

EDITORIAL

THE PATHOLOGY OF SUDDEN AND UNEXPECTED DEATH UNDER ANESTHESIA *

THE first death under anesthesia occurred just 100 years ago (1). Since then it has been estimated by Gillespie (2), from a large sample, that such death occurs about once in every one thousand anesthetics given. The great and continuing interest of anesthesiologists in this subject, and the problems that cluster about it, are illustrated by the frequency with which it appears on the programs of this Association and in the literature of anesthesia and surgery. That same frequency, however, makes it a somewhat frustrating subject for the speaker, who knows full well that whatever he may say as regards the pathology in these sudden and unexpected deaths has been said quite thoroughly before. Thus, I have elected to discuss the problem as a whole from the pathologist's point of view rather than to deal with details of pathology.

Your interest in this problem, both as a group and as individuals, stems from the just hope that as causes are understood, prevention will be possible in at least some of the cases. As has already been indicated, much has been said and written about the causes, but each report has, first, included but a small number of cases at best and, second, has been classified by one man or a small group of men who are inevitably influenced by their most recent personal experience and by local conditions.

The impossibility of compiling data from the literature into a statistically important series can best be illustrated by showing you various classifications:

A. Michael (3):—

1. Poor physical condition of patient
2. Improper technique in administration of anesthetic
3. Impurities in anesthetic used
4. Extreme loss of blood during operation
5. Asphyxiation
6. Intracranial hemorrhage
7. Acute hemorrhagic pancreatitis
8. Hemorrhage into adrenals
9. Coronary occlusion
10. Embolism
11. Fatal stimulation of carotid sinus
12. Status thymicolymphaticus

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B. Turner, and Wilkinson (4) :—

I. Cardiac	3 cases
II. Asphyxia	5 cases
III. Shock	7 cases
IV. "Pleural Shock"	2 cases
V. Air Embolism	2 cases
VI. Anesthesia	4 cases
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Total	23 cases

C. Waters, and Gillespie (5) :—

1. The operative procedure—8 cases
2. The patient's condition—3 cases
3. The patient's condition and operation—10 cases
4. Anesthesia—13 cases
5. Anesthesia and operation—1 case
6. Anesthesia and patient's condition—10 cases
7. All three factors—6 cases

D. Jetter (6) :—

1. Aspirated vomitus
2. Serious pre-existing disease of an inflammatory or degenerative nature
3. Sudden death on a neurogenic basis—fatal carotid sinus stimulation
4. Delayed deaths—chronic anoxia
5. Deaths without known cause

E. Ruth, Haugen, and Grove (7) :—

1. Entirely or largely the result of anesthetic management
 - Overdose—43 cases
 - Cardiac failure—33 cases
 - Hypoxia—26 cases
 - Respiratory Failure—18 cases
 - Respiratory Obstruction—9 cases
 - Cardiorespiratory—8 cases
 - Asphyxia due to vomitus—4 cases
 - Atelectasis—3 cases
 - Ventricular fibrillation—1 case
2. Hemorrhage and/or shock—70 cases
3. Others, grouped as patient's disease—83 cases

The variations in the classification criteria and, more important, their brevity and simplicity are obvious. Now it is perfectly clear that such deaths are either cardiac, respiratory or cerebral but it is equally obvious that, for example, cardiac failure may be due to direct effect of the anesthetic on the myocardium, to neurogenic stimuli, to coronary occlusion, to relative coronary insufficiency, to central failure or to respiratory failure, and several of these may in turn be due to pre-

existing disease, to effects of the surgical procedure, to the anesthetic or any combination of these.

In the literature one frequently finds the statement that it is extremely difficult or impossible to assess the proper cause of death. That it is difficult no one will deny, but that it is impossible, if the observable facts are obtained, I deny. The problem has not been carefully or thoroughly enough studied. I have already pointed out why I think studies by one man or small groups of men are insufficient. I should like to add one further reason. With a few exceptions, most articles dealing with this subject are very circumspect as regards the operative procedure and the ability of the surgeon. These are factors that must be considered, for they are extremely important. Until anesthesiologists have created a situation in which they can say and write what they think scientifically without regard to financial, social, or moral considerations, progress will be extremely slow.

