The somnolent type of cerebral hemorrhage, which is most frequent in prematurely born infants, is characterized by apathy, a subnormal temperature, difficulty in swallowing, fleeting cyanosis, and sometimes a depressed fontanel.

Infants suffering from cerebral hemorrhage refuse food entirely or take very little nourishment. Because such infants do not take food well, they become dehydrated very rapidly.

With the exception of the fleeting cyanosis, the skin of infants suffering from cerebral hemorrhage is usually dusky red, the duskiness being constant and most apparent on the trunk, the face at times being even pale. If there are active symptoms of cerebral hemorrhage, the duskiness may persist for days or even weeks. Retinal hemorrhages are sometimes present; these often result in optic atrophy.

If the cerebral hemorrhage is part of a hemorrhagic diathesis, there may be bleeding from the umbilicus, mouth and rectum. The coagulation and bleeding time of the blood are prolonged in these cases.

It is thus seen that not all cases of cerebral hemorrhage are of the same type, clinically or pathologically; further, that some meningeal hemorrhage may absorb without leaving any scar, even if no treatment is used. I therefore believe that in the somnolent type of cerebral hemorrhage spinal puncture is not necessary and, if done once, should not be repeated. In the irritative type, however, spinal puncture should be done for therapeutic purposes and may even be repeated.

The most important part of the treatment in cases that have been diagnosed as, or are suspected of being, cerebral hemorrhage is, I believe, complete rest. The infant should not be permitted to nurse from the mother but should receive the feedings by bottle, spoon or dropper. The feeding portions should be small, so that the baby will not be fatigued and cyanosis thus be produced. If breast milk is not available, diluted milk should be given. Physiologic solution of sodium chloride should be given subcutaneously for dehydration. The body heat should be maintained by keeping the infant in an incubator or by applying external heat by means of hot water bottles. Intramuscular blood is an accepted procedure.

In fleeting cyanosis either oxygen or a mixture of 95 per cent oxygen and 5 per cent carbon dioxide has been advocated. The Henderson apparatus would be very useful for this purpose, but the mask is too heavy for the baby. Oxygen by catheter is useful, but the supply of oxygen is uncertain; a small oxygen tent may be useful. Hess has recently devised a flow meter for administering oxygen to prematurely born infants in the incubator. I use oxygen without carbondioxide in my cases.

If the patient has convulsions, sedatives, such as sodium bromide or sodium amytal should be given rectally. Introduction of a hypertonic solution of sodium chloride or from 10 to 15 per cent dextrose solutions, intramuscularly, may also be used for relief of increased intracranial pressure.

30 North Michigan Avenue.

TABLE 2.—*Pathologic Changes in Forty-Five Cases of Intracranial Hemorrhage of the New-Born*

Location of Hemorrhage	
Meningeal	45
Ventricular	15
Intracerebral	2
Type of Meningeal Hemorrhage	
Subarachnoid	45
Subdural	27
Tentorial tear	6
Falx tear	4

TABLE 3.—*Incidence of Cerebral Hemorrhage in Prematurely Born Infants Admitted to the Sarah Morris Hospital, 1927-1934 Inclusive*

Total admissions	1,527
Cases of cerebral hemorrhage	292
Deaths	173
Survivals	119

U. S. P. ETHER FROM LARGE DRUMS AND ETHER FROM SMALL CANS LABELED "FOR ANESTHESIA"

COMPARISON IN SEVEN HUNDRED AND TWO OPERATIONS

ELLA M. HEDIGER, M.D.
AND
HARRY GOLD, M.D.
NEW YORK

The United States Pharmacopeia, in the article on ether, (U. S. P. X) makes the following statement in italics: "Caution—Ether to be used for anesthesia must be preserved only in small, well-closed containers, and is not to be used for this purpose, if the original container has been opened longer than twenty-four hours."

This statement gives official sanction to the general practice in this country of using anesthetic ether chiefly in small cans of one-fourth and one-half pound. What remains in the can is usually regarded as unfit for anesthesia on the following day. Ordinary U. S. P. ether has been in use for many years in the laboratory of pharmacology of Cornell University Medical College for anesthesia in animals. Although this ether was taken from cans which had been opened many times, no ill effects were observed, but a systematic study of the question was not made.

