A COMPARISON OF ETHER, SPINAL, AND CYCLOPROPANE ANÆSTHESIA*

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AT the Prince Edward Island Hospital we are using ether, cyclopropane and spinal anæsthesia in about the same number of operations. Looking over the records, I found that up to and including the year 1933 we were using ether almost exclusively; in 1934 we began to use spinal anæsthesia regularly; and in November, 1936, we started using cyclopropane.

This is the record for the past six years.

	Ether	*Spinal anæsthesia*	*Cyclo-propane*	
1933.....	90%	5 cases	nil	The remainder received chloroform, nitrous oxide with oxygen, and local anæsthesia.
1934.....	60%	35%	nil	
1935.....	80%	15%	nil	
1936 to Nov. 1936	70%	25%	nil	
Nov. & Dec.	40%	25%	30%	
1937.....	40%	20%	35%	
1938 to date	40%	10%	45%	

You can see what may happen in the course of a morning's work in the operating room, *viz.*, that the first operation may be under ether, the next under spinal anæsthesia and the next under cyclopropane. This actually does occur on many days. When asked to prepare a paper for this meeting I decided to give you something on the results we are having with these three anæsthetic agents, and try and arrive at an estimate of the relative value of each.

In order to make a comparison of their respective values I have adopted a scheme of measurement—a yardstick it has been called—with ten sections or headings, and I am allotting so many points to each under the various headings something after the manner of judges at our shows when they grade the article by the number of points scored in a particular class.

1. *Safety.*—We will all agree that safety is one of the prime requisites of an ideal anæsthetic. We might go farther and say it is the first essential element. How shall we judge safety? I find the usual criterion is the number of deaths during the operation, which is hardly fair. For instance, if the patient "bled to death" during the operation you should never charge that to the anæsthetic. Nevertheless it is always easy to attribute to the anæsthetic or to its mode of administration any unusual complications which cannot be accounted for otherwise. I think we should take into consideration the condition of the patient prior to the operation, the time taken to perform the operation, the nature of the operation, and also the difficulties encountered during the operation in order to keep the patient within the safety-zone.

Ether has always been regarded as a very safe anæsthetic, if not the safest of all. On the other hand there is a great diversity of opinion as to the safety of spinal anæsthesia. Some say it is safer than ether, while others assert that it is more dangerous than chloroform. Cyclopropane, being one of the newer anæsthetics, has yet to make its reputation.

We had one death on the operating table while administering ether. The patient, a woman, was apparently a first-class risk; the heart, lungs, kidneys were normal as shown by chart. Five minutes after the operation started she suddenly went bad. The pulse became weak, the respirations feeble, and in spite of everything we could do she died. Evidently the death was due to the anæsthetic. No post-mortem was done. Our greatest difficulty with ether is to maintain normal respiration, and I have a feeling that this has increased since we began heavier premedication, especially if avertin has been given and to a less extent after nembutal. The respirations become feeble and may stop, requiring artificial respiration, which is rather awkward for the surgeon and embarrassing to the anæsthetist. It seems to require less ether to paralyze the respiratory centre, and it is therefore necessary to watch the breathing very closely. We have less trouble with the circulatory system, and I think this is largely due to our routine practice of giving intravenous saline and glucose in all operations that we think may continue for an hour or more. We do this regardless of the anæsthetic employed and in all cases where the patient is considered a poor risk.

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Although we have had no deaths under spinal anæsthesia we did have several cases which gave us some very anxious moments. I will never forget one case—I would say he was a good half-way "across the Jordan", and it required twenty minutes hard coaxing with artificial respiration, oxygen, and stimulants to bring him back to this side. In about 10 per cent of the cases under spinal anæsthesia we experience some minor troubles, such as lowering of blood pressure, distressed respirations, and some nausea, but I have learned during the past year that a little cyclopropane will relieve these conditions, so that our worries seem to be decreasing from year to year. In fact, there are many cases in which we never take the blood pressure. This however, can be said, that the higher the anæsthesia, the more difficulties are encountered; in other words the higher the anæsthesia, the greater the danger.

We have been singularly free from worry and anxiety with cyclopropane, but not altogether. That is perhaps too much to expect. The breathing is very quiet under this gas; often one must watch the bag to know whether the patient is breathing or not. This, in itself, is rather disconcerting, especially to one accustomed to giving ether. Notwithstanding this, I feel more at ease with a patient under cyclopropane than under ether or spinal anæsthesia. Value: ether 90; spinal anæsthesia 80; cyclopropane 95.

2. *Potency.*—The ability to abolish pain and spasm is another essential requisite of the ideal anæsthetic. All three will abolish pain, but they vary in their power to control spasm. There is always perfect relaxation under spinal anæsthesia. It is sometimes necessary to push ether beyond the safety-zone in order to produce the relaxation some surgeons desire. Cyclopropane does not give adequate relaxation in 50 per cent of cases in our experience. Value: ether 90; spinal anæsthesia 100; cyclopropane 50.