Thus, I have several recommendations that I have the temerity to make to this Association. First, that a central commission be appointed to set up detailed criteria for the study of sudden death under anesthesia. Second, that this commission have among its members at least two physiologists, two pathologists, two pharmacologists, and two surgeons. Third, that exhaustive data on all sudden deaths be sent to this commission for study either directly or through existing anesthesia commissions. Fourth, that no case be considered for statistical purposes unless a postmortem examination has been done. The reason for this last recommendation is the fact that a pulmonary embolus or coronary occlusion, occurring under anesthesia, does not give classic signs and symptoms and, unless demonstrated by postmortem examination, such a death is almost certain to be blamed on the agent used or to ineptitude of the anesthetist. Fifth, I should like to recommend that it be realized that status lymphaticus and such terms are not descriptive of pathologic entities but are cloaks of ignorance. My own opinion, which agrees with that of Macintosh and Bannister (8), is that these deaths represent idiosyncrasy or unusual susceptibility to anesthetic agents. This needs pointed investigation and research.

Another problem which needs investigation is the apparent peculiar liability of the Negro to sudden death under anesthesia. This has been noted by several observers (9, 10). It is perfectly easy to say that the average Negro comes to operation in poorer condition and with more advanced disease than the average White, but study of individual protocols negates that easy statement. The central commission should instigate, encourage and even direct these and other pertinent investigations.

Finally, I have another recommendation, pertinent to the others made, but not a part of them. Two of the most important items in preventing deaths under anesthesia are the proper selection of agent and its mode of administration and the management of the patient before

and during anesthesia. The necessary knowledge of the normal and pathologic physiology and pharmacology of anesthesia is exceedingly large and complex. Not one surgeon in ten has been given such training or has the time or energy to acquire it. Thus, it is perfectly clear to me that the average surgeon should have little to do with anesthesiologic control. If an accident occurs the anesthesiologist is held accountable, either overtly or covertly. It is his duty to the patient and to medical science to demand the authority commensurate with his responsibility.

REFERENCES

1. Beecher, Henry K.: The First Anesthesia Death with some Remarks Suggested by it on the Fields of the Laboratory and the Clinic in the Appraisal of New Anesthetic Agents, *Anesthesiology* **2**: 443-449 (July) 1941.
2. Gillespie, N. A.: Death during Anesthesia, *Brit. J. Anaesth.* **19**: 1-16 (Jan.) 1944.
3. Michael, P.: The Pathology of Sudden Operative Death, *California & West. Med.* **44**: 179, 1936.
4. Turner, F. P., and Wilkinson, F. A. H.: Operating Room Deaths: Study of 23 Consecutive Cases in which Autopsies were Performed, *Am. J. Surg.* **57**: 242-252 (Aug.) 1942.
5. Waters, R. M., and Gillespie, N. A.: Deaths in the Operating Room, *Anesthesiology* **5**: 113-128 (Mar.) 1944.
6. Jetter, W. W., quoted by Bishop, H. F.: Operating Room Deaths, *Anesthesiology* **7**: 651-662 (Nov.) 1946.
7. Ruth, H. S.; Haugen, F. P., and Grove, D. D.: Anesthesia Study Commission: Findings of Eleven Year's Activity, *J. A. M. A.* **135**: 881-884 (Dec. 6) 1947.
8. Macintosh, R. R., and Bannister, F. B.: *Essentials of General Anaesthesia*, Oxford, Blackwell Scientific Publications, Inc., 1943, pp. 131-133.
9. Trent, J. C., and Gaster, E.: Anesthetic Deaths in 54,128 Consecutive Cases, *Ann. Surg.* **119**: 954-958 (June) 1944.
10. Veal, J. R., and VanWerden, B. DeK.: Mortality of Spinal Analgesia, *Am. J. Surg.* **34**: 606, 1936.

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