

**Staff Meeting Bulletin
Hospitals of the » » »
University of Minnesota**

**Convulsions
Complicating
Anesthesia**

STAFF MEETING BULLETIN
HOSPITALS OF THE . . .
UNIVERSITY OF MINNESOTA

Volume IX

Friday, October 15, 1937

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Published for the General Staff Meeting each week
during the school year, October to May, inclusive.

Financed by the Citizens Aid Society

William A. O'Brien, M.D.

I. LAST WEEK

Date: October 8, 1937
Place: Recreation Room
 Nurses' Hall
Time: 12:15 to 1:10 P.M.
Program: Movie: Fighting Marlin

Announcement:

J. C. McKinley

Clinical Pathological Studies:

1. Periarthritis nodosa
2. Miliary tuberculosis
Lupus erythematosus
3. Chronic ulcerative colitis
4. Chronic ulcerative colitis

Present: 107

Discussion: W. A. O'Brien
 A. A. Nelson
 C. J. Watson
 E. T. Bell
 L. G. Rigler
 H. S. Diehl
 B. A. Watson
 Wesley Spink

The program was prepared
 by A. A. Nelson.

Gertrude Gunn,
 Secretary

II. FELLOWS

Dees, Susan Coons--Chevy Chase, Maryland
 M.D. Johns Hopkins Medical School, 1934
 Intern in Medicine, Johns Hopkins,
 1934-1935
 Ass't. Resident in Medicine -
 Strong Memorial Hospital,
 Rochester, N.Y., 1935-36

Hall, Harry--Minneapolis, Minn.
 B.S., University of Minnesota, 1935
 M.D., University of Minnesota, 1936
 Internship, University Hospitals,
 1936-37.

Hertzog, Ambrose J.--Derry, Louisiana
 M.D., Tulane, 1932
 Internship, Touro Infirmary,
 New Orleans, 1933
 Mayo Foundation, 2 years.

Hilger, Jerome Andrew--St. Paul, Minn.
 B.S., St. Thomas College, St. Paul,
 1932
 M.D., University of Minnesota, 1937
 Internship, Rotating, Ancker
 Hospital, 1936-37

Nelson, Arthur A.--Duluth, Minn.
 M.D., University of Minnesota, 1935
 Internship, Minneapolis General
 Hospital, 1934-35
 Fellowship in Pathology, 1935

Tracht, Robert--Crown Point, Indiana
 B.S., Loyola University
 M.D., Loyola University
 General Internship, Mercy Hospital,
 1931-32
 General Practice, 1932-36
 University of Minnesota Hospitals, 1937

III. MOVIETitle: Pardon My SprayReleased by: R-K-OIV. CONVULSIONS COMPLICATING ANESTHESIA1. Introduction

C. Burling Roesch

Since 1927, there have been
 many contributions on "Convulsions during

Anesthesia," mostly British, with just a few by American authors. Before this, the literature is apparently barren of reports except for the 5 cases observed by Thomas prior to 1925. Lundy has collected 137 cases, added 7 more and had 6 additional cases with insufficient data to record.

The following is a typical picture of a convulsive seizure: The patient is a child or young adult with hyperpyrexia, usually septic. (It is interesting to note that the greatest percentage of cases reported are in appendiceal abscesses). He is in an overheated operating room under deep ether anesthesia, with good color, the pupils being dilated and inactive to light; perhaps he has had an excessive preoperative dose of atropine.

There is no primary respiratory or circulatory involvement. These systems are affected by the severity of the seizure.

As the attack starts, the eyelids twitch, then the face; after which the convulsions become generalized. Three things may then happen:

- (1) In the rapidly fatal cases, within 5 or 10 minutes after the onset of the seizure, respiration stops, the patient becomes blue, and the heart stops.
- (2) The convulsions end, but the patient subsequently expires from cardiac failure.
- (3) Recovery may follow cessation of convulsions.

As is usual when little is known about a condition, a multitude of explanations are advanced. Probably no single cause can be applied to every case and undoubtedly one or more cases have fallen into each category. Over 33 significant factors have been noted. A few of the more important ones are listed.

1. Impurities in Ether (Walton, Wilson)
 - a. Acetaldehyde)
 - b. Peroxides) Toxic in any
 - c. Ethyl sulfide) percentage over
 0.5%

- d. Ketones
- e. Alcohol (?)

The belief is that the nerve cells are poisoned so as to be incapable of utilizing oxygen.

Lundy has found that samples of four different brands of ether did not meet the requirements of purity. Possibly pharmacopeial tests do not bring out all the dangerous impurities or there may be some for which the manufacturers do not test. Ether is unstable and difficult to prepare at best.

