded tonsil. To allay pharyngeal reflex in a hypersensitive individual I resort to a lozenge containing amidopyrine (2 grains) and butyn (½ grain) prepared in a pleasant tasting excipient. This troche is dissolved on the tongue just prior to the application of the local anesthetic and may be used at intervals following treatment to allay irritation. The apparatus should be set to deliver a smooth, non-fluctuating current sufficient to produce uniform, non-adherent coagulation. Only an apparatus of low voltage, though high frequency, can accomplish this desired result. The "sparkless" circuit put out recently by the High

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Tension manufacturers has proven most efficient in my hands. The older types of high tension machine built primarily for medical diathermy are unmanageable and cause many of the difficulties encountered in electrosurgery. I cannot emphasize too strongly the importance of a properly constructed coagulation, desiccation and fulguration circuit for attaining desirable end-results with a minimum of discomfort.

Pain is best avoided by careful retraction of the upper reflection of the capsule, the plica semilunaris, when coagulating the upper pole of the tonsil. It is of paramount importance to completely ablate all of the cryptal tissue in the superior fossa right down to the membrana basalis. It is in this upper fossa that access to the retrotonsillar area is gained through the very thin capsular tissue separating the tonsil proper from the aponeurosis of the constrictor muscle. Usually the capsule is anomalous here, and a direct communication permits infection to pass into the potential peritonsillar space. With a previous history of quinsy or retrotonsillar abscess it is necessary totally to eradicate all infected tissue posterior to the tonsil and to obtain a smooth, glistening fossa formed by the aponeurosis of the constrictor muscle of the throat.

In this respect I have often noted after the most painstaking surgical tonsillectomy, where a history of retrotonsillar abscess is present, that infection may remain latent for years. An acute exacerbation of a transient infection may reveal a pocket of pus extending to the aponeurosis of the constrictor muscle. Sometimes in the case of discrete tonsils buried deeply in the muscle, a fistulous tract may require ablation in order that total eradication of an overlooked focus may be accomplished. Electrosurgery is the method par excellence for correcting any of these annoying complications following classic operations.

To understand occurrence of hemorrhage we must consider the anatomy and physiology of the tonsil from an electrosurgical point of view. The tonsil is highly vascular. It receives its blood supply from at least five branches of the external carotid artery. It is this vascularity which suggested the rationale of a "double-checking technic" to control postoperative bleeding. The modi-

fied coagulation technic was first inaugurated to completely control bleeding. It was later that I clinically noted that patients complained less of the pain following coagulation, after the application of the monoterminial electrode, both deeply and superficially.

Technic of Modified Coagulation

The patient having dissolved two butynamidopyrine lozenges on the tongue and being thoroughly swabbed with 2 per cent pantocain solution is ready for electrosurgical treatment. Rarely will the pharyngeal reflex require further anesthetization. Depending upon the size of the tonsil, from five to six applications of the biterminial or double tipped electrode are made to cover the entire organ to the depth of one millimeter and spaced one millimeter apart. The tip of the electrode is always pointed toward the center and away from the plical folds. Coagulation should never approach the highly sensitive capsule and the reflected plical folds closer than is absolutely necessary. Desiccation by a monoterminial electrode now follows. The pointed, angulated needle is placed through the coagulum to the depth of at least one millimeter and never more than two. The current from the Oudin terminal is now employed to maximum heat tolerance. The patient decides just when the heat generated in the tissue is sufficient to thrombose any larger vessels which may not have been sealed during the coagulation process. Four to six such applications usually suffice to completely control primary and secondary bleeding. The same monoterminial needle electrode is now used for fulguration. Sparking is obtained by keeping the tip of the electrode at a slight distance from the tonsil. The entire area of the tonsil is sprayed with this short spark. The resultant coagulum becomes dried and much more friable, and does not separate as a foul, sloughing mass. It will become detached as a relatively dry mass almost unnoticed while the patient gargles with an astringent solution.

As noted, coagulation causes a complete destruction of cell walls and nuclei; the tissue becoming a homogeneous, hyalinized mass. Desiccation is confined more to the needle tip and shriv-

eling of cells and nuclei is evidenced. Fulguration completes the dehydrating process superficially and is most advantageous in sealing the smaller vessels and lymphatics, thus preventing metastasis and undue absorption of any of the toxic end-products of tissue combustion. Should one of the larger vessels remain patent during coagulation, it is the purpose of desiccation to thrombose this vessel at the margin of the coagulated area. It is important to restrict the heat generated in the tissue to a white, nonadherent coagulum. Cauterization or charring of tissue must be avoided.

As previously demonstrated⁽⁴⁾ absorption of the end products of electrocoagulation is provocative of an "immunity reaction." This reaction continues after each treatment as long as infection exists in the tonsillar crypts and is independent of the amount of coagulation. The virulence of the invading organism determines the severity of the general response or autogenous vaccine reaction. When the infection is either attenuated or eliminated, as is usual after the fourth treatment of each tonsil, there is rarely a general or grippe-like reaction. Fulguration, though sealing the lymphatics and inhibiting the non-specific protein reaction, does not interfere with the absorption of the end-products of bacterial destruction. It is this absorption, of necessity, which accounts for the unabated vaccine-like reaction which affords the patient so much relief of both subjective and objective symptoms. I have often observed⁽⁵⁾ and recorded the rapid disappearance of cervical lymph node enlargement, both in the tuberculous and non-tuberculous infections, following the first few applications of surgical diathermy. Infection is either attenuated or eradicated prior to the total extirpation of the tonsil.

Newer Electrodes

To avoid inadvertent injury to adjacent structures, the electrodes have been insulated with hard rubber throughout the entire shank. The tip alone is left exposed. The angulation of both biterminal and mono-terminal electrodes is carefully insulated so that no damage is done to the posterior pillar when the needle is aimed at the anterior portion of the tonsil. The tips of the biterminal electrode are properly blunted to enable the operator to more accu-

rately estimate the depth of coagulation. This is of especial importance when the capsule is reached. Unless, as has been noted above, there is a history of peritonsillar infection, the capsule should be left *in situ*. The fibrous capsule then acts as a barrier to invading organisms. The mono-terminal electrode used in fulguration and desiccation employing the higher voltage Oudin current has been lengthened to 13 cm. This permits the shank of the needle to be inserted into the chuck handle outside of the buccal area and so to prevent sparking of tongue and lips.

Effects of Modified Coagulation

A connotation of the principal effects of modified electrocoagulation is appended:

1. Desiccation seals vessels left unthrombosed by coagulation. Larger vessels at margin of coagulum require extra heat.
2. Fulguration seals lymphatics superficially, prevents undue absorption of toxic products of combustion and minimizes reaction.
3. Prevention of postoperative adhesions. Pillars and plical folds are left dry and non-adherent.
4. Dehydration of coagulum. Extreme dehydration makes possible the detachment of the coagulum as a fine powder imperceptibly while the patient gargles.
5. Sloughing of coagulum is avoided.
6. Malodor and bad taste are avoided when dehydration is thorough.
7. Definite relief of pain due to coagulation is noted. Counter heat of desiccation and fulguration apparently lessens afferent nerve impulses.

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