

STATISTICAL ANALYSIS OF ANESTHESIA AT THE CLEVELAND CLINIC *†

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Received for publication February 24, 1948

SEVERAL significant changes in the types and methods of administering anesthesia have occurred in the Cleveland Clinic Hospital. A comparison of the types of anesthetic agents administered in 1946 and 1947 reveals a number of differences. In 1946, which was the peak year thus far, 9,724 surgical procedures were carried out as compared with 9,356 in 1947. In 1947, however, 455 of these cases involved minor procedures such as proctoscopy, changing of casts, and simple suturing, for which anesthesia was not required.

In 1947, 208 patients were operated on under regional block anesthesia. This includes abdominal wall block, intercostal block and cervical block.

Previously, such procedures were classified as local anesthesia. The present classification of local anesthesia includes only that which is administered by members of the surgical department, without the services of an anesthesiologist, such as in tonsillectomies, endoscopies, vein ligations and biopsies. In 1946 the administration of 2,807 local anesthetics was recorded, while 1,717 were given in 1947. When these figures are corrected for the above reasons, a decrease of 427 cases may be seen.

Spinal anesthesia was used in 2,180 cases in 1946 and in 2,207 cases in 1947. This is not a remarkable increase until one examines the figures for continuous spinal anesthesia. In 1946 continuous spinal anesthesia was used 198 times, but in 1947 only 79 times, with none being used since July. This may be explained first because technics of single injection are adequate for operations taking less than two hours. Second, curare is used to prolong relaxation in waning spinal anesthesia.

Avertin as a basal or sole anesthetic agent was used 484 times in 1946 and 218 times in 1947. This marked decrease is the result of a concomitant increase in the use of pentothal for induction in the nitrous oxide, oxygen, and ether sequence.

Pentothal was used as the sole anesthetic agent in 2,601 cases in 1946 and in 2,853 cases in 1947. Endotracheal anesthesia was used 65 times in 1946 and 157 times in 1947.

* Presented at the meeting of The Cleveland Society of Anesthesiologists, Cleveland, Ohio, January 21, 1948.

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The use of inhalation anesthesia decreased from 1,627 to 1,407 in the two years compared. This also includes the recently adopted technic of using vinethene in place of ether in the vaporizer of the gas machine. This procedure is especially valuable in out-patient cases in which anesthesia of short duration and rapid recovery are desired.

Curare was used in 53 surgical procedures in 1946, while it was employed 266 times in 1947. An additional 40 patients received curare for the treatment of multiple sclerosis and other spastic diseases.

Sympathetic blocks increased from 422 in 1946 to 808 in 1947. Of interest in this classification is the change from paravertebral lumbar sympathetic block to a caudal approach. Two hundred and thirty-six such caudal blocks are included in the total for 1947.

Intravenous procaine was used 4 times in 1946 and 27 times in 1947. Favorable results were reported in 10 patients with pruritus and in 1 patient with cardiac irregularity during operation. Indifferent or poor results were recorded in 12 patients with arthritis and 3 patients with intractable pain. One patient with hiccups received no benefit.

Intravenous ether was used 4 times in 1946 and 5 times in the first nine months of 1947.

Controlled hypotension by withdrawal of blood was used during 17 operations in 1946 and 60 times in 1947. In this procedure operative hemorrhage is controlled by reducing the patient's blood pressure, and this technic is not to be confused with arterial transfusion. The records of this latter technic are difficult to keep, since many departments other than the anesthesia department employ this method.

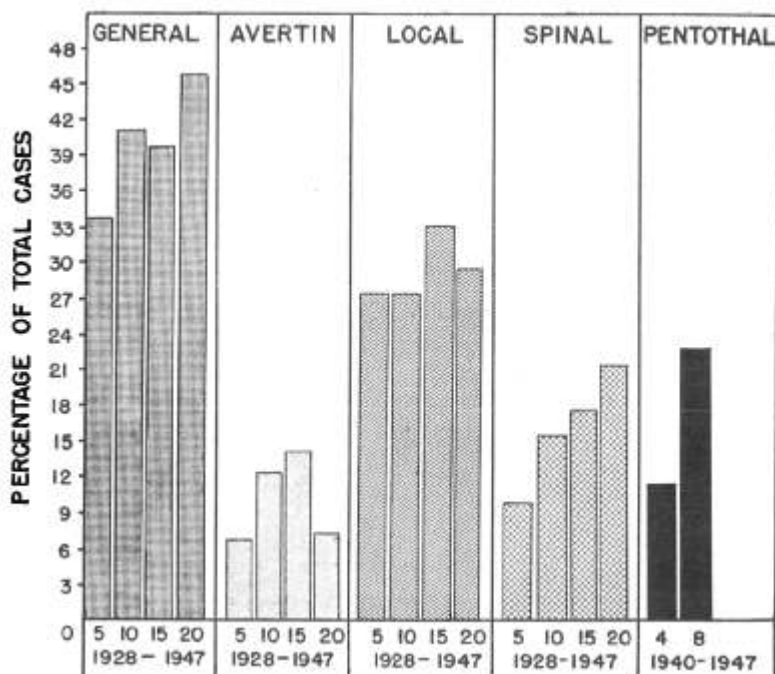
The services of a professional anesthesiologist was introduced to the Cleveland Clinic Hospital in 1946, and the statistics for the two years prior to this innovation are interesting when compared with those of the two years that followed. It will be seen in table 1 that

