plained of difficulty in breathing when she woke up, but was not dyspneic. Fourteen hours later there was subcutaneous emphysema over the right side of the head and neck, extending below the scapula and over the right temple. The patient was dyspneic. A roentgenogram showed a total pneumothorax with complete collapse of the left lung, but no shift of the mediastinum. Air was aspirated in small amounts at frequent intervals for 24 hours with relief of symptoms. In the second postoperative day emphysema was less marked and there was no difficulty in breathing. There was little febrile reaction and the subsequent convalescence was uneventful. On the seventh postoperative day roentgenograms of the chest were normal.

C. B. H.

WATERS, RALPH M.: *Anoxia: The Anesthetist's Point of View.* J. A. M. A. **115**: 1687–1690 (Nov. 16) 1940.

By derivation, the meaning of anoxia is "without oxygen," a condition incompatible with life and therefore scarcely a suitable word to use in clinical discussions. For want of such a word as "hypo-oxia" or "hypoxia," anesthetists are in the habit of using the clumsy expressions "oxygen want," "oxygen lack" and "oxygen deficit."

Illness, injury and the exigencies of surgery cause pain and often an associated oxygen want. Pain relieving drugs have side effects which interfere with the mechanism of respiration. Hence, if suffering is to be safely abolished or even minimized, the prevention and treatment of oxygen want must go hand in hand with drug administration.

The circumstances which embarrass oxygen transport with which anesthesiology is concerned may be classified in four groups:

1. The condition of the patient before anesthesia.
2. The pharmacologic characteristics of drugs other than pain relief.
3. Disturbances of physiology due to technical difficulties of drug administration.
4. The contributions of surgery.

The Condition of the Patient

Because of his illness or injury, the oxygen transport mechanism of the surgical patient is frequently defective. Consciously or unconsciously, the anesthetist must evaluate every patient's physical status in terms of ability to deliver oxygen to the central nervous system. The normal patient tolerates temporary oxygen deficit surprisingly well. Pre-existing defect in transport reduces tolerance in geometric proportion to the gravity of the defect. The chart is searched for evidence of defective oxygen delivery. Is there evidence of hypersensitive autonomic reflexes or attacks of syncope? What is the blood count? Are the lungs normal? A preanesthetic record of temperature, pulse and respiratory rate and blood pressure is important as a control with which to compare observations made during and after anesthesia. Administration of anesthetics for so-called emergency operations without preliminary examination has led to frequent morbidity and mortality due to oxygen lack which, if anticipated, might have been prevented. Insistence on preoperative hospitalization for twenty-four to forty-eight hours has saved many lives.

Pharmacology

Sedatives and narcotics administered orally or hypodermically, as well as anesthetic agents which are injected or inhaled for the prevention or relief of pain, have similar effects on the mechanism of respiration. Almost without exception they depress the respiratory center, decreasing minute-volume exchange, the extent varying with the dose of the drug and the susceptibility

of the patient. Obstruction to ventilation likewise is an indirect result of many pharmacologic effects. Secretions of the mucosa and salivary glands are either increased or decreased and made more viscid. The pharyngeal, laryngeal and vomiting reflexes may be made hyperactive or obtunded and their normal coordination distorted. The cough reflex and ciliary activity may be paralyzed, thus depriving the respiratory tract of its normal service.

Technical Considerations

Second-to-second supervision of the physiologic processes of anesthetized patients is essential to safety. The management of patients requiring pain relief after operation or in the medical wards is no less important. Individualization in the choice of agents and the doses in which they are given from minute to minute or hour to hour, as the case may be, will minimize interference with oxygen transport.

Proper atmospheric mixtures must be offered the patient to insure sufficient tension of oxygen in contact with the alveolocapillary membrane. Artificial airways must be available and utilized promptly and with skill. The respiratory center subject to severe oxygen lack is not susceptible of stimulation until the defect is remedied.

Like all good things, however, oxygen is capable of doing harm. Extremely high tensions of oxygen help to maintain saturation of the hemoglobin in spite of obstructed or depressed respiration. Atmospheres containing largely oxygen, nitrous oxid or other rapidly absorbable gases are sometimes administered to patients when their breathing is temporarily stimulated at the end of inhalation anesthesia. If depressed breathing ensues immediately afterward, inactive or obstructed areas of lung may become rapidly atelectatic.

Contributions of Surgery

The oxygen transport deficits attributable to surgery are considered by many to be secondary to blood loss and traumatic shock. The anesthetist, however, believes that the perfection of modern surgical technic minimizes these factors. Instead, it is apparent that anatomic distortions necessary for the performance of certain operations or the dressings essential following them are more frequently the causes of inadequate transport.

Evidence does not support the conclusion that either anesthetic agents or surgical trauma frequently produce a direct effect on the heart. Unrecognized and untreated defective oxygen transport may result in fatigue of both the myocardium and the respiratory musculature.

Comment

The induction of anesthesia, whether by injection or inhalation, stimulates the experienced anesthetist to watch carefully for the slightest evidence of oxygen lack. Hyperventilation is not considered a reliable sign of oxygen deficiency, and in the presence of nonvolatile premedication and of profound dosage of anesthetic agents, it seldom occurs. The absence of cyanosis, likewise, is not assurance of ample oxygen supply. If either hyperpnea or cyanosis is present, the cause must be sought and removed if possible. The following incomplete list of symptoms and signs has been found useful to the anesthetist in determining the possible presence of oxygen transport deficiency: In the operating room: vomiting, dilatation of pupils, muscle twitchings and contractions, circulatory abnormalities such as disturbed pulse rate or rhythm, increasing or decreasing pulse pressure, skin pale, cold and wet or blue, delayed capillary refilling.

Respiratory abnormalities: Phonation, obstruction, depression, altered rate and rhythm. asymmetrical chest movements, prolonged expiration, hyperpnea.

In the ward: Psychic changes, headache, nausea, airhunger, increasing temperature, precordial or substernal pain, increasing pulse rate, syncope shock, respiratory abnormalities.

When one or more of these signs and symptoms are noted during anesthesia, the addition of oxygen to the respired atmosphere is logical. If after one or two inspirations of pure oxygen a short period of apnea follows, it is almost positive proof that marked oxygen want previously existed. When a deficient oxygen supply is suspected, every effort must be made to diagnose and relieve the cause.

J. T.

THOMS, HERBERT: *"Anesthesie à La Reine."* Am. J. of Obst. & Gynec. **40**: 340 (Aug.) 1940.

Thoms in his article states that Queen Victoria was delivered of her eighth child on April 7, 1853. She was attended by Sir James Clark, M.D., and John Snow, M.D., the latter in the capacity of anesthetist. Chloroform was administered on a handkerchief in 15 minim doses, the inhalation lasting fifty-three minutes. The drug was administered intermittently and induced what we think of as inhalation analgesia, for the patient was not unconscious at any time. Today this event is memorialized in obstetric parlance by the term "anesthesie à la reine" which signifies the type of intermittent inhalation anesthesia which is used today. The author briefly reviews the high points in the career of Sir James Clark, court physician, and John Snow, anesthetist and epidemiologist.

The first application of inhalation anesthesia in obstetrics was that of Sir James Simpson in January, 1847. An analysis by Thoms of Simpson's writings on chloroform in obstetrics reveals the fact that in his use of chloroform consciousness was abolished and that voluntary efforts on the patient's part were not used. This method is essentially different from that used by Snow.

The author calls attention to the fact that the first man to use intermittent inhalation analgesia was Nathan Cooley Keep, M.D., in Boston. The evidence for this is in a letter to the Boston Medical and Surgical Journal, April 14th, 1847. This case occurred less than three months after Simpson's first case with chloroform. Keep used ether. He had previously used ether for analgesia in 200 dental cases.

R. E.

GORDON, EVERETT J.: *Postoperative Complications. An Analysis of Etiology, Diagnosis, Prophylaxis and Treatment.* Am. J. Surg. **50**: 294-305 (Nov.) 1940.

"The incidence (of pulmonary infections) is reported as high as 5 per cent. in all operations and 10 per cent. in those limited to the abdomen. . .

"Etiology: 1. Site of Operation: The more closely the operative procedure approaches the diaphragm, the greater the incidence of postoperative pulmonary complications. This is explained by the resultant immobilization of the abdominal muscles together with elevation of the diaphragm. . . Davis observed that the preoperative chest roentgenograms in the expiratory position is almost identical with the postoperative roentgenograms in the inspiratory position.

"2. Sepsis in the operative field. The means of spread may be by direct extension, via the lymph channels, or by embolic means.

"3. Pre-existing respiratory infec-