2. Overetherization with Overoxygenation (Mennel, 8 cases). The nerve cells absorb more ether in the presence of an excess of oxygen.
3. Excess of Carbon Dioxide (Pinson, Kemp). The patient has dyspnea and the exaggerated muscular activity of the respiratory group flows to the rest of the body. 15 cases, 5 fatal, all children with acute infections.
4. Anoxemia of the Brain due to edema and collapse of the lung bases - from improper premedication.
5. Atropine Overdosage (Hornobrook) especially in children.
6. Increased Cerebral Vascularity (Daly).
7. Acute toxemia (MacKenzine) - a predisposing condition with ether as the exciting agent.
8. Histamine Bodies Liberated by the Trauma of Operation (Clarke). Increases vascularity of cerebral cortex, particularly the rolandic area, an effect increased by ether.
9. Youth - predisposing factor.
10. Overetherization.
11. Hypoglycemia from depleted glycogen reserve (Sears).
12. Hyperglycemia.

13. Ether vapor warmed.
14. Idiosyncrasy to Ether.
15. Prolonged anoxemia.
16. Alkalosis due to Acapnia.
17. Anaphylactic Edema.
18. Stimulation of Large Nerves
(Steindler, Revenstine).

Treatment has been varied. General measures against convulsions, e.g. 50% glucose, etc. Lundy believes that an intravenous injection of a barbiturate is the best therapy. He suggests that proper preoperative administration of barbiturates in likely cases tends to minimize convulsions; ~~avertin~~ ~~avertin~~ may also be useful.

Intravenous barbiturates will probably control the convulsions until the patient has recovered from the anesthesia, i.e., if they are due to anesthesia. If due to the removal of a focus of infection, the therapy can be kept up for days with excellent results.

* * * * *

2. CASE REPORT

W. P. Ritchie

White female, age 4, admitted 2-9-34, expired 2-10-34.

History

On the morning of the day before admission had a poor appetite and in the afternoon vomited and complained of pain in the lower part of her abdomen. She ate nothing during that day and vomited several times. Her bowels did not move. On the morning of the day of admission she was examined by a physician who reported a leukocyte count of 21,000 and made a diagnosis of acute appendicitis. She arrived at the hospital about 3 P.M.

Past History

No pulmonary or genito-urinary complaints.

Examination

Temperature 104°; pulse 130; white blood count 16,000. Conjunctivae slightly injected. Ears show redness. Throat definitely reddened. No Koplik spots. Lymph nodes not enlarged. No neck rigidity. Heart tones normal. Chest - no fullness. Breath sounds clear. Abdomen slightly distended. Right side, however, seems to be definitely rigid with no periods of relaxation. Crying is definitely exaggerated by palpation of right lower quadrant. Rectal examination seems to elicit excruciating tenderness. Reflexes - normal. Radiologic examination of chest - negative. Abdomen shows slight generalized curvature with concavity to right. Psoas shadows not seen but no other evidence of perinephritic abscess. Urine negative.

Diagnostic impression:

1. Acute appendicitis
2. Acute pharyngitis tonsillitis, etc.
3. Mild acute otitis, bilateral

Surgical opinion:

Believe surgery is indicated and safe.

Operation

February 9, 1934, 11:45 P.M.
Preoperative medication - chloral hydrate gr. XV, codeine sulfate gr. $\frac{1}{2}$ at 11:20, atropine sulfate gr. 1/300, 11:20.
Anesthetic - ethylene with ether (2 oz.)

The peritoneum was opened through a right McBurney incision. Pus escaped. The mesentery was found to be adherent in the right lower quadrant. This was carefully separated. Several small pockets were opened. The appendix lay somewhat medially and inferiorly to the operative wound; however, it was delivered without much difficulty. There was a perforation in its center. It was removed in the usual way. Two Penrose drains were inserted and closure of the wound was started.

Attack

The patient's eyelids began to twitch, and she had difficulty in breathing. Artificial respiration was begun.

Breathing soon became normal. The mouth was quickly closed, but during this time the twitchings had become generalized and much more severe. The anesthetic was discontinued when the twitchings began and oxygen with a little carbon dioxide was given. The convulsions increased in severity. Caffein sodium benzoate and adrenalin were given. Respiration ceased and in spite of artificial respiration the heart stopped. The culture from the stump of the appendix showed *B. aerogenes*. The blood serum calcium was 10.85 mg. per cent.

No postmortem examination permitted.

* * * * *

3. CASE REPORT

Carl Lind

White female, age 16, admitted to hospital 6-6-37 and expired same day.

Admitted

6-6-37 - While doing housework at noon on 6-3-37, patient noted feeling of heaviness in epigastrium. Tried to eat but vomited; vomited again next day, but not afterward. Between time of onset and time of admission, took small amounts of food. Pain became progressively worse. On night before admission, ate a hamburger and a cinnamon roll, and went to a dance. On morning of admission, there were two attacks of severe pain one-half hour apart; this was followed by a constant severe aching in right lower quadrant. For two days before admission, there had been a sore throat. The last menstrual period was on 5-9-37. For six years, patient had noted a goiter, and had taken some iodine. She had been quite nervous, and dyspneic on exertion.

