

THE USE OF CURARE IN GENERAL ANESTHESIA

HAROLD R. GRIFFITH, M.D., AND G. ENID JOHNSON, M.D.*

Montreal, Canada

EVERY anesthetist has wished at times that he might be able to produce rapid and complete muscular relaxation in resistant patients under general anesthesia. This is a preliminary report on the clinical use of a drug which will give this kind of relaxation, temporarily and apparently quite harmlessly.

The physiological action of curare as an interrupter of the neuromuscular mechanism has long been recognized, and its best known practical applications have been by South American Indians as an arrow poison and in the physiological laboratory. The crude curare of the South American forests contains numerous toxic substances, but it has been possible so to refine the drug that the elements of cardiac and respiratory depression are removed and only the "pure" curare effect remains.

For several years this purified curare has been used experimentally in psychiatric hospitals to prevent traumatic complications in convulsive shock therapy. Bennett (1), Gray (2) and others have reported on the efficiency and harmlessness of curare when used for this purpose in quite a large number of patients.

In January, 1942, at the suggestion of Dr. L. H. Wright, we began using Intocostrin (Extract of Unauthenticated Curare, Squibb) in order to increase skeletal muscular relaxation in patients under general anesthesia. So far, we have given it to 25 patients, and in each case there has been rapid and complete muscular relaxation, which develops within one minute after intravenous injection of the drug and gradually disappears in from ten to fifteen minutes. In none of our patients has there been any serious depressing effect on respiration, pulse or blood pressure, and there was no demonstrable postoperative effect of any kind. Apparently the drug is very rapidly broken down and excreted almost as rapidly as it acts, although there is some evidence from the psychiatric experience that patients who are given a second injection on the same day require a smaller dose to produce the physiological effect.

We administer the Intocostrin intravenously with a dosage of 10 to 20 mg. of the active curare per 20 lbs. of body weight. Intocostrin is prepared in solution containing 20 mg. of the active curare substance per cubic centimeter, so that an average adult dose is 4 to 5 cc. We have

* From the Department of Anesthesia, Homoeopathic Hospital of Montreal.

not given to any one patient more than 5 cc., and we make the injection rather rapidly, in less than a minute.

It has not been necessary to administer artificial respiration or stimulants in any of our cases. As our patients are all under gas anesthesia, with means of resuscitation by oxygen immediately available, we do not fear this complication. Since prostigmine is used as an antidote to curare, an ampule of this drug should always be available.

The operations during which curare was given have been as follows:

Appendicectomy	12
Cholecystectomy	4
Laparotomy	3
Curettag of Uterus	2
Hemorrhoidectomy	2
Colostomy	1
Nephrectomy	1
Total	25

All the patients were under cyclopropane anesthesia, and ranged in age from 18 to 70 years. Since we do not ordinarily have difficulty due to inadequate relaxation during cyclopropane anesthesia, in many of these cases the anesthesia was purposely lightened to the point of abdominal straining in order to test the effect of the curare. Several cases, however, have illustrated the possible real usefulness of this drug to the surgeon.

One case was that of a man weighing 250 lbs. who insisted on general anesthesia for hemorrhoidectomy. Under cyclopropane anesthesia, relaxation of the anal sphincter was unsatisfactory. Immediately after the administration of 5 cc. of Intocostrin, complete relaxation was obtained, and the operation was easily performed.

Several of the cases of appendicectomy were in healthy young adults undergoing operation for an acute infection, and who were particularly resistant to anesthesia. When the surgeon began to close the peritoneum the abdominal muscles became tense, a situation which arises at times in the experience of every anesthetist. We administered 5 cc. of Intocostrin, and within one minute the abdomen was "soft as dough," and the surgeon was able to finish the operation without any difficulty.

In one case of curettage the Intocostrin was given to see if there would be any effect on the muscular tone of the uterus or cervix, and no effect was observed. The other case of curettage was an extremely obese woman on whom the surgeon found it difficult to make a satisfactory bimanual examination. The Intocostrin gave such complete relaxation of the abdominal musculature that he was able to feel the pelvic organs without difficulty.

It seems to us, as the result of these preliminary clinical investigations, that curare may prove to be a drug which will occasionally be of great value, and will give us a means of providing the surgeon rapidly

with excellent muscular relaxation at critical times during certain operations.

Its scope of usefulness is limited because of its somewhat fleeting action, and because it is in no sense an anesthetic agent. It is potentially a dangerous poison, and should be used only by experienced anesthesiologists in well-equipped operating rooms; but we have been so much impressed by the dramatic effect produced in every one of our patients that we believe this investigation should be continued.

The Intocostrin used has been supplied through the courtesy of E. R. Squibb & Sons, to whom we are grateful also for friendly assistance.

SUMMARY

A purified extract of curare (Intocostrin) has been administered intravenously to 25 patients under light general anesthesia. In each case temporary but complete muscular relaxation was rapidly produced with apparently no harmful effect.

REFERENCES

1. Bennett, A. E.: Preventing Traumatic Complications in Convulsive Shock Therapy by Curare, *J. A. M. A.* 114: 322-324 (Jan. 27) 1940.
2. Gray, R. W.; Spradling, F. L., and Feehner, A. H.: The Use of Curare in Modifying Metrazol Therapy, *Psych. Quart.* 15: 159-162 (Jan.) 1941.

For the information of anesthesiologists who are contemplating application for certification by the American Board of Anesthesiology, Inc., or who are training physicians for the specialty, the following questions have been employed for Part I (written) examination in the past in *Physiology*:

1. Assuming that they are all available, under what circumstances during anesthesia would you recommend the intravenous use of glucose, whole blood, plasma, and normal saline solutions?
2. If a patient stops breathing during cyclopropane anesthesia what may be the cause? How should treatment be attempted?
3. "By using the carbon dioxide absorption technic the anesthetist attempts to maintain more nearly normal physiological function than can be had with the open technic." Give the arguments that might be used for or against the accuracy of this statement.
4. Define: (a) Acapnia, (b) Hypoxia, (c) Polypnea, (d) Respiratory quotient, (e) Tidal air, (f) Acarbia, (g) Apnea, (h) Tachypnea.
5. State one theory to explain the hypotension during high spinal anesthesia. What laboratory investigations have been completed to support it?
6. Explain briefly the significance to the anesthetist of the commonly used term "reflexes." Identify these reflexes: (a) Vago-vagal, (b) Carotid sinus, (c) Traction, (d) Hilar, (e) Periosteal, (f) Anal sphincter.