form of intoxication. Its symptoms are not so pronounced or so easy of recognition as in the acute form, but the eyes, digestive apparatus and nervous system undoubtedly suffer.

15. The use of ethyl or grain alcohol in the arts, as in the manufacture of varnishes, as a burning fluid, for "stiffening" hats, lacquering brass, etc., is without danger to life or eyesight. By adding to it a small percentage of naphthalin, for example, the fluid would be undrinkable. A combination of ethylic alcohol with 10 per cent. of wood spirit would answer the same purpose. Such a mixture is the "methylated spirit" of Great Britain, where not a single case of acute poisoning or amaurosis from methyl alcohol is recorded, in spite of the extensive commercial use of methylated preparations in the British Isles.

16. The treatment of methyl alcohol intoxication consists chiefly in getting rid of the poison from the stomach and intestines by means of the stomach-pump and rectal injections; stimulants, especially ethyl alcohol, strychnia and coffee; heat to the body and extremities.

17. The treatment of the amaurosis is unsatisfactory. In the early stages pilocarpin and potassium iodid; later, strychnia hypodermically and by the mouth.

EDITOR'S NOTE: This concludes the report save for the tabulated summaries of the cases previously published elsewhere, which will appear next week.

REFLEX APNEA AND CARDIAC INHIBITION IN OPERATIONS ON THE RESPIRATORY TRACT.*

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The following case, reported elsewhere by one of us,¹ gives some idea of the practical importance of this subject:

In 1900 one of my students came to me for an explanation of certain curious phenomena that occurred during massage of an epithelioma of the lower lip. It was about 1 1/4 inches in diameter and surrounded by an indurated area. The center was very sensitive. When this part was massaged the patient cried: "Don't cut my wind off! You are choking me!" He gripped the chair and grew dark in the face, breathing hard, with a pulse of 100, subsiding quickly to 20; respiration about 12. Massage next day caused the same alarming symptoms.

No doubt it was a case of reflex inhibition caused by mechanical stimulation of the abnormally sensitive endings of the trifacial.

Reflex inhibition has not received from laryngologists the attention it deserves. The text-books do not refer to it, and yet it is a subject familiar to most general surgeons and physiologists. It seems worth while, therefore, to discuss in a brief way the subject as a whole. We would call attention to the value of inflation of the lungs when death seems imminent from cardiac inhibition.

CAUSES OF INHIBITION.

Reflex inhibition of heart and respiration is caused

in the following way: Afferent impulses, following irritation of the trifacial and sensory branches of the vagus (superior laryngeal and pulmonary), are carried to the cardioinhibitory center in the medulla. This center is thrown into greater activity, and strong inhibitory impulses are sent to the heart. At the same time the respiratory center is so acted on as to cause a cessation of respiratory movements, until the accumulated carbon dioxid again drives it into action. The consequent inflation of the air vesicles of the lungs then reflexly lessens the activity of the cardioinhibitory center,² and in this way inhibition is overcome.

Inhibition of this kind must not be confused with syncope or shock, for syncope is due to a sudden vasodilation; the blood, from gravity, collects in the abdominal viscera and dependent parts of the body, and loss of consciousness ensues from cerebral anemia. Inhibition following trifacial and superior laryngeal irritation, on the contrary, causes a reflex stimulation of the vasoconstricting mechanism and is not necessarily associated with loss of consciousness.

Of course, reflex inhibition can be produced by irritation of other sensory terminals than those in the respiratory tract; it frequently occurs in operative procedures on the trifacial area about the lips,¹ teeth,³ eye¹ and ear.⁴ As this paper will deal with the respiratory tract only, we can now take it up in detail.