Physical examination

The pupils were negative. Mouth was negative. Tonsils hypertrophic with prominent crypts, and moderately injected. Anterior cervical adenopathy. Thyroid enlarged on both sides, contained palpable

nodules. Chest essentially negative; there was an occasional wheezing sound anteriorly and posteriorly on upper left; heart enlarged to left; left border of cardiac dullness 11 cm. from the midline; there was a systolic murmur heard best in 2d interspace to left, and a systolic thrill in same area; blood pressure 150/80; no diastolic murmurs. Abdomen tender to palpation, especially in right lower quadrant, and a rebound tenderness referred to right lower quadrant; pain in same area on movement of right thigh. On rectal examination, greatest amount of pain in right lower quadrant. Clinical impression was suppurative appendicitis, with rupture; hypertension; questionable toxic adenomatous goiter.

Laboratory

Hemoglobin was 82%, leukocytes 28,000, with 90% neutrophils. Temperature 102.2°.

Operation

2:30 P.M. - preoperative medication - morphine sulfate gr. 1/6, atropine sulfate gr. 1/150.

2:45 P.M. cyclopropane and oxygen begun. Blood pressure 130/60; pulse 116

3:00 modified McBurney's incision. Free serous peritoneal fluid without definite peritonitis. Curled appendix postero-medial to cecum, with numerous recent adhesions. Rupture is imminent. Incision extended by cutting rectus sheath. Appendix removed in reverse manner. 20 cc. sodium ricinoleate solution injected. 4:32 P.M. Closure started. Up to this time operation was uneventful. Blood pressure had been about 160/80 and the pulse about 150.

Attack

Sudden onset of clonic convulsions, lasting until the end of operation. Mainly flexor groups of muscles involved. Convulsions came in series of about a minute's duration with a few seconds between them. Tonus apparently not increased during these intervals. Anesthesia discontinued, without effect. (Only cyclopropane had been given up to this point). Small amount of ether given, without effect.

4:45 P.M. closure completed. Convulsions stopped shortly before this. Respirations shallow.

4:55 Final spasmodic convulsion lasting about 10 seconds, followed by cessation of respiration. Did not breathe spontaneously again. Given immediate artificial respiration, with oxygen. Also covered with hot blankets and head lowered.

5:00 P.M. Coramine, ampoule i, intravenously.

5:05 P.M. Repeated. Heart still beating.

5:08 P.M. Pulse now imperceptible. Adrenalin - 1 cc. of 1:1000 (intracardiac) no response.

5:25 P.M. Adrenalin repeated. No heart beat, but patient warm.

Drinker respirator.

Autopsy

Body is that of a well-developed, well nourished white female measuring 157 cm. in length, and weighing about 110 lbs. There is no rigor, edema or jaundice. Hypostasis is beginning. There is a rather marked generalized cyanosis, in addition to tanning of the skin. The pupils are 6 mm. each in diameter and are regular; the conjunctivae are normal. Over the cardiac area on the left side are 5 needle punctures. In the right lower quadrant is a recent incision closed with clips, 11 cm. in length. The upper portion of the chest is moderately flattened. The teeth are in good condition.

The subcutaneous abdominal fat measures up to 1.2 cm. in thickness. The stomach is markedly dilated, measuring 11 x 24 cm. The liver edge is 2 cm. below the costal margin in the midclavicular line. The Appendix (retrocecal) has been recently removed. The stump and operative field are in good condition. There is evidence of a rather marked preoperative inflammatory process lateral to the cecum, in the area around the appendix. The serous surfaces in this area are thickened, reddened, and covered with a thin film of fibrinopurulent exudate. The regional lymph nodes are moderately enlarged. The diaphragm reaches to the 4th rib on the right and 5th rib on the left.

The chest is opened after clamping the trachea. The left lung is markedly collapsed, and there is a large pneumothorax on left side. The right Pleural Cavity contains numerous string-like adhesions laterally. There are no adhesions on left. There is no fluid in either pleural cavity. The Pericardial Sac is normal; the pericardial fluid is bloody.

The Heart weighs 240 grams. The heart is opened under water; there is no air within the cavities of the heart. The epicardium, myocardium and valves are normal. The foramen ovale is closed. There are no mural thrombi. The root of the aorta and the coronary arteries are normal.

The Right Lung weighs 250 grams, the Left 260. There is no apical scarring. The right lung is markedly atelectatic and moderately congested. The parenchyma of the right lung shows nothing of note. There is no pneumonic consolidation and no evidence of tuberculosis in either lung. The bronchi contain bloody mucous material. The pulmonary arteries and hilar nodes are normal. There are no thrombi in the pulmonary veins.