TABLE 1

	1944-1945, Per Cent	1946-1947, Per Cent
Local	30.4	27.2
Spinal	21.0	22.9
General	42.9	49.3
Avertin	10.2	3.7
Pentothal	16.2	28.6
Total Cases	7925	9540

the average number of total cases per year increased from 7,925 in the years 1944 and 1945 to 9,540 in 1946 and 1947. This great increase serves to make the percentages even more significant than they appear at first glance. This table also reveals a decrease in the number of local anesthetics. This may be explained by the fact that more thyroidectomies are being performed under endotracheal anesthesia, as opposed to the former method of local infiltration by the surgeon.

The use of spinal anesthesia has increased slightly but does not show a significant change. It should be mentioned, however, that formerly all the spinal anesthetics were given by members of the surgical service, whereas these are now given by members of the Department of Anesthesiology. General anesthesia has continued to occupy the major position and includes all forms of anesthesia in which the patient is put to sleep except spinal anesthetics with supplementation. The use of avertin as a basal agent has shown a considerable decrease owing to its replacement by sodium pentothal. The use of pentothal alone has almost doubled in the years 1946 and 1947, partly because of an increase in the number of neurosurgical operations, for which pentothal is employed almost exclusively. Additions to the work of the department include sympathetic blocks, controlled induced hypotension, arterial infusion, supervision of the blood bank and inhalation therapy.



It may be interesting to observe the changes in types of anesthesia over a more extensive period of time. The graph shows the over-all changes for the past twenty years. It is evident that the use of general anesthesia has increased in the last five-year group to the average of 45.9 per cent, almost half the number of operations performed. In contrast, avertin has decreased in the last two groups from 14 per cent to 7 per cent. Local anesthesia has maintained a rather steady pace over the years. This is a tribute to the late Dr. George W. Crile, who was one of the foremost advocates of this type of anesthesia. Spinal

anesthesia has climbed steadily from 10 per cent in the first group to 21 per cent in the last group. Pentothal was introduced in this hospital in 1940 and doubled in use in the last four years.

Since space does not permit the complete breakdown of all classifications of anesthesia, we have chosen spinal anesthesia as the most interesting and have completely subdivided it, as illustrated in table 2. The total number of spinal anesthetics administered in 1947 was 2,207. Continuous spinal anesthesia was used 79 times, or 3.6 per cent of all anesthetics given. In this technic the original dose was 10 mg. of pontocaine combined with 200 mg. of dextrose and 50 mg. of ephedrine.

TABLE 2

Total Spinal	2207	Continuous Spinal	79
	Per Cent		Per Cent
Procaine	24.2	Spinocaine and Pontocaine	1.9
Pontocaine	4.7	Pontocaine, Dextrose, Ephedrine	17.3
Spinocaine	8.1	Pontocaine and Procaine	41.6
		Spinal and Pentothal	58.4%
		Spinal and Curare	0.9%

This was supplemented after two hours with an additional dose of 33 mg. of procaine and 3 mg. of pontocaine and repeated every half hour as needed. In the single injection technic, procaine was used in 24.2 per cent, and pontocaine in 4.7 per cent; this includes the use of hypobaric 0.1 per cent solution. Pontocaine mixed with procaine, using the 10 and 100 mg. strength, was employed in 41.6 per cent of cases, and spinocaine in 8.1 per cent. In September, spinocaine, 100 mg., mixed with pontocaine, 10 mg., as a hypobaric solution was first used and has since been employed in 1.9 per cent of cases. These agents, administered with the patient in the prone position, proved to be satisfactory for lumbodorsal sympathectomy and removal of herniated intervertebral disk. Pontocaine, dextrose and ephedrine have been used in 17.3 per cent of cases, mostly for upper abdominal or prolonged operations (1). In 58.4 per cent of the spinal anesthetics, sodium pentothal was used as a supplementary agent, and in 0.9 per cent curare was used because of either prolonged operating time or inadequate relaxation.

SUMMARY

It is evident that over a period of years an increasing number of operations is being performed demanding better and more varied anesthesia. In addition, the services of the anesthesiologist have been required to aid in diagnosis and treatment in fields outside the domain of anesthesia.

REFERENCE

1. Potter, J. K., and Whitacre, R. J.: Pontocaine-Dextrose-Ephedrine for Spinal Anesthesia. *Anesthesiology* 7: 499-503 (Sept.) 1946.