

## A DEFENSE OF SPINAL ANESTHESIA •

FRANK COLE, M.D.†

*Lincoln, Nebraska*

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A RECENT editorial (1) stated that "spinal anesthesia is dangerous." It went on to say that "one death in 500 is an appalling rate"; the number 500 had been chosen at random, it had no basis in fact, and was without significance. "It is double," it continued, "that estimated by Gillespie who calculated on the basis of a large sampling that one death occurs in every 1000 anesthetics administered." Further discussion of these values and of the element of preventability seemed to indicate that spinal anesthesia was meant. Actually, Gillespie (2) had said "Almost a quarter of a million cases are considered, and of these two hundred and eighty-three did not recover from the operation and anesthetic. The mean mortality during operation was therefore 0.12 per cent: just over one case in every thousand." Gillespie's figures refer to all anesthetics; they do not represent a study of spinal anesthesia. All seven deaths in his own series were associated with general anesthesia.

Later, the editorial contained the statement: "The statistical fact that spinal anesthesia is three times as lethal as the condemned chloroform anesthesia of fifty years ago is one to make the thoughtful ponder the deadliness of the technic so nonchalantly exercised." The basis for this statement was an article by Corlette (3) which appeared in the *Medical Journal of Australia* in 1946. Corlette had obtained his figures from an article by Bortone (4) and one by Babcock (5); both appeared in 1932. It took Corlette fourteen years to find these figures; they are now at least nineteen years old.

Bortone had reviewed anesthetics administered in New Jersey Livingston (6), in discussing Bortone's study, wrote: "My final criticism of the published conclusions has to do with the assertion that all regional and local methods combined are 52 per cent more dangerous to life than are inhalation methods, considered collectively. This brings to notice the greatest shortcoming of the investigation, namely, the study of these deaths without reference to the types of operations performed and the preoperative conditions of these patients, for example

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† Chief, Department of Anesthesiology, U. S. Veterans Administration Hospital, Lincoln, Nebraska.

without direct reference to risk. In many institutions spinal anesthesia is still reserved for solely the bad risk case." Bortone replied: "The most important thing to be remembered with regard to the use of spinal anesthesia, and one of the reasons I would never want to relinquish it, is that it really lowers the operative mortality. It is an intangible thing. It makes a difficult operation easier and quicker. Under its use, tissues need not be mauled or packs used. There is a beautiful relaxation under which to work. Spinal anesthesia, so employed, lowers the operative mortality." Bortone cared no more for his own figures than did Livingston.

Babcock, Corlette's other source for spinal statistics, reported, in 1932, "six deaths on the table out of 437 (a figure of 590 is given elsewhere in the article) administrations"; other investigators cited by her were averaging a table mortality of 1 in 2,641 (95 deaths in 250,895 spinal anesthetics). Her postoperative death rate was 1 in 28 for spinal, but it was 1 in 29 for ether (1040 ether anesthetics with 35 deaths; 590 spinal anesthetics with 21 deaths). She wrote: "The results were interesting." They were; they were the same.

So much for Corlette's own supporting articles. Waters and Gillespie (7), reviewing 51 operating room deaths during a ten year period, reported one spinal-pentothal and three spinal anesthetics. The spinal-pentothal case was grouped with the spinal, so that there were 4 deaths in 2878 cases, an incidence of 0.139 per cent. Had the spinal-pentothal case not been included with the group which had spinal anesthesia alone, the mortality rate would have been only 0.104 per cent. Trent and Gaster (8), discussing anesthetic deaths in over 54,000 cases, said: "All deaths which occurred during spinal anesthesia at this hospital were in patients judged poor operative risks who were undergoing emergency abdominal operations." Their mortality rate following spinal anesthesia was 0.11 per cent. Remember that Gillespie's value for all anesthetics was 0.12 per cent.

Foss and Schwalm (9) presented 2000 cases of ether and 2000 cases of spinal anesthesia. "Deaths in the operating room," they said, "has frequently been alleged, are by no means more frequent with spinal anesthesia than with ether. In fact, in this series, they were far commoner with ether, in a proportion of 10:1." "Postoperative deaths occurring in the first few days following operation," they wrote, "are not, as is frequently claimed, more common after spinal anesthesia. In this study the reverse was true, ether carrying a much higher mortality rate." "The majority of patients prefer spinal anesthesia," they observed from the results of a questionnaire sent to 500 patients, "this being especially true with those who have had both spinal and ether anesthesia." They concluded that: "The ultimate death rate in the hospital is practically the same following the administration of the two anesthetics." Foss and Bush (10) concluded, from a study of 10,000 consecutive operations, of which half were done under spinal and half

under general anesthesia, that the safety of spinal anesthesia "was found to equal the safety of general," and that "the likelihood of operating room deaths is no greater with spinal than with general anesthesia.