The Spleen weighs 155 grams. On section, it is normal.

The Liver weighs 1310 grams. On section, it is of a pale yellowish brown color and is slightly soft.

The Gallbladder contains about 15 cc. of dark green bile. The gallbladder and bile ducts are normal.

The esophagus is normal. The stomach has been described previously; the mucosa of the stomach is normal. The small intestine contains a little greenish yellow mucous material; the mucosa is normal. The large intestine contains green fecal material; the mucosa is normal.

The Pancreas and Adrenals are normal.

The Right Kidney weighs 110 grams, the Left 130. On section, the kidneys are normal; the pelvis and ureters and Blad-

der are normal.

The cervix and corpus uteri are normal; the endometrium is thick and pale. The tubes and ovaries are normal; there is a large corpus luteum in the left ovary.

The Aorta is normal.

Each lobe of the Thyroid is lobulated somewhat like a bunch of grapes. The thyroid weighs 68 grams, and is made up of numerous colloid adenomas up to 2 cm. in diameter; many of these show various amounts of calcifications and cystic degeneration. There is only a small amount of normal appearing thyroid tissue. There is a moderate degree of lateral compression of the trachea from the adenomatous thyroid. A finger is passed up the trachea and through the larynx to the back of the mouth; no foreign body is found. The thymus weighs 16 grams; it contains several small hemorrhages.

The scalp, skull and meninges are normal. The brain weighs 1355 grams. The convolutions are slightly flattened. There is a moderate degree of cerebellar herniation, but this is not any more marked than in some cases where there were no cerebral symptoms. The pituitary is normal.

No thrombi can be milked from the veins of the extremities or pelvis.

The breasts are normal.

Chemical Examination (4 hours postmortem)

Blood sugar, 20 mgs.; Non-protein-nitrogen, 54 mgs.; CO₂ combining power, 22 vol. %; calcium 11.9 mgs.

Microscopic

Pericecal lymph node - sinuses filled with neutrophiles and mononuclears.
Liver, pancreas, kidney, thymus - negative.
Thyroid - mixed type of adenoma.
Lung - varying degrees of atelectasis, hemorrhage and edema (probably from attempt at resuscitation); no inflammatory reaction.

Report by A. B. Baker

The brain was negative on external examination. Thin coronal sections

through the brain reveal only an extensive distention of the blood vessels. No gross petechiae could be seen. The pons, medulla and midbrain were normal with the exception of the vascular congestion.

Microscopic sections of the nervous system reveal a marked vascular congestion. No other changes are noted in the cerebral hemispheres. In the floor of the 4th ventricle in the region of the 7th nerve nucleus as well as the lateral lemniscus and superior olivary nucleus there are numerous good sized petechial hemorrhages probably toxic in origin. The rest of the brain stem was negative. The nuclei of the bulb were intact and showed no changes. No hemorrhages were observed within the region of the medulla. There is no histological evidence of a muscular atrophy of a bulbar type.

Diagnosis

1. Acute suppurative appendicitis
2. Recent appendectomy
3. Anesthetic death
4. Petechiae in floor of 4th ventricle
5. Diffuse adenomatous goiter

* * * * *

4. CASE REPORT

W. P. Ritchie

A 6 year old girl was admitted to the Ancker Hospital on 7-13-37, complaining of pain in the abdomen, of 14 hours duration. The pain was felt at first in the umbilical region. She was given a cathartic by her parents, following which she vomited. She vomited 4 times further through the day. Her bowels moved once since the onset of the illness.

Past history

Usual childhood diseases. Two months previously had a stomach upset with pain and vomiting which receded in 5 days.

No neurological symptoms. Cardio-respiratory and genito-urinary history negative. Always a well, active child. No convulsions.

Family history

Negative, especially for convulsions and neurological diseases.

Physical examination

Temperature 102^o, pulse 160, leukocyte count 24,000 cells per cu.m. Head - no changes. Lungs - clear. Heart - normal in size and shape - no murmurs. Abdomen - extremely tender throughout with spasm and slight rigidity on both sides, more marked on the right. Rectal - tenderness throughout with no mass felt. Because of the vomiting, 500 cc. of 5% glucose was given intravenously. Pre-operative medication consisted of codeine sulfate gr. 1/8, atropine sulfate gr. 1/300.

Operation

N₂O was begun at 9:08 P.M. and shortly afterward ether was added to the mixture. Induction was uneventful. (Ether had been used the same day on another patient with no reaction. Gas had also been used the same day on another patient with no reaction. Closed system Heidbrink machine with CO₂ absorber and fresh soda lime.) At 9:15 P.M. the incision was made.

Attack

At 9:20 the anesthetist noticed slight twitching of the facial muscles, particularly the eyelids. At this point the peritoneum had just been opened and pus was encountered. As soon as the muscular twitching was noted, a Penrose drain was quickly inserted in the abdomen, and the muscle and skin closed with several interrupted sutures. The anesthesia was discontinued at 9:22 P.M., 14 minutes after the start, and the operation finished at 9:30 P.M., 15 minutes after the incision had been made.