Nose.—Those who have inhaled strong ammonia know that it is several minutes before they can get their breath, or, technically speaking, before the inhibition of respiration passes off. Also, in etherizing rabbits, it is noticed that as soon as ether is applied to the nose the animal stops breathing over a more or less prolonged period. At the same time the heart is markedly inhibited—in fact, almost stopped. This reflex inhibition is also produced when applications of irritating solutions, e. g., dilute sulphuric acid, are made to the turbinates. Such result was observed by Kratschmar,⁵ who experimented with tobacco smoke as an irritant. Quite frequently in operations on septum reflex inhibition will cause a patient to suddenly feel faint, "lose his nerve," although, the tissues being cocaineized, he experiences no pain. Some of these cases can be ascribed to psychical causes, a few to the cocaine⁶; indeed, it is apparent at once that a large percentage of cases of so-called cocaine idiosyncrasy may properly be ascribed to reflex inhibition. Doubtless many of the deaths occurring in primary anesthesia can also be attributed to this cause. The effect of slight irritation of the nasal terminals of the fifth nerve is illustrated by the following case:

John C., aged 10 years. Acute purulent rhinitis. Pulse before examination, 100. During cleansing of nasal mucosa pulse fell to 66. Inhibition gradually decreased as cocaine was applied.

Rhinopharynx.—The rhinopharynx is also very sensitive to reflex inhibition. Applications to this region produce in some instances a momentary catching of the breath, and in the removal of adenoids a marked slowing of the pulse almost invariably occurs when the instrument—forceps, curette or finger—is introduced behind the soft palate.

CASE 1.—Edward C., aged 3 years. Adenoids operated on under ether. Before operation pulse was 145. No change in pulse occurred during removal of faucial tonsils; respiration was, of course, interfered with. The pulse immediately afterward

* Read at the Fifty-fifth Annual Session of the American Medical Association, in the Section on Laryngology and Otology, and approved for publication by the Executive Committee: Drs. G. Hudson Makuen, George L. Richards and John F. Barnhill.

1. Good: American Medicine, Aug. 23, 1902.

2. Sitz. d. k. akad. Wissensch., vol. lxxiv, p. 11.

3. New Orleans Med. and Surg. Jour., 1850.

4. H. O. Reik: Trans. Amer. Otol. Soc., 1903.

5. Sitz. d. k. akad. Wissensch., vol. lxxil, p. 11.

6. Harland: Philadelphia Med. Jour., May 23, 1903.

went up to 168. When forceps were used in the rhinopharynx the pulse suddenly slowed, and for 40 seconds remained about 90, at times running as low as 72 per minute. After operation the pulse ran up to 150.

CASE 2.—Dorothy T., aged 4 years. Adenoids removed under ether. Pulse before ether was applied, 120; under anesthesia it rose to 172; just before operation it was 160. During manipulations in postnasal space pulse fell to 66, increasing at once as soon as the instrument was removed. Three minutes after operation the pulse was 136. Two hours later it was 124. Respiration was also interfered with during operation.

CASE 3.—Josephine C., aged 8 years. Adenoids removed under ethyl chlorid. Before anesthesia pulse was 125. During early stages the pulse suddenly fell to 96 and respiration ceased for a short time (probably due to cold ethyl chlorid vapor irri-

pulse to fall, first to 96, later to 75. After operation it rose rapidly to 160; ten minutes later it was 132.

Jane R., aged 8 years. Adenoids under chloroform. Pulse before anesthesia, 160; under full relaxation, 120. During operation it fell to 72. Immediately after operation it rose to 150.

There seems to be no choice of anesthetic so far as cardiac inhibition is concerned.

Larynx.—We have found by experimental irritation of the laryngeal mucosa of rabbits with dilute sulphuric acid that reflex inhibition arising from the larynx is accompanied by a rise of blood pressure, unless the irritation is particularly well marked, when there may be a slight fall. If inhibition is prevented by division of both vagi the pressure is increased (40 to 70 mm.).