"A surgeon who operates upon a patient suffering with acute intestinal obstruction using inhalation anesthesia," according to Graham and Brown (11) "if adequate facilities for spinal anesthesia are available, is guilty of malpractice."

Campbell (12) in a study of over 1500 urologic operations, found that "the ultimate postoperative mortality was 4.4 per cent less in those patients operated upon under spinal anesthesia than in those to whom general anesthesia was administered." He spoke of "the reduction of the operative mortality following upper urinary tract surgery and prostatectomy." He found "in an analysis of pulmonary deaths following general and spinal anesthesia in (a) series of 350 cases subjected to perineal operation, the mortality ratio was 7:1—certainly an argument in favor of spinal anesthesia."

In over 10,000 spinal anesthetics at the Mayo Clinic, Stein and Tovell (13) stated that no instance of permanent motor paralysis had been encountered. "Areas of numbness in the lower extremities may, they said, "at times, be distressing to the patient but the numbness disappears in a short time and does not necessitate treatment."

Ciliberti (14) reported a case of paraplegia following general anesthesia. "Had spinal anesthesia been used," he added, "such anesthesia would have been incriminated." He referred to an article by Woltman (15), who, he said "listed senility, arteriosclerosis, infectious neuritis and trauma as important factors in the etiology of these (spinal) neuropathies. He found that convulsions, extrapyramidal rigidity and postoperative psychosis followed general anesthesia almost exclusively, while cranial nerve palsies, hemiplegia, and peripheral neuropathies followed general as well as spinal anesthesia."

Thomas and Dwyer (16) reported a case, in 1950, of paraplegia following general (ether) anesthesia. They added that "if such an accident had followed spinal anesthesia, the symptoms would have been falsely ascribed to the local toxic effects of the anesthetic agent. Perhaps some complications which have been attributed to spinal anesthesia may be caused primarily by the operation or may be merely coincidental. Many other reports have appeared of damage to the brain and even to the spinal cord after general anesthesia (17-31); these have included convulsions, spasticity, blindness, hyperpyrexia, personality change, hemiplegia, idiocy, and decerebrate rigidity.

Harrison (32) believed that "the discussion of these catastrophes has obscured the fact that for operations below the umbilicus spinal anesthesia, far from being excessively dangerous, is perhaps the safest method, and in comfort to the patient and convenience to the surgeon is almost ideal."

Simpson (33) reported 750 cases in 1930 without a death; he stated

that "we charge the patient the fee of an ether anesthesia and I demand the complete and undivided attention of an expert anesthetist."

Jackson (34) reported that "there were no fatalities in this group of 1,000 cases that could in any way be traceable to the spinal anesthesia." He also stated that "this method has made surgery 25 per cent simpler and that postoperative pneumonia, phlebitis, embolism, obstruction and other surgical complications have been reduced to a fraction of that observed with any form of general anesthesia."

Said King (35): "There have been no immediate deaths in this series. While we have had no deaths directly due to the anaesthetic itself, we do believe that it did perhaps act as a contributing factor in 68." He presented 1500 cases. The patients who died seem to have been poor risks and, in most of the instances, toxic. The blood pressure did not fall until twelve, eight, eight, four, five and two-thirds and eight hours after operation.

Jones (36) presented a series of 1000 spinal anesthetics and stated: "At the outset we may say we have had no death on the table or within three hours of the administration of the anesthetic, and we do not believe we have had any case in which we can be certain that spinal anesthesia caused death or even contributed to a fatal issue in the entire series."

Ehrlich (37) reported 150 hypobaric nupercaine cases, of which he said: "There were no deaths in this series." He later noted that: "We have now used the Jones method in 1500 cases, with results almost identical to those reported in this paper."

Shimberg (38) reported one death (not immediate, but related to the anesthesia) in a series of 1216 cases, an incidence of 0.082 per cent.

Weinstein and McHugh (39) published an article titled: "One Thousand Cases of Spinal Anesthesia Without A Death Attributable To The Anesthetic." They did have one death, however, which might be attributed to the anesthetic, a case of aspiration of fecal vomitus on the operating table, in which there had been a history of repeated vomiting, becoming copious and fecal for many hours before the operation. This would give them a mortality rate of 0.1 per cent, lower than Gillespie's value, but the authors do seem justified in not calling this a death due to spinal anesthesia.