Five per cent glucose was administered intravenously. About 3 or 4 minutes after the onset of the facial contractures there were generalized clonic convulsions. Two cc. of intravenous evipal was administered and the convulsions receded. This was quickly followed by 1 gm. of

calcium gluconate intravenously. This controlled the convulsions, but they recurred in 10 minutes, and the same procedure was carried out with enough evipal to control the convulsions, followed by calcium gluconate. The convulsions recurred at varying intervals for about two hours. They were controlled by 1 cc. doses of evipal followed by 1 cc. doses of calcium gluconate. 7 cc. of 10% evipal, 2.1 gm. of calcium gluconate, and 500 cc. of 5% glucose were ultimately used. At about 11:30 P.M., two hours after the onset of the convulsions, they ceased entirely, having been less in severity for the last thirty minutes.

Chloral hydrate gr. X was given by rectum at 12:05 A.M., and no convulsion having occurred for 30 minutes, the patient was returned to her room. She had not regained consciousness. Her temperature was 104, pulse 170 and respiration 90.

For the next 24 hours, the patient was extremely restless. She was treated by Wangensteen suction-siphonage, hot packs, intravenous glucose and sedatives.

Thirty-six hours after the convulsions, a spinal puncture was done. The fluid was clear, cell count was 1 per cubic mm. Wassermann was negative. Colloidal gold was 0000000000. The test for globulin was negative.

The patient rapidly recovered, having a normal temperature and pulse on the 8th postoperative day. On the tenth postoperative day, the blood chemistry was

Blood sugar	130 mgs. per 100 cc.
Creatinine	1
Urea nitrogen	14.7 mgs. per 100 cc
Van Slyke	48.56% vol. CO in 100 cc. plasma
Calcium	9.9 mgs. per 100 cc.
Chlorides	620 mgs. per 100 cc.
Glucose tolerance test:	
Fasting	104 mgs. per 100 cc.
1st hour	186 mgs. per 100 cc.
2nd hour	138 mgs. per 100 cc.
3rd hour	133 mgs. per 100 cc.

Patient was discharged 20 days after admission with no complaints.

* * * * *

5. CASE REPORT

H. A. Hilger

White male, age 6, admitted 8-31-37.

History

Measles and chicken pox, no scarlet fever, mumps or otitis media. Frequent colds and sore throat. Two years ago developed a right inguinal hernia. Herniotomy July 8, 1937, done under ethylene ether anesthesia. Good recovery without untoward symptoms.

Laboratory

Hemoglobin and blood counts normal. Urine normal.

Examination

Normally developed, slightly undernourished.

Face and head, ears, eyes, nose negative. Throat - tonsils injected and greatly enlarged.

Neck - nodes have been greatly enlarged but are now reduced.

Lungs, heart, abdomen, skin and extremities, genitalia negative.

Operation

September 1, 1937, 11:45 A.M. Preoperative medication nembutal gr. 3/4, atropine gr. 1/300. Anesthetic - ether by the drop method. Operation - the left tonsil was removed with dissection and snare. A small vein which was bleeding was tied.

Attack

At this stage of the operation the patient had a generalized convulsion. The mouth gag was removed, and the patient placed in a more comfortable position. The convulsion subsided only to recur again, first starting in the face and then extending down to both legs and arms, becoming generalized. Patient developed moderate cyanosis and was given oxygen. Pentothal was prepared but by that time the convulsions had ceased and did not recur. On the advice of Dr. Knight, the tonsillectomy was completed, the right tonsil being removed

with dissection and snare and a large central adenoid body removed with the adenotome. A small amount of ether was added during the last part of the operation with no untoward effect. Patient regained consciousness normally and recovery was normal. He was discharged the next day.

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6. CASE REPORT

J. B. Carey

Case is that of a white male, 57 year of age, who died in the Outpatient Department 8-4-37.

History

Patient was seen 7-29-37 - in Outpatient Department with complaint of anorexia, 30 lb. weight loss, a mass in the upper left quadrant of abdomen, and weakness. The patient had noticed a loss of appetite in summer of 1936; this had progressed in severity. He did not eat solid foods because of the resultant pain in stomach, and had been unable to work since Dec. 1936 because of weakness. Had vomited only twice with present illness, last time on 7-26-37; there had been no blood in the vomitus. Beginning in Dec. 1936 the patient had been treated by a physician. Another physician made radiologic studies of the gastro-intestinal tract about 7-20-37 and found a mass in the left upper quadrant. Previous health had been good; there had been no headaches or cardiorespiratory symptoms. The patient had had mumps as a child, a left inguinal hernia since childhood and a right inguinal hernia since 1928. He denied venereal infection.