Why should ether be considered unfit for anesthesia twenty-four hours after the container is opened? In a recent study [1] an answer to this question was sought from (*a*) the results of chemical tests for deterioration and (*b*) the experience of anesthetists.

The results of that investigation failed to reveal sufficient evidence to justify the twenty-four hour clause. The inquiry among surgeons and anesthetists disclosed that adherence to the practice directed by the United States Pharmacopeia has been so general that one does not readily find an anesthetist who has made observations sufficiently controlled to afford an acceptable judgment regarding U. S. P. ether taken from metal containers which had been opened several days prior to their use for anesthesia. Several anesthetists declared that they had used ether from cans that had been opened several days and that they had not observed any special danger in its use. On the other hand, many feel that such ether is undesirable, and among these the most divergent opinions prevail regarding the nature of the danger. Some state that the ether becomes very

From the Department of Surgery and the Department of Pharmacology of Cornell University Medical College.

The authors are indebted to Dr. William DeWitt Andrus for his cooperation in carrying out this study.

1. Gold, Harry, and Gold, David: Stability of U. S. P. Ether After the Metal Container Is Opened, J. A. M. A. **102**: 817-820 (March 17) 1934.

irritant; some, that it becomes very toxic so that extremely small quantities produce symptoms of collapse; others state that they have found it loses some of its anesthetic properties so that with it satisfactory anesthesia cannot be induced. The view regarding the dangers of ether for anesthesia from a container that has been opened for some time seemed to be based chiefly on reports in the literature describing toxic reactions produced by samples of impure ether which failed to comply with the present U. S. P. standards.

The literature on the subject of deterioration of ether as determined by chemical tests also failed to supply a rational basis for the twenty-four clause. Baskerville,[2] who more than twenty years ago made some notable contributions to the chemistry of the oxidation of ether, urged the use of ether from small containers so that the entire contents might be used at one time because of the possible danger of deterioration after opening of the container. His emphasis on rapid deterioration was not justified by his own experiments, as in them ether was exposed for periods of months under extreme conditions before the tests for deterioration were made. No reports could be found in the literature to show that opening the container leads to rapid chemical deterioration of U. S. P. ether in metal cans, although the literature abounds in warnings against the danger of using ether for anesthesia which has been kept under those conditions.

In the previous study[1] it was shown that ether, whether labeled "U. S. P." or "for anesthesia," does not deteriorate rapidly under ordinary conditions when the metal cans are opened, part of the contents removed and the remainder stoppered with cork, even though no precautions are taken against exposure to air other than stoppering. Although the containers had been opened and again stoppered many times during periods of from several days to several months, the U. S. P. X tests were negative for aldehydes, peroxides and acids. These results were obtained with a group of more than fifty specimens of ether supplied in containers varying from quarter-pound cans to 55-pound drums by five manufacturers or distributors. In many cases the labels stated that the cans were copper lined, were so treated as to become "catalytically inert," or contained a coil of steel wire to inhibit oxidation. In the case of the steel drums, as well as many of the tin cans, no special claims regarding the quality of the containers were made. The results were identical in all.

It should be stressed that the foregoing statements regarding the stability of U. S. P. ether apply to the product as supplied in metal containers at the present time by the outstanding manufacturers in this country, to whom a large share of the credit is due for the work that has made such relatively stable ether available on a large scale.

Since a 27-pound or 55-pound drum of ether would last only a week or two in the average hospital, there seemed to be no justification for purchasing ether in hundreds of quarter-pound or half-pound tins at a cost five or six times that of ether in a large drum, which could easily be supplied to the operating rooms daily in quarter-pound tins by the hospital pharmacist. A smaller container, such as a 5-pound tin, which is easier and somewhat safer to handle, might in some cases prove more desirable than the larger drum.

However, even though ether labeled U. S. P. is the official ether of anesthetic quality, the view prevails that such ether is not suitable for anesthesia and that an especially purified ether is necessary for this purpose. To distinguish these two types of ether, the words "for anesthesia" appear on the cans of anesthetic ether. In the minds of many, this would exclude the ether in drums from use for anesthesia because it bears only the label "U. S. P." and not "for anesthesia." Therefore, before anesthetists could feel free to use U. S. P. ether for anesthetic purposes, obtained from a large drum, it was necessary to have the answer to another question; namely, is there any difference that can be detected in patients between the effects of U. S. P. ether taken from large drums which are opened from time to time and the effects of ether labeled "for anesthesia" taken from small containers opened less than twenty-four hours?

This formed the subject of the present investigation, which was carried out on surgical patients in the New York Hospital.

PLAN OF INVESTIGATION

The study was made with the "blind test." Those administering the anesthetics to the surgical patients were unaware of the source of the ether and identified the specimens in terms of code numbers in their records. The daily orders for ether were filled in the department of pharmacology. The supply was delivered to the operating rooms in quarter-pound and half-pound cans of ether bearing a special uniform label with the date and time the can was filled and a consecutive code number. All the cans were tightly stoppered with ordinary cork. Ether remaining in the small can after twenty-four hours of the time it was filled was not used for anesthesia during this study; this afforded more uniform and comparable conditions for the comparison of the two types of ether. At irregular intervals the drum ether was tested by the U. S. P. X tests for peroxides, aldehydes and acid (litmus test). In addition, all ether was tested daily by other extremely delicate tests[3] for both peroxides (solution of potassium iodide) and aldehydes (Nessler's reagent).

The U. S. P. bulk ether as supplied by a well known manufacturer was bought in 55-pound drums. For convenience of filling the daily supply of quarter-pound and half-pound cans, the ether in the drum was transferred to 5-pound tins which had previously contained ordinary U. S. P. ether (supplied by Eimer and Amend). These were thoroughly rinsed with the fresh drum ether, then filled with the latter, stoppered with cork, placed on a shelf in a dark room and stored at room temperature. This ether was compared with the ether labeled "for anesthesia," which was obtained in quarter-pound and half-pound sealed cans manufactured by the Mallinckrodt Chemical Works, Merck & Co. and E. R. Squibb & Sons. The necessary number of cans were opened for the daily supply and the contents transferred to the quarter-pound cans bearing the uniform label, after they were thoroughly rinsed with the fresh ether. In general, the two types of ether were alternated daily, although no fixed order was followed, in order to avoid the danger of possible detection by the anesthetist.

2. Baskerville, Charles: Ethyl Ether for Anesthetic Purposes, Am. Druggist & Pharmaceut. Rec. **57**: 162, 1910.

3. In the test for peroxides, 1 cc. of a colorless 10 per cent solution of potassium iodide was added to 10 cc. of the ether in a glass stoppered cylinder previously rinsed with the ether. The absence of a yellow color after shaking from time to time during five minutes indicates that not more than a trace of peroxide, if any, is present (result designated negative). In the test for aldehydes, 3 cc. of Nessler's solution (U. S. P. X) was added to 20 cc. of the ether in a glass stoppered cylinder previously rinsed with the ether. The absence of almost immediate change in color after shaking and allowing layers to separate indicates that not more than a trace of aldehyde, if any, is present (result designated negative).

A complete record of all cans of ether sent to the operating rooms was kept in the department of pharmacology. In addition to this open record, a sealed envelop containing a duplicate record was sent to the anesthetist with the daily supply of ether. These sealed envelops were opened for the purpose of identifying the specimens of ether only after the work had been completed and the results had been analyzed from records which gave no clue as to the source of the ether.

TABLE 1.—*Types of Operations in the Cases in Which a Mixture of Anesthetic Agents Was Used*

	Operation	U. S. P. Drum Ether	Small Can Ether Labeled "for Anesthesia"
1	Appendicectomies	68	64
2	Biliary tract operations	22	27
3	Major gynecologic operations	16	22
4	Prostate and bladder operations	7	4
5	Kidney and ureter operations	5	2
6	Gastric operations	11	14
7	Intestinal resections	2	6
8	Nose and throat operations (tonsils, adenoids, antrums, etc.)	40	60
9	Thyroid operations	5	4
10	Exploratory laparotomies	14	7
11	Radical breast operations	4	2
12	Brain operations	1	0
13	Splenectomies	1	0

The anesthesias comprising this study were conducted by nine experienced anesthetists. A group of 113 patients received ether alone and in these the open cone drop method was used. A group of 589 patients were anesthetized by a mixture of anesthetics comprising various combinations of tribrom-ethanol, ethylene, nitrous oxide and ether. In a large proportion of the latter group some form of rebreathing method was used for the administration of the ether. A record of the anesthesia was made by the anesthetist on a special form provided for each patient. It was filled out at the time of the operation and further notes were added as the additional observations were made. These special charts were employed for the analysis of the data when the work was completed. This form supplied the following significant data: the diagnosis, the type of operation, the name of the anesthetist and surgeon, the physical status of the patient before operation, the drugs given prior to anesthesia and the time of their administration, the amounts of anesthetics other than ether, the amount of ether used and the code number of the specimen, the character and duration of the induction stage, the stage of maintenance and the stage of recovery, and postoperative complications up to the time of discharge from the hospital. Special attention was paid to such factors as coughing, excessive mucus, undue struggling, vomiting, cyanosis, signs of collapse, unduly prolonged induction stage, and difficulty in obtaining sufficient anesthesia or relaxation.

These special charts also provided a space for a general estimate by the anesthetist of the quality of the anesthesia in the individual patients, which was recorded immediately after the operation and was expressed as "satisfactory" or "unsatisfactory." These designations were intended to express a judgment on the part of the anesthetist which would take into account factors which might reasonably influence the character of the anesthesia, as the temperament of the patient, the character of the operation, and the type of preliminary medication. Anesthesias in which the induction, the maintenance and the recovery were smooth and uncomplicated by struggling, coughing, vomiting or other special reactions made up by far the larger part of the group of "satisfactory" anesthesias. However, some cases presenting special and undesirable reactions were also placed in the group of "satisfactory" anesthesias. The plan may be made clearer by a few illustrations:

An anesthesia was described as "satisfactory" when a patient who was unduly nervous struggled violently during the induction but passed through the other stages of anesthesia without any special symptoms. If vomiting occurred during the induction stage in a patient who had received suitable preoperative preparation, the anesthesia was judged "unsatisfactory," whereas if vomiting occurred in an emergency operation in which the stomach was not empty the anesthesia was considered "satisfactory," provided it was normal in other respects. If cyanosis developed during the stage of extremely deep anesthesia purposely induced as is sometimes requested by the surgeon during a difficult cholecystectomy, the anesthesia was not judged "unsatisfactory," whereas if the anesthetist found it impossible to induce a normal depth of anesthesia without cyanosis the anesthesia was considered "unsatisfactory."

With the exception of the foregoing cases, anesthesias were regarded as "unsatisfactory" if the anesthetist's efforts to maintain smooth, even and uncomplicated anesthesia proved unavailing. In the designation "unsatisfactory" it is not intended to imply that the special symptoms were due to the anesthesia alone or to the ether alone, for differences in susceptibility of patients were not excluded, and other anesthetics in addition to ether were used in a large proportion of the cases. Nevertheless, ether was present in these mixed anesthesias, and it was felt that, if significant differences between drum ether and ether labeled "for anesthesia" exist, they would be revealed in the records which give an account of the foregoing observations. We realize that the subjective elements involved in the classification of anesthesias as "satisfactory" and "unsatisfactory" introduce variable factors with a considerable margin of error and that under ordinary circumstances opinions which are based on such estimates are vitiated by the bias of the anesthetist who knows the source of the ether. The significant point of this study is that the general appraisals were made entirely free of possible prejudices and preconceived notions regarding the relative value of different types of ether, since those who made them had no knowledge of the source of the ether.