Dino and Menez (40) had 4 deaths (on the operating table) in 5,255 cases over a period of twenty-two years. Their mortality rate was 0.076 per cent.

Thorek (41) quoted Babcock as giving the mortality rate of spinal anesthesia as 1 in 10,000.

Veal and Van Werden (42) reported 30 deaths in 33,811 cases in eleven and a half years, an incidence of 0.088 per cent.

Marvin (43) reported 2608 cases at the Boston City Hospital during "sixteen months without a fatality."

Hollenbach (44), in 1933, reported over 1000 cases without a death.

Putting together the cases offered by Simpson, Jackson, Jones, Ehrlich, Shimberg, Weinstein and McHugh, Dino and Menez, Veal and Van Werden, Marvin, and Hollenbach, there were 35 deaths in 49,120 cases, an incidence of 0.0712 per cent. If all of King's 6 deaths were attributed to the anesthetic, which should not be necessary, and his case added to the above, there would be 41 deaths in 50,620 cases, a mortality rate of 0.0809 per cent.

Rygh and Bessesen (45) collected 250,895 cases of spinal anesthesia, with 75 deaths, a mortality rate of 1 in 3345, 0.0298 per cent, or 2.98 deaths per 10,000 cases. "Of the deaths of which we have some record, they said, "only 4 were attributable to the anesthetic, presupposing a knowledge of the subject such as should now be general. Taking a corrected mortality rate from the statistics which contain these briefly reviewed deaths, and leaving out all other figures," they obtained 44,241 administrations with 4 deaths, an incidence of 1 in 11,060, 0.009 per cent, or 0.904 deaths per 10,000 cases.

Maxson (46) referred to a study by Forgue and Bassett, who compiled 222,647 cases from 75 different sources and found the mortality from spinal anesthesia to be 0.06 to 0.08 per cent.

A considerable amount of confusion results from the vagueness of the term: "anesthetic death." Anesthetic deaths may be divided into four groups: (a) those occurring on the operating table; (b) patients who die after being returned to their rooms, but who have obviously never recovered from the effects of anesthesia, in addition to group (c) deaths occurring during the first few days following anesthesia and surgery, plus groups a and b, and (d) all cases in which the patient does not leave the hospital alive. Although any one of these categories may be preferred by various investigators, it must be clearly understood what each author means when he speaks of mortality rates, and statistics presented by different workers can be compared only within identical groups.

The following paragraph is taken from Dealy's (47) article on anesthetic deaths. "Most of the interest in this whole question of anesthetic deaths seems usually to center only upon those patients who die under spinal anesthesia. Deaths under inhalation anesthesia attract much less attention. This is so even when the latter are elective or when the pathological state is comparatively simple and scarcely adequate in itself otherwise to cause death. In the cases under discussion as many patients had died under inhalation anesthesia as under spinal. Of the former, moreover, only one was operated upon as an emergency and in the majority the pathological status was comparatively uncomplicated. Of the 7 patients dying under spinal anesthesia 4 were definite emergencies, practically all were desperate cases, admittedly bad risks, and in all the pathological condition was diverse, extensive and competent in itself to result in a fatality unless corrected by successful surgical intervention. Nevertheless despite these facts, it was the spinal deaths

rather than the others that had prompted the investigation and that there had actually been an appreciable number of deaths under inhalation anesthesia as well came as a complete surprise to the professional staff."

By adding two sets of figures dealing with chloroform anesthetics, Corlette arrived at a mortality rate of 0.089 per cent, or 8.9 in 10,000. It may be noted that Gillespie's value for all anesthetics is 0.12 per cent or 12.437 in 10,000, from which the astonishing conclusion might be deduced that modern anesthesia by all methods is 39.7 per cent deadlier than "the condemned chloroform anesthesia of fifty years ago." With statistics, it has been said, "you can prove anything, even the truth."

Mortality figures of fifty years ago cannot be compared with modern statistics; they are surprisingly low, owing, no doubt, to the fact that surgical procedures then were brief and were largely minor and palliative. As an example, here are mortality rates published in 1897 (48). Notice that they are lower than modern values for all anesthetics.

Clarke's (48) figures, published in 1883, were: "Grand total for the seven years—14,436. Death rate—0.034 per cent."

"Combined statistics of Gurlt, of Berlin, and Juillard, of Geneva:  
Chloroform—691,319 cases, 224 deaths. One death in 3082 (3082) cases.

Ether—341,058 cases, 23 deaths. One death in 14,828 cases."

In deaths per 10,000 administrations, then, the most reliable figure for all anesthetics is 12, while the value for spinal anesthesia, obtained here from many obviously sincere studies, is 7 and, in another large study, 6 to 8. To attempt to calculate, as Corlette did, "the overall mortality rate for spinal anaesthesia, as at present known," from these sources, is unjust.

Most of the available mortality studies are old. Corlette reproduced the results of Babcock's questionnaire. She wrote to 124 hospitals and 18 replied: 40 operating table deaths occurred in 15,652 spinal anesthetics. I have given nearly this many spinal anesthetics and have had no deaths on the table or in any way attributable to the anesthetic.

The various series and their mortality rates are shown in table Without an accurate count, I have estimated the number of my own spinal anesthetics at about 10,000; I have entered a minimal figure 7000 in the table as my series. I do know that I have until now had no deaths, on or off the table, attributable in any way to a spinal anesthetic, and it is my practice to employ single-injection spinal block for almost all subdiaphragmatic surgery, except, perhaps, gastrectomy and often but not invariably, cholecystectomy.

The studies offered on both sides of the question were made between 1930 and 1943. Spinal anesthesia has come a long way since then. It has too long suffered unjustly because too many surgeons thought that

it was an anesthetic they could give and leave the patient without either a doctor or nurse in attendance. The attitude of not watching patients who have spinal anesthesia is still shared by many surgeons and anesthesiologists. The unattended patient who has spinal anesthesia is unsafe, but to discard spinal anesthesia because of this is unwarranted. Many studies have been made to demonstrate its worth and its safety. It deserves, not condemnation, but appreciation, and requires only to be administered by trained physician anesthetists.

It is entirely safe so long as it is considered to be a major medical procedure. Like any other form of anesthesia, it can be made dangerous by performing it recklessly and inviting disaster. I have come to look upon spinal anesthesia with an enormous amount of respect. I do not perform it lightly, nor do I attempt it without first preparing myself for

TABLE 1

Author	Cases	Deaths	Deaths per 10,000 Cases
1. Spinal anesthesia only			
a. Jackson, Simpson, Jones, Ehrlich, Shimb- berg, Weinstein and McHugh, Dino and Menez, Veal and Van Werden, Marvin and Hollenbach	49,120	35	7.12
b. Cole	7,000	0	0
c. Rygh and Bessesen	250,895	75	2.98
d. Rygh and Bessesen, corrected	44,241	4	0.904
e. Forgue and Bassett	222,647	—	6 to 8
f. (a) plus (b)	56,120	35	6.23
2. All anesthesia			
g. Gillespie	227,546	283	12.437

the few untoward eventualities which I know may follow. When done in this way, its mortality rate may be made to approach the ideal of zero.

When a patient dies under spinal anesthesia, it is dramatic and, for some inexplicable reason, an unnecessary death seems to the spectator to have occurred, even though the mortality rate may be the same as that for general anesthesia, or even lower. When a death occurs under general anesthesia, the connection between the fatality and the anesthetic seems less apparent or direct; for some reason, the anesthetic seems not to be at fault, and the death is attributed to an unknown factor, to some consequence of the surgery, or especially to a hidden and mysterious defect in the patient's condition. Probably the reason for this is that deaths from spinal anesthesia occur quickly and that their causes are few and are clear-cut and well known, while deaths due to general anesthesia result from causes that are vague, less clearly defined, and not as well understood. Patients die of spinal anesthesia only because of hypotension or respiratory depression; their mode of occur-

rence, prevention and treatment are well understood. General anesthesia is not on as firm a foundation. Untoward consequences of spinal block are almost always immediate, so that first, the time of their occurrence is known and they cannot be said, therefore, to be unanticipated, and second, the battle is of short duration and does not need to be fought continuously, as during general anesthesia. This last is to say that the trauma inflicted by spinal block is short and occurs usually only during the first fifteen minutes, while the harm done by general anesthesia continues during the entire procedure.

Not many years ago it was the policy of the anesthesiologist to recommend spinal anesthesia. Spinal block was new then and was regarded as a highly specialized procedure. Since that time the mortality rate of general anesthesia has changed little if at all, while the mortality rate of spinal anesthesia has steadily decreased. Surely spinal block should be advocated now even more strongly than before.

I have seen an intern sitting with a patient who has had a spinal anesthetic that he did not give, who did not know what to look for or what to do. I have known anesthetists who never gave more than 10 mg. of tetracaine (pontocaine) and others who never used less than 20. I have spoken to men who never tested the level of anesthesia and who never took blood pressures. Disaster does not strike without warning. What spinal anesthesia needs is common sense.

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