Physical examination

The pupils were regular but were unequal; the left was larger. Both pupils were fixed to light but reacted slightly to accommodation. The lungs and heart were negative. The blood pressure was 144/80. Just above and to the left of the umbilicus was a hard mass about 5 cm. in diameter. The liver margin was sharp and smooth and was about 2 or 3 cm. below the costal margin. There were bilateral inguinal hernias; the right was reducible, while the left

descended into the scrotum and was not reducible. Rectal examination was negative. The clinical impression was carcinoma or syphilis of the stomach, and central nervous system syphilis.

Laboratory

Urinalysis was negative. Blood - hemoglobin 79%. On gastric expression only barium was obtained. Blood - Wassermann reaction was 4+. Radiologic examination showed an operable carcinoma of the antrum of the stomach.

Operation

The routine anesthetization of the throat and esophagus was carried out at follows:

8:30 Codeine gr. 1, atropine sulfate gr. 1/100.

9:00 Throat swabbed with 2 cc. 2% pantocain containing one drop 1-1000 adrenalin to each cc.

9:15 4 cc. of some preparation instilled into the upper esophagus through a catheter, perforated along a six inch segment.

9:30 second instillation of 4 cc. of same.

After second intubation with pantocain the patient had a convulsion and became rigid and cyanotic. The tongue was pulled out and artificial respiration was given but within a short time the patient stopped breathing and the pulse stopped. Adrenalin 1-1000 1 cc. injected into the heart. Caffein sodium benzoate intravenously. Artificial respiration continued for 20 minutes.

Autopsy

The body is that of a well developed, fairly well nourished white male, 180 cm. in length, and weighing about 165 pounds. Rigor and hypostasis are beginning. There is no edema or jaundice. The right pupil is oval while the left is round. They are about 5mm. each in diameter. The conjunctivae show nothing of note.

The subcutaneous abdominal fat measures up to 1 cm. in thickness. The liver edge is even with the costal margin in the midclavicular line. On the left side the omentum extends downward

through the left inguinal canal into the scrotum forming a mass about the size of a lemon. The left internal inguinal ring easily admits one finger; the right internal inguinal ring admits a finger tip for a short distance. The appendix is normal. The diaphragm reaches to the 5th rib on the right side and the 5th interspace on the left.

The Pleural and Pericardial Cavities are normal.

The Heart weighs 350 grams. The ascending portion and arch of the aorta show an irregular whitish thickening of the intima which is fairly characteristic of syphilitic aortitis. There is a moderate degree of separation of the commissures of the aortic cusps. The coronary orifices are not notably narrowed. The remaining valves are normal. The foramen ovale is closed. There are no mural thrombi. The myocardium shows no fibrosis. The left coronary artery shows a slight to moderate sclerosis, and the right shows a minimal sclerosis.

The Right Lung weighs 235 grams, the Left 215. There is an apical scar on each side. Except for the apical scars, the lungs are entirely normal. The bronchi, pulmonary arteries and hilar nodes show nothing of note.

The Spleen weighs 140 grams and show nothing of note.

The Liver weighs 1450 grams together with the Gallbladder. The liver shows nothing of note; there is no metastatic tumor in the liver. The gallbladder and bile ducts are normal. The gallbladder contains about 30 cc. of dark green bile.

The hypopharynx and esophagus are normal; there is no evidence of trauma. The stomach shows an ulcerated scirrhous carcinoma 2.5 cm. in width encircling the pylorus, which is markedly thickened. On the serosal side there are tumor nodules visible. The tumor has produced a marked stenosis of the pylorus. The stomach contains about 400 cc. of greenish yellow soupy material and undigested food. In the vicinity of the tumor are

about a dozen tumor filled lymph nodes 1 to 1.5 cm. in diameter; in the lower portion of the mesentery is an irregular nodule about 1.5 cm. in diameter, and there is a similar irregular tumor nodule in the middle of the right spermatic cord. The small intestine contains a moderate amount of greenish yellow mucous material. The mucosa is normal. The colon is not opened but is normal to inspection and palpation.

The Pancreas and Adrenals are normal.

The Right Kidney weighs 140 grams, the Left 170 grams. The kidneys, pelvis, ureter and bladder are normal.

The prostate shows slight hypertrophy of the lateral lobes. The seminal vesicles are normal. The right testis and epididymis are normal. The cavity of the left tunica vaginalis is filled with a lemon size mass of omentum together with about 15 cc. of fluid. The left testis is small and is flattened by the hernial mass.

The upper portion of the Aorta has been described; the lower portion shows a rather marked atherosclerosis.

The thyroid and parathyroids are normal. On the posterior wall of the larynx are two irregular areas of superficial inflammation of the mucosa; each of these areas is about 1 cm. in diameter. The larynx and trachea contain a small amount of material similar to that in the stomach, evidently regurgitated.