TABLE 2.—*Types of Operations in the Cases in Which Ether Was the Sole Anesthetic Agent*

Operation	U. S. P. Drum Ether	Small Can Ether Labeled "for Anesthesia"
Tonsillectomies	6	8
Appendicectomies	1	1
Closed reduction (humerus)	0	1
Incision and drainage of abscess	4	4
Circumcisions	40	15
Cholecystectomies	0	3
Exploratory laparotomy	0	1
Dilation of rectal sphincter	0	1
Osteotomies	0	2
Prostatectomies	0	1
Mastoidectomies	2	4
Ventriculogram	0	1
Excision of periauricular gland	0	1
Excision of nevi, back and chest	0	1
Hernia	0	1
Thyroidectomy	0	1
Rib resection	0	1
Excision of cyst of elbow	0	1
Cystoscopies	3	2
Craniotomy	0	1
Laminectomy	1	0
Repair of hydrocele	1	0
Suture tendon	1	0
Resection of rectum	1	0
Muscle biopsy	1	0
Splenectomy	1	0

RESULTS

The analyses are based on the results obtained in 702 surgical patients. There were nine additional patients who were not included because the records were not sufficiently complete. In all, 349 patients received the drum ether and 353 the small can ether labeled "for anesthesia." Table 1 shows the distribution of the more common types of operations in patients who received drum ether and those who received small can ether labeled "for anesthesia," in the group of mixed anesthesias. Table 2 shows a similar analysis in the group of 113 cases in which ether was the sole anesthetic agent. While the types of operations were not equally distributed between the groups of patients receiving the two types of ether, there is a large enough representation of the more common operations in the two groups to justify the deductions that are made in this study.

TABLE 3.—*Distribution of Cases of Vomiting During the Induction and Maintenance Stages of Anesthesia*

Type of Anesthesia	Number of Cases
All anesthesias	30
Mixed anesthesias	29
Small can ether (mixed anesthesia)	19
Drum ether (mixed anesthesia)	10
Small can ether alone	1
Drum ether alone	0

Table 3 shows the distribution of the cases of vomiting during the induction and the maintenance stages of anesthesia in the total number of 702 patients. As may be seen, there were in all thirty patients who vomited during one or the other of these stages, and those receiving the small can ether labeled "for anesthesia" constituted twenty of these thirty cases. The number of cases is much too small for the results to have any statistical value, but as far as they go they do not give any suggestion that ether taken from a large drum is more irritant and more apt to induce vomiting than ether labeled "for anesthesia."

An attempt was made to ascertain whether there is any difference between the quantities of the two types of ether necessary for anesthesia. There are so many variable factors in an analysis of this kind that again the statistical value of the figures obtained in a relatively small group of cases is open to question, especially in the group in which ether was not the sole anesthetic agent. We examined the results in the group of 113 patients who received ether alone, and we present them for what they are worth. The amount was recorded in forty-four cases in which the small can ether labeled "for anesthesia" was used and in fifty-nine cases in which the drum ether was used. The amount of small can ether ranged in the different cases from 0.25 ounce to 10.5 ounces, with an average of 3.26 ounces. The amount of drum ether ranged from 0.25 ounce to 9 ounces, with an average of 2.16 ounces. It seems extremely unlikely that these figures represent actual differences in the anesthetic potency of the two types of ether. In any case, however, they lend no support to the view commonly expressed that ether taken from a can which has been opened some time loses much of its power to induce anesthesia.

An analysis of the data on the postoperative complications revealed comparable conditions with the two types of ether. There were nine deaths in the group receiving drum ether and seven deaths in the group receiving small can ether labeled "for anesthesia." The nature of the complication in the fatal as well as in the nonfatal cases is presented in table 4. The only death caused by a pulmonary complication occurred in the group which received the ether labeled "for anesthesia." Since it was due to a pulmonary infarction, it is extremely doubtful whether the ether was responsible for it. Excluding this case, there were no deaths in the whole series which could by any possibility be charged to either type of ether. There were six cases (all nonfatal) of postoperative pulmonary complications in the group receiving drum ether, and four cases (three nonfatal and one fatal) in the group receiving small can ether labeled "for anesthesia." If the two cases of bronchitis that occurred in patients who gave a history of chronic cough before the anesthetic was administered are omitted, the results in regard to postoperative pulmonary complications are essentially identical for the two types of ether.

Two additional groups of data have been analyzed, which present the most significant facts of the present study; namely, the chemical tests of the drum ether and the relative incidence of "satisfactory" and "unsatisfactory" anesthesias in the cases in which the two kinds of ether were given. The results of the chemical tests are presented in table 5. The contents of three 55-pound drums of U. S. P. ether had been transferred to twenty-five 5-pound tins, which were opened from time to time for the filling of the quarter-pound cans. The number of times the tins were opened and the intervals between the first opening and the last testing are stated in the table. Extremely delicate tests, capable of detecting traces of aldehydes and peroxides, gave negative results as long as sixty-eight days after the tins were first opened. Not one of the twenty-five tins showed signs of chemical deterioration of the ether. These confirmed the results obtained in the previous study.[1]

TABLE 4.—*Postoperative Complications with the U. S. P. Drum Ether and Small Can Ether Labeled "for Anesthesia"*

	U. S. P. Drum Ether	Small Can Ether Labeled "for Anesthesia"
Total number of postoperative pulmonary complications	15	10
Total number of deaths	9	7
Causes of death	1. Peritonitis and hemorrhage 2. Peritonitis 3. Peritonitis 4. Peritonitis 5. Carcinomatosis 6. Septicemia 7. Shock; death on second day after operation* 8. Gas gangrene 9. Intestinal obstruction	1. Shock and hemorrhage 2. Peritonitis 3. Coronary thrombosis 4. Heart failure 5. Pulmonary embolus 6. Uremia 7. Septicemia
Nature of nonfatal pulmonary complications	1. Septic pulmonary infarction with empyema 2. Pulmonary infarction 3. Bronchitis† 4. Bronchitis† 5. Bronchitis 6. Pulmonary atelectasis	1. Pleural effusion 2. Pulmonary infarction 3. Pneumonia with pleural effusion

* The patient was 44 years old; the operation, of two hours forty-three minutes' duration, for resection of a pancreatic tumor.

† These patients gave a history of a chronic cough before the operation.

In table 6 the incidence of "satisfactory" and "unsatisfactory" anesthesias in the cases in which U. S. P. drum ether was the agent is compared with that in the cases in which small can ether labeled "for anesthesia" was used. As has already been stated, these designations expressed a judgment of the anesthetist as

to the quality of the anesthesia made at the time of the operation and without knowledge of the source of the ether. It is clear from this table that the results are identical with the two kinds of ether.

The results obtained in three cases illustrate in a striking manner how differences in the behavior of the patient may be a source of error in judging the quality

TABLE 5.—*Results of Tests for Deterioration of Drum Ether After the Container Was Opened*

Number of the Five Pound Tin	Number of Times Tin Was Opened	Interval (Days) Between Date When Tin Was Filled and Date When Last Opened	Tests for Deterioration Products
	Ether from First Drum		
1	7	14	N
2	7	29	N
3	6	36	N
4	5	42	N
5	6	49	N
6	4	53	N
7	4	62	N
8	2	68	N
	Ether from Second Drum		
1	3	3	N
2	5	15	N
3	4	23	N
4	3	29	N
5	4	37	N
6	4	46	N
7	3	53	N
8	4	63	N
9	1	64	N
	Ether from Third Drum		
1	4	4	N
2	5	11	N
3	5	21	N
4	5	30	N
5	4	37	N
6	5	46	N
7	3	51	N
8	5	60	N

of an anesthetic agent. One of these came to operation on two occasions, during both of which small can ether labeled "for anesthesia" was administered. After the first operation performed for adhesions, recovery was uneventful, whereas after the second one, for intestinal obstruction, a postoperative pulmonary infarction developed. In the second patient a convulsive seizure developed during the induction stage, although the period of

TABLE 6.—*Incidence of "Satisfactory" and "Unsatisfactory" Anesthesias in Cases in Which U. S. P. Drum Ether Was Used with That in Cases in Which Small Can Ether Labeled "for Anesthesia" Was Used*

