is then introduced to the bone and a hematoma is searched for. If a hematoma can be found, and injected with novocain an excellent result may be expected. When no hematoma can be located, the area in general is infiltrated. Immediately after the injection, the area is lightly massaged to aid diffusion. Active motion of the part is then insisted upon. . . . The result is a relaxation of the surrounding muscles, relief of pain, and a rapid return of normal function. If the joint involved is a weight bearing or carrying joint, an adhesive strapping or tight muscle bandage is applied. . . . If favorable results are not obtained after 2 or 3 injections, further injections are not indicated. (1 per cent novocain is used and in amounts usually of 5 to 10 cc.) Typical case histories and a statistical study are presented." 10 references.

A. W. F.

MOERSCH, H. J.: *Bronchoscopy in the Treatment of Postoperative Atelectasis.* Editorial. Surg., Gynec. & Obst. 77: 435-437 (Oct.) 1943.

"The value of bronchoscopy in the diagnosis and treatment of pulmonary disease is widely recognized. Its value in the prevention and treatment of postoperative pulmonary complications is not so well known. Pulmonary complications following operation are a constant source of anxiety to the surgeon and that such anxiety is warranted is emphasized in the studies of Scott and of Lewis. From statistics compiled from all parts of the world in which modern surgical methods prevail, these observers have estimated that some type of pulmonary complication develops in approximately 2 per cent of all operations and that one out of every 200 operations results fatally from this cause. Most observers are of the opinion that atelectasis is the most frequent type of pulmonary complication following operation, and that it is only when the atelectatic lung becomes secondarily infected that true bronchopneumonia occurs."

"Many hypotheses have been advanced to explain the etiological factors involved in the production of postoperative atelectasis. The most widely accepted hypothesis is that postoperative atelectasis is produced by an obstruction of the bronchus by a plug of thick, tenacious mucus. Lee and Tucker in 1925 were the first to demonstrate this bronchoscopically, and they showed furthermore that atelectasis could be relieved by removal of the obstructive mucous plug."

"Atelectasis may occur as a complication following any operation, but it is more likely to occur in operations on the upper part of the abdomen and of the thorax than elsewhere in the body. This is to be anticipated because operations on the upper part of the abdomen and the thorax are prone to lead to the greatest interference with the normal respiratory movements and the effectiveness of the cough reflex. Atelectasis is estimated to occur in 10 per cent of cases in which operation is performed on the upper part of the abdomen and the thorax, in contrast to 2 per cent of cases in which the lower part of the abdomen is the site of operation. It occurs very rarely following operations on the extremities. Postoperative atelectasis is more likely to develop among patients suffering from bronchiectasis, infection of the upper part of the respiratory tract, or any other disability which leads to excessive accumulation of secretion in the mouth during the course of anesthesia than among normal, healthy persons. The length of time required to perform the operation, the type of premedication, the character of the anesthetic agent, and the ease of induction of anesthesia are also important etiological factors in the development of atelectasis. The position of the patient during operation also has been demonstrated to be

an important factor in the frequency with which postoperative atelectasis occurs. Gray found that he could reduce the incidence of postoperative complications approximately 30 per cent by simply placing the patient in the Trendelenburg position during and after operation."

If postoperative atelectasis occurs, it invariably develops within the first 48 hours after operation. In fact, evidence would seem to indicate that it is likely to occur before the patient recovers consciousness from the anesthesia. One would assume, therefore, that the factors involved by its development were present during the course of the operation. Postoperative atelectasis is not in itself a serious complication: its danger lies in the fact that it may be the precursor to the development of true bronchopneumonia."

"Most patients, on recovering consciousness following operation, are able to expel the secretions retained in the tracheobronchial tree without a great deal of difficulty, and if atelectasis has occurred, it will subside promptly with expulsion of these retained secretions. This usually occurs within the first 48 hours after operation. Frequently a patient who has atelectasis can be encouraged to expectorate any retained plug of mucus by support of the operative wound at the time of the cough. If, however, the obstruction is allowed to remain in the bronchus and secondary pulmonary infection occurs, as it is likely to do, then atelectasis is but the precursor of pneumonia."

"It is apparent, therefore, that in order to decrease the incidence of postoperative complications following operation, it is important to eliminate the factors that gave rise to their development. The most important preventive measure is the prompt removal of secretions in the tracheobronchial tree before, during, and immediately after operation. This should be carried out while the patient is on the operating table, and a patient who has secretion in the airways should never be allowed to leave the operating room until the secretion has been thoroughly aspirated. Harrington has expressed the opinion that, in cases in which operation has been done in the thorax, and following any operation in which atelectasis is suspected, roentgenograms should be made while the patient is still on the operating table to be certain that a region of atelectasis may not be overlooked."

"In many cases, the aspiration of retained secretion in the airways can be accomplished by the use of an aspirating catheter inserted through an intratracheal tube or directly into the laryngoscope during and immediately after the operation. Frequently, however, the secretion may be beyond the reach of the catheter, and so viscid that it cannot be removed adequately by this method. In cases of this type, bronchoscopic aspiration of the tracheobronchial tree becomes essential to prevent the development of atelectasis. Bronchoscopy also is indicated in cases in which there is evidence of atelectasis which cannot be relieved by the more conservative measures. The procedure itself is relatively simple and can be performed without risk or undue discomfort to the patient. To be effective, however, bronchoscopic aspiration must be employed before secondary infection and pneumonia are superimposed on the primary atelectasis. The prompt aspiration of retained secretions from the tracheobronchial tree by catheter or bronchoscopy during and after operation until consciousness is recovered and the normal cough reflex is fully restored, will reduce the occurrence of postoperative complications to a minimum."

"In spite of the outstanding work of Lee and Tucker, who demonstrated that bronchoscopic removal of retained secretion in the bronchus brought about

a prompt disappearance of atelectasis, this method of treatment was slow in being accepted. Only within the past few years has it been employed more and more extensively in the prevention and treatment of postoperative atelectasis."

"The problem presents itself as to the person best qualified to carry out bronchoscopic aspirations of the tracheobronchial tree during and following operation. The ideal situation would be for a trained and experienced bronchoscopist to be available for this procedure. This, however, is not always possible. In certain instances the surgeon may have the training necessary to perform bronchoscopy, especially if he is interested in thoracic disease, but this is the exception rather than the rule."

"It would appear that the trained anesthetist would be in an especially favorable position to take over this duty. It is the anesthetist who watches the patient most closely for evidence of aspirated secretion and vomitus during operation and immediately thereafter. With his training and skill in the introduction of intratracheal tubes, he should be especially adapted to learning the technique of bronchoscopy. Undoubtedly, in the not far distant future every qualified anesthetist will be required to have fundamental training in the field of bronchoscopy."

A. W. F.

HENDERSON, YANDELL: *Tonus and the Venopressor Mechanism: The Clinical Physiology of a Major Mode of Death.* Medicine **22**: 223–249 (Sept.) 1943.

The author's interest in physiology extends over almost a half century. This paper appears to be an attempt to recapitulate and correlate his theoretical concepts of the mechanisms by which oxygen is distributed to the tissues and carbon dioxide removed therefrom. The dissertation runs approximately as follows:

It appears probable that no living muscle ever completely ceases its tonic pull. Always a few of the motor nerve fibers to it are discharging impulses into it and a few of its bundles of muscle fibers are stimulated to contract. This circumstance involves continuance of the pumping action of the discrete muscle bundles as they relax and contract thereby filling, compressing and emptying their intercalated capillaries and veins. This is the principal but not the only aid that muscle tone affords to venous return. The state of tonus in muscles maintains an intramuscular pressure higher than that of the environmental atmosphere and the pressure in the thorax is subatmospheric—the difference between these two pressures constituting the effective venous pressure.

The most significant influence upon the motor centers is chemical, the blood gases. The blood gases, particularly carbon dioxide, exert an influence upon motor nerve centers that is manifested in muscular tension and in activity of the intramuscular booster pumps. That is, under normal conditions the amount of carbon dioxide produced in the body determines alike the volume of air breathed, the volume of venous return and thereby the volume of blood circulated.

"Experimental shock" results from overventilation through the causal sequence: 1. acapnia; 2. depression of tonic nerve centers; 3. decrease of booster activity; and 4. failure of venous return.

Spinal anesthesia "shock" is due to paralysis of motor roots which puts a stop to the activity of the booster pumps and lowers intramuscular pressure, hence venous return fails.

When the tonic influence of the motor centers fails, skeletal muscles be-