The scalp, skull and dura are normal. The leptomeninges show no definite thickening. The brain weighs 1400 grams and shows nothing of note. The pituitary is normal and is given to Dr. Peyton for special study.

No thrombi can be milked from the veins of the extremities or pelvis.

Microscopic:

Stomach and lymph node - grade II adenocarcinoma.

Aorta - syphilitic aortitis.

Brain and spinal cord - negative.

Larynx - slight inflammatory changes but nothing characteristic of

syphilis.

Diagnosis:

1. Carcinoma of stomach with metastases to lymph nodes and right spermatic cord.
2. Syphilitic aortitis.
3. Anesthetic death (clinical).

* * * * *

7. CASE REPORT

J. B. Carey

White male, aged 60, admitted 5-21-37.

Present complaint

Epigastric distress.

Past history

Fifteen years ago the patient had symptoms suggestive of peptic ulcer and from time to time had recurrences. Symptoms have remained same without remission for the last 2 years. Has lost 35 lbs. in weight. Rheumatism at the age of 9, recurring each year for many years. Herniotomy 20 years ago.

Examination

Tenderness in upper abdomen.

Gastric Expression

Shows free hydrochloric acid.

Gastrointestinal Radiologic Examination

shows a large benign ulcer on the lesser curvature of the stomach above the angle. The gallbladder is negative.

Gastroscopy - May 19, 1937.

8:30 Codeine gr. 1, atropine sulfate gr. 1/100.

9:00 Throat swabbed with 2 cc. 2% pantocain containing 1 drop 1-1000 adrenalin per cc.

9:15 Through a catheter perforated along a 6 inch segment 4 cc. of the above pantocain preparation was instilled into the upper esophagus.

9:30 4 cc. instillation repeated.

Attack

Immediately following the second instillation the patient had a convulsion and struggled on the floor. This lasted

about ten minutes, and the patient recovered. He never completely lost consciousness and reacted to pain during the attack. The gastroscopist and the neurologist who saw him in consultation felt that it might be an hysterical attack. The patient stated he had never had any such attack before and that he recalled nothing of what happened after the last intubation of his throat. The gastroscopy was not done. Neurological examination was negative.

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8. DISCUSSION

Ralph T. Knight

Convulsions associated with anesthesia have reputedly occurred about as long as anesthesia has been employed in the modern sense. Reference to their occurrence has been strangely absent from the literature until 1917. The earlier articles dealt with "Ether Clonus," and there seems to have been confusion between clonus and convulsions. Clonus does occur during anesthesia but is usually limited to one member and change of position or removal of pressure usually stops it. Occasionally a general trembling may occur during late induction but I have never seen such an occurrence which was not stopped by increased anesthesia or increased oxygen. Clonus is quite different from convulsions and should not be confused with the latter condition. Convulsions have occurred during anesthesia induced by ether, chloroform, ethyl chloride, nitrous oxide, ethylene and cyclopropane, and yet until 1927 no reference to any but "Ether Convulsions" was made. Then a few titles began to appear as "Convulsions under General Anesthesia." Still, however, "Ether Convulsions" has been the most frequent title up to the present time.

Convulsions have occasionally occurred when too large a dose of a local anesthetic drug for the particular patient has too rapidly entered the blood stream. Cocaine has perhaps been the greatest offender in this respect and procaine perhaps the least. Lundy has pointed out that the mechanism of the convulsions associated with general anesthesia is

probably entirely different from the mechanism of those associated with local anesthesia and that unless and until we find them to be similar we should consider them as two separate subjects and not confuse them. We recognize the correctness of this attitude and ask that this be borne in mind and that we be granted forbearance in presenting the 2 types of cases in this one hour inasmuch as the circumstances of their appearance, the symptoms, the recognized treatment and the prognosis are quite similar.

Lundy has recently made a very complete summary of the subject, has collected a bibliography of 112 articles in which 33 different causes or significant factors have been named as involved in the production of convulsions associated with general anesthesia. It is thought worth while to abstract Dr. Lundy's article here as well as a very few others which are typical.

Convulsions associated with general anesthesia: by John S. Lundy, M.D., Rochester, Minn.: Surgery: 1:666-687, (May) 1937.