	U. S. P. Drum Ether		Small Can Ether Labeled "for Anesthesia"	
	Number	Per Cent	Number	Per Cent
Ether alone (113 cases)				
Total cases	62	..	51	..
Satisfactory	61	..	48	..
Unsatisfactory	1	..	3	..
Mixed anesthesia (589 cases)				
Total cases	287	..	302	..
Satisfactory	248	86.7	259	85.7
Unsatisfactory	39	13.3	43	14.0
All anesthesia (702 cases)				
Total cases	349	..	353	..
Satisfactory	309	88.5	307	86.9
Unsatisfactory	40	11.5	46	13.1

maintenance was even and uneventful. The ether in this case was from a quarter-pound tin labeled "for anesthesia" similar to that used in many other cases in this study. In the third case it was found impossible to obtain sufficient relaxation to perform a hemorrhoidectomy during anesthesia with nitrous oxide and 6 ounces of drum ether. Small can ether labeled "for anesthesia" was then substituted, but the anesthesia was discontinued when relaxation was not obtained after 6 ounces of this had been administered.

SUMMARY AND CONCLUSIONS

1. This study shows that U. S. P. ether as supplied at the present time in large metal containers does not undergo rapid chemical deterioration when the container is opened. Deterioration products were not found even sixty-eight days after the container was first opened. These results confirm a previous report.[1]

2. The study of 702 surgical anesthesias shows, furthermore, that the anesthetist is unable to distinguish the effects of U. S. P. drum ether from those of ether obtained in small cans labeled "for anesthesia," by the reactions of surgical patients, provided the anesthetist does not know the source of the ether he is using. Under those conditions, the anesthetist was unable to distinguish, for example, the ether in a quarter-pound tin labeled "for anesthesia" from ether taken from a 55-pound drum sixty days after it had first been opened.

3. The U. S. P. drum ether that we used in the present study was therefore as satisfactory for anesthesia as the ether in small tins labeled "for anesthesia." We believe that this statement is applicable to U. S. P. ether in large containers from at least five other sources, which, although not labeled "for anesthesia," was found in a previous study [1] to be similarly resistant to chemical deterioration after the containers were opened.

1300 York Avenue.

Clinical Notes, Suggestions and New Instruments

HYPERPARATHYROIDISM: CLINICAL PICTURE IN THE FAR ADVANCED STAGE

SECOND REPORT

ARMAND J. QUICK, PH.D., M.D., MILWAUKEE; AMBROSE HUNSBERGER JR., M.S., ELDRIDGE L. ELIASON, M.D., AND HARRY HUDSON, M.D., PHILADELPHIA

In 1931 we [1] presented a case of hyperparathyroidism that had advanced to such a stage that every bone showed cysts and decalcification, and some of the long bones, especially the femurs, almost complete demineralization. Owing to the numerous fractures early in the disease, and the extreme softness of the bones later, marked deformities had occurred, leaving the patient a hopeless cripple. When the decision had been made to do an exploratory operation with the objective of finding a parathyroid tumor, no other hope was entertained than to stop the progress of the disease. Not only was this hope realized but the patient has been restored to a degree that seemed unbelievable at the time of his first operation. Since the case forcefully illustrates what can be expected from the surgical treatment of hyperparathyroidism arising from an adenoma of this gland, the history subsequent to the first publication is presented.

SUMMARY OF CASE

J. M., a well developed man, 6 feet (183 cm.) tall and weighing 200 pounds (90.7 Kg.), was well up to the age of 21 (1925). A roentgenogram of the knee at that time showed beginning bone changes. A year later he sustained spontaneous fractures of both femurs and the right humerus. After six months of hospital treatment, he was discharged with the diagnosis of

From the Divisions of Medicine, Surgery and Orthopedic Surgery, and the Laboratory of Biochemistry, Philadelphia General Hospital.

1. Quick, A. J., and Hunsberger, Ambrose: Hyperparathyroidism: The Clinical Picture in the Far Advanced Stage, J. A. M. A. **96**: 745 (March 7) 1931.