3. *Control.*—Ether and cyclopropane, being volatile anæsthetics, are comparatively easy to control; cyclopropane being more volatile than ether is therefore the more controlable. The patient is anæsthetized in less time with cyclopropane and regains consciousness quicker. In spinal anæsthesia if the anæsthetic effects have reached too high a level, causing embarrassment of the respiration, there is no means of control, one has only to wait until the effects of the drug have passed off, and in the meantime combat the symptoms as they arise with artificial respiration, oxygen, and stimulants. However, there are three means by which the height of the anæsthesia can be controlled, 1st, by posture; 2nd, by the interspace where the spinal is given; and, 3rd, by the amount of fluid given with the drug. We always use the third interspace if possible. After nupercain is given I raise the head of the table about 20 degrees and lower the feet. Then I watch very carefully the anæsthesia as it creeps upwards; when it reaches the desired height I reverse the table. With novocain the technique is just the opposite, but the head is seldom lowered more than 10 degrees. I feel that this is the most important measure of the three. We may be "fooling ourselves" in so thinking, but this much I am sure of, *viz.*, that the time required to reach a certain level, be it umbilicus or ensiform cartilage, varies considerably in almost every case. Sometimes the desired level is reached in 2 minutes and again it may be 10 or 12 minutes before it even reaches the umbilicus, so that if one should keep strictly to a certain time limit the level of anæsthesia would sometimes be too low, at other times too high. Values: ether 90; spinal anæsthesia 50; cyclopropane 100.

4. *Toxicity.*—I have included toxicity in the yardstick because I feel it is an essential requisite of an ideal anæsthetic. I mean by toxicity the toxic effects on the different organs, not the effects of overdoses or maladministration. The use of chloroform has been largely banned because of its toxicity.

I realize I am not capable of placing a value in this section on the anæsthetic agents under consideration, but from my reading of articles by Anderson, Bourne, Raginsky and others I would say we need not worry over the toxic effects of any of them. However, if I had a patient with damaged heart or faulty function of the liver or kidneys I would feel safer with cyclopropane than with ether or spinal anæsthesia. Value: ether 90; spinal anæsthesia 90; cyclopropane 100. The remaining sections of the yardstick can hardly be regarded as primary requisites of an ideal anæsthetic. Nevertheless they are more or less important.

5. *Comfort.*—It is under this heading that cyclopropane far surpasses ether and spinal anæsthesia. With it the patient falls into a natural sleep in one to two minutes and is ready for the operation in four to six minutes. There

is no excitement, no struggling, no rigidity—all is peace and quietness.

Ether, on the other hand, is not an agreeable anæsthetic, either from the patient's standpoint or that of the anæsthetist. There is always more or less excitement and rigidity, with a tendency to nausea and vomiting. I know the textbooks say that these can be largely avoided if ether is properly administered. I have seen a large number of doctors and nurses give ether in many of the larger as well as smaller hospitals and the irritation of the ether has always a tendency to produce spasm with its consequent discomfort.

With spinal anæsthesia there is a certain amount of discomfort. It is never a pleasant sensation to get a jab in the back even if it is only from a hypodermic needle. Then also it is sometimes necessary to make several attempts at different angles in order to reach the spinal canal. After the anæsthetic is given the patient often complains of a disagreeable sensation in his legs. "If I could only move my legs" is a common expression. Values: ether 50; spinal anæsthesia 75; cyclopropane 100.

6. *Complications.*—The nausea and vomiting following ether anæsthesia are the two factors that have made people dread an anæsthetic perhaps more than any other. They are unconscious to a large extent of the distress during induction, but they never forget the ether sickness following the operation. An anæsthetic which would banish all the distressing sequels of an operation would be a welcome addition to the armamentarium of the anæsthetist. Whether we have such an agent in cyclopropane it is perhaps too soon to say, but this much is certain, that with it nausea, vomiting, distension, gas-pains, and even pneumonia are not met with so often as with ether. Another thing I have noticed is that there is never the excessive perspiration which we often see with ether. With spinal anæsthesia there is less vomiting than after ether, but, strange as it may seem, there appears to be as much pneumonia following spinal anæsthesia as after ether. There is, however, one rather serious complication which we have had after spinal anæsthesia, and that is severe headache. One patient had a very distressing headache for almost six months. Two others had severe headache, but it did not continue so long, while quite a large percentage suffer from headache for several days. Value: ether 50; spinal anæsthesia 60; cyclopropane 95.

7. *Simplicity of administration.*—One would never think of asking a layman or a midwife to give cyclopropane or a spinal anæsthetic, and I suppose all of us who have had any experience in country practice have requested midwives and laymen to give ether and chloroform for us time and time again. Therefore it would appear that ether is much simpler to administer than cyclopropane or spinal anæsthesia. On the other hand, it does not require much training to be able to give cyclopropane, especially if one is accustomed to giving nitrous oxide or ethylene. In my own case I had the good fortune to be in Montreal when Dr. Harold Griffith commenced using this gas at the Homœopathic Hospital. I spent a week with him at that time. I came home enthusiastic over the new anæsthetic, but it was a year later before I began to use it at our hospital, after spending another week with Dr. Griffith. That was the extent of my training with cyclopropane. Now I would rather give it than any other anæsthetic.

The technique of spinal anæsthesia appears simple, but it is not always so easy as it looks. We had four cases in which we failed to get the needle into the spinal canal, and had to revert to ether. Value: ether 100; spinal anæsthesia 90; cyclopropane 95.

8. *Scope of usefulness.*—We have never attempted to use spinal anæsthesia for any operation above the level of the diaphragm. Ether has been used in every conceivable type of operation. It cannot be employed in operations about the head and neck when cauterization is required. Cyclopropane can be used for any operation where ether can be used and has the same limitations on account of its explosiveness. Just here I might say that we do not take any extra precautions in our hospital on account of the explosive nature of cyclopropane. Our operating room is partially air-conditioned, and we can change the air in it every 10 or 15 minutes if necessary. Values: ether 90; spinal anæsthesia 50; cyclopropane 90.

9. *Popularity.*—The popularity of any agent is not a very dependable criterion of its value in this day of high pressure salesmanship. I think we can better gauge the value of an anæsthetic by the way it is received by surgeons and anæsthetists. In our hospital cyclopropane has replaced ether and spinal anæsthesia in about 50 per cent of the operations, and the same ratio

is seen in other hospitals where it is used. In the Homœopathic Hospital, Montreal, cyclopropane is used almost exclusively, and I saw a report of the Lahey Clinic some months ago to the effect that cyclopropane was given in 13.3 per cent of all operations in 1934, 34 per cent in 1935, and 54.5 per cent in 1936. Value: ether 50, spinal anæsthesia 50; cyclopropane 100.

10. *Cost.*—This, of course, has nothing to do with the efficiency value of the anæsthetic, but from the trustees' standpoint it is a rather important factor. In our hospital the cost per patient for ether was 55 cents, spinal anæsthesia varied from 40 to 75 cents, while the cost of cyclopropane per patient was $1.00, not including the oxygen. Value: ether 100, spinal anæsthesia 100, cyclopropane 50.

What is the result of our analysis of the merits of each?

	Ether	*Spinal anæsthesia*	*Cyclopropane*
1. Safety	90	80	95
2. Potency	90	100	50
3. Control	90	50	100
4. Toxicity	90	90	100
5. Comfort	50	75	100
6. Complications	50	75	90
7. Simplicity of administration	100	90	95
8. Scope of usefulness	90	50	90
9. Popularity	50	50	100
10. Cost	100	100	50
	800	760	870

This shows that each has its good points while none can be regarded as the ideal anæsthetic in all respects. Cyclopropane heads the list, and I think deservedly so. I believe that the hospital that has not provided its anæsthetist with the facilities to administer cyclopropane is not giving its patients all the benefits of the advances made in anæsthesia in the past five years.

In conclusion, I would like to express my appreciation of the values of these anæsthetics in a more personal way. If I should be so unfortunate as to require an abdominal operation at any time I would wish to be given a spinal anæsthetic, for I feel that the surgeon would then be working under the most ideal conditions, and this, I believe, would far outweigh any risks occasioned by this method of anæsthesia. However, I would make the proviso that if I should become "seasick" during the operation, when the surgeon begins to explore I would want a little cyclopropane to ease the discomfort. If I should ever require a rib-resection or a thoracoplasty I certainly would demand cyclopropane; if a thyroidectomy, I would like the surgeon to commence under local anæsthesia and if things became disagreeably painful when working in the deeper structures I would want some cyclopropane added; and if I should ever require to have my tonsils removed I would wish to have cyclopropane by the intratracheal method. So you see I am pretty much "sold" to cyclopropane.

OTITIS MEDIA FROM THE PÆDIATRICIAN'S VIEWPOINT*

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THIS disease in infancy demands the closest cooperation between otologist and pædiatrician.[1] As Duel[2] has said, "The otologist who operates on an infant with otitis needs the pædiatrist to help in the subsequent care just as much as the pædiatrist needs him (the otologist) to do the operating". Otitis media is usually ushered in with pædiatric rather than otologic symptoms; a painful cough, diarrhœa, anorexia or loss of weight suggests to the mother the need of a pædiatrist rather than an otologist. The diagnosis having been made, the primary decision as to whether myringotomy should be performed rests with the pædiatrist. One often hears otologists say that it never does any harm to open an ear drum, that all inflamed ear drums should be opened. Let me quote the opinion of Kopetzky[3], discussing the surgical treatment of streptococcal otitis, "As a result of long observation it has become evident that to incise the drum too early in the course of the development of an acute suppuration of the middle ear is to add a factor toward the promotion rather than toward the retardation of the middle ear infection".

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