The author states that attention was not really called to this condition until 1927. He calls attention to the summary presented in 1933 by Sears and to the article in 1932 by Blomfield who requested that reports of cases be sent to him so that they might be more easily collected and analyzed. Dr. Lundy urges that all cases be as carefully studied as possible and reported so that the problems of etiology and prevention may be more quickly solved. He states that some cases are true epileptic seizures which are characterized by a sudden onset of a violent tetanic spasm followed by a subsiding series of isolated clonic spasms. These are controlled by anesthesia which can usually be deepened sufficiently before the occurrence of a second seizure. The author then describes the special type of convulsions associated with general anesthesia as usually beginning with twitchings about the face and spreading to other parts of the body with increasing violence. Lundy speaks of the analogy between

tetanus and this condition, in that mild convulsions coming on late favor a good prognosis, and severe convulsions coming on early indicate a poor prognosis. He tabulates 140 cases from the literature and 4 of his own, showing diagnosis or operation, age, sex, month of the year or temperature in the room, preliminary medication, anesthetic, method of administration, analysis of ether, duration of convulsions, treatment, result and the author's explanation of the cause. He calls attention to the paucity of details in the reports of cases, and the difficulty in trying to arrive at any conclusion from them. The mortality in the assembled cases was 18.9%. The causes or significant factors mentioned by the reporters were toxemia and septicemia, excessive carbon dioxide, impurities in the ether, impurities in the oxygen, trauma, deep anesthesia, hypoglycemia, method of anesthetization, instability of the nervous system, overdosage of atropine, cerebral anemia, alkalosis, overbreathing, idiosyncrasy, cerebral accident, disturbance of calcium metabolism, ketosis, heat, youth, anoxemia, latent tendency to fits, overoxygenation, changes in the blood, sex susceptibility, increased vascularity of brain cortex, concentrated ether, deficiency of carbon dioxide, lightness of anesthesia, hyperventilation, anaphylactic edema, hydration of protein particles in the plasma and fits produced by convulsant poisons ("fits caused by nitrous oxide and curare are respiratory fits"). Some authors just as definitely state that the factors underlined above are not causes. Lundy is himself impressed with the work of Rosenow and Tovell who suggested that the condition is attributable to a neurotoxin produced by streptococci in amounts insufficient to cause spasms in the absence of anesthesia, but which, in the course of general anesthesia suffice to incite characteristic muscular spasms. 53% of the patients have been children, and most of them have had an obvious septicemia or toxemia. Lundy urges that general anesthesia be avoided for such patients when spinal or local anesthesia will suffice, that barbiturates or avertin be used in such cases as pre-anesthetic medication when general anesthesia is necessary, and that, when convulsions

occur, a soluble barbiturate be administered at once, intravenously, slowly, in just sufficient amount to stop the convulsions, and repeated if they recur, while oxygen and any other desired treatment is being administered.

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9. TREATMENT

Ralph T. Knight

The anesthetic should be discontinued at once unless the case is definitely identified as one of clonus or epilepsy. Oxygen should be administered without delay. A soluble barbiturate should be given intravenously as soon as possible. Everyone in all departments in this hospital using local or general anesthesia should be familiar with this treatment and no type of anesthesia should be given unless the material including a sterile 20 cc. syringe and intravenous needle is quickly available. Only enough to stop the convulsions should be given. A short acting barbiturate such as evipal soluble or pentothal sodium is preferred. It will soon be evident whether or not the convulsions will tend to recur. Nembutal or sodium anytal can then be given if sustained action is necessary. Calcium gluconate or chloride intravenously in one gram doses following the barbiturate is probably also helpful.

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10. BIBLIOGRAPHY

1. Bloomfield, Joseph
Convulsions during ether anesthesia
Anes. & Analg. (Suppl.) 11:38, 1932
2. Lundy, J. S.
Personal Communication to Dr.
Ralph T. Knight
3. Lundy, J. S.
Convulsions associated with general
anesthesia
Surg. 1: 666-687, 1937
4. Lundy, J.S. and Tuohy, E.
General anesthesia, complicated by
convulsions
J.A.M.A. 108: 971-972, (Mar.20)1937

5. Rovenstine, E. A.
Convulsions during ether anesthesia
Anes. & Analg. 14:40-42, 1935
6. Rosenow, E. C. and Tovell, R. M.
Etiology of muscular spasms during
general anesthesia
Am. J. Surg. N.S. 34:474-485, 1936
7. Sears, J. B.
Late ether convulsions
J.A.M.A. 100:1150-1152 (Apr.15), 1933
8. Waters, R. M.
Personal communication to
Dr. Ralph T. Knight
9. Wollmer, R. G. and Taylor, Stephen
Late ether convulsions; a study
based on four cases
Lancet 1: 1005-1007, 1936

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V. ONCE SIX, NOW THREE

Charles McLennan
and
Margaret J. Thomas
June 26, 1937

John A. Layne
and
Margaret Hyland
Aug. 11, 1937

Charles Hayden
and
Clarissa Johnson
Oct. 8, 1937

After subtraction
comes multiplication.

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VI. GAY PAREE'

Irvine McQuarrie, Pediatrics
Head Man, sends greetings to the staff
from Paris where he was seeing the city
with pediatrician Chester Stewart. He
reports visit to Europe very interest-
ing and instructive. At the Inter-
national Congress in Rome, Minnesota
was the best represented part of the
United States.

He indicates in his message
that he will be back soon, ready to
take up the old grind.

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