Tracing 1.—These tracings are one-fourth actual size. Upper line is the respiratory curve; at "a" and "b" the lungs were inflated with a pressure of 40 or 50 mm. mercury. The middle line is the blood pressure with the cardiac pulsations. The lower line is the seconds marked and zero pressure raised 25 mm. Tracing 1 is from a rabbit (morphin, gr. 1/3, injected hypodermatically). Dilute H_2SO_4 had been applied a few moments before to the nasal mucosa. At "x" it was reapplied. At "x" the apnea and cardio-inhibition are well marked. As soon as the lungs are inflated the blood pressure falls and the heart begins to beat rapidly, the cardioinhibition returning as soon as the inflation ceases.

Tracing 2.—Rabbit (morphin, gr. 1/3, inj. hypoderm.). The animal was recovering from the effect of a previous stimulation of the nasal mucosa, when at "x" dilute H_2SO_4 was again applied to one nostril, and about 90 seconds later to the other nostril. The cardioinhibition in both cases is well marked and the blood pressure is increased; as soon as the lungs are inflated the heart commences to beat rapidly and the pressure falls at least 50 mm.

Tracing 3.—Rabbit (morphin, gr. 1/3, hypoderm.). Dilute H_2SO_4 applied to the nasal mucosa with the usual marked cardioinhibition, in this case from 250 to 40 beats per minute. The release from inhibition by inflation of lungs can not be made out in this tracing on account of reproduction being small.

tating the air tract). Later, when relaxed, the pulse was 120. During the removal of the adenoids the pulse was irregular, faulty, and 75 per minute. There was clonic spasm, similar to that seen in rabbits when the nasal or laryngeal mucosa is irritated. After operation the pulse was 120; five minutes later, 116; ten minutes later, 105.

In order to eliminate error due to individual fault of operator the following cases, operated on by Dr. Grayson, were studied with his permission:

James M., aged 8 years. Adenoids, under ether. Before anesthesia pulse was 110; before operation it was 180. Child completely relaxed. Manipulations in rhinopharynx caused

Crile⁷ has shown that irritation of the larynx, forcible dilatation of the pharynx and violent traction on the tongue will each cause reflex inhibition, and even death. He states that in 156 intubations inhibition was encountered six times, twice with fatal results. Simple obstruction causes cyanosis and a full pulse, whereas inhibition is characterized by pallor and by a slow, weak pulse—diagnostic signs of considerable importance.

Irritation of the trachea causes little or no reflex inhibition. However, in the rabbit, at least, cardiac slowing

7. Crile: Surgery of the Respiratory Passages, THE JOURNAL A. M. A., Feb. 22, 1902.

is at times observed when a tracheotomy tube is placed in position, especially when the tube is rather large.

Lung.—Brodie and Russell⁸ have shown that electrical irritation of the pulmonary vagal fibers, or irritation of their terminals in the alveoli, with irritant vapors, causes marked cardioinhibition, apnea and vasodilation. Their results we have been able to confirm on rabbits by injecting small amounts of dilute sulphuric acid into the alveoli through the chest wall. McWilliams⁹ caused well-marked cardiac inhibition in eels by irritating the gills, which have the function of lung alveoli. A case in point is reported by Brodie and Russell⁸ of a child that died on the withdrawal of a hypodermic needle that had been introduced two inches into the lung in a vain search for pus. The heart stopped at once; breathing continued for a short time, aided by artificial means. In another case¹⁰ death occurred after a few inhalations of ether. The fatal result was ascribed to irritation of lungs rendered abnormally sensitive by disease (multiple carcinoma).

The subject of this paper is one that invites to further study and elucidation. Enough has been given, however, to suggest the possible dangers that attend all operations on the air tract and to explain some of the causes in which heart failure and death have followed unexpectedly from what seemed insufficient causes. It is only necessary in this brief outline to say a word further on prevention and treatment.

PREVENTION.

We can not hope to prevent reflex inhibition in every case. Atropin is the one drug given internally that, theoretically, is of value. It paralyzes the peripheral cardio-

Tracing 4.—Sphygmogram. W. Z., aged 3 years, adenoids removed. The pulse fell from 140 to 80 when instrument was introduced into rhinopharynx. x, Operation commenced.

inhibitory ganglia in the heart, thus preventing cardiac inhibition, which is the most important indication, for apnea can be controlled by artificial respiration and lung inflation. Atropin must be administered early and in full dose to insure its absorption before ether is given or operation begun.

General anesthesia, when complete, prevents inhibition by abolishing the reflexes, but it is dangerous to abolish all the reflexes. Of the anesthetics ether is safer than chloroform, and probably safer than ethyl chlorid. Cocain, applied locally, prevents inhibition when the anesthesia is complete. In the larynx absorption is slow, and it can be used without much danger of toxic effect; in the nose the amount must be guarded. It is not always practicable to get cocain to penetrate deep enough, and when sawing through spurs on the bony septum inhibition will occasionally occur, even though the mucous membrane itself is insensitive.

Before ether is given a preliminary spray of 1 per cent. cocain, with 1 to 10,000 adrenalin chlorid,¹¹ into the nose and throat prevents not only irritation, congestion and excessive secretion, but also lessens the tendency to reflex inhibition. Applied with an applicator to the rhinopharynx, it is still more effective. Strychnin should probably not be given; it can not be expected to prevent reflex inhibition, as it increases the normal reflexes and,

according to Wood, probably stimulates the cardioinhibitory mechanism.

TREATMENT.

Treatment will vary with the severity of the symptoms. Usually a temporary withdrawal of the cause of irritation will suffice. In severe cases one can hardly rely on atropin, even if given hypodermically, as ten or fifteen minutes will elapse before it is absorbed. The prone position and artificial respiration, gentle traction on the tongue, etc., should be at once resorted to. If these prove without effect, then inflation of the lungs by mouth-to-mouth insufflation or with a bellows, keeping the lungs distended for five seconds, and repeating until the patient is revived. The value of this procedure has been demonstrated again and again. In a series of experiments on cats and rabbits (under morphin, inhibition having been induced by applications of sulphuric acid to the laryngeal or nasal mucosa), inflation caused the cardiac inhibition to at once cease, and the heart tended to beat even faster than normal. Hering² has shown that in normal animals moderate inflation (40 to 50 mm. of mercury) of the lungs causes a marked increase in the number of heart beats. He believes that the sensory nerves of the lungs stand in the same relation to the cardioinhibitory center as the nervus depressor does to the vasomotor center. In other words, irritation of sensory endings in the lungs by inflation causes, reflexly, a decreased activity of the cardioinhibitory center and a consequent increase in the number of heart beats. Jackson,³ in a case of marked reflex apnea and cardiac inhibition from trifacial irritation, resuscitated his patient by mouth-to-mouth inflation. "The effect was instantaneous; the chest expanded, the eyes opened, a sigh was breathed, and the heart pulsated a few seconds. The insufflations were repeated until the functions were re-established. There was another attack in the afternoon, without unconsciousness. She was restored by insufflation by her husband."

CONCLUSIONS.

Any part of the air tract, when irritated, is apt to produce reflex apnea, cardiac inhibition, and even death. Usually this can be prevented by the administration of atropin, by having the patient completely anesthetized before operating, when general anesthesia is used, and by the use of cocain locally. If severe inhibition does occur we have in moderately forcible inflation of the lungs a most valuable means for relieving this dangerous condition.

DISCUSSION.

DR. G. HUDSON MAKUEN, Philadelphia, said that the whole subject of reflex disturbances originating in peripheral irritation of various portions of the respiratory tract furnishes a fertile field for conjecture and speculation. Opinions differ with regard to it; some think that there is no such thing as a reflex neurosis, while others class almost all nervous symptoms in this category. When skilled neurologists, such as Dana of New York, openly declare that they find no special pathologic relationship existing between the mucous membrane of the nose, for instance, and the general nervous system, we must pause and think before making contradictory statements or advancing opposing theories. Dr. Makuen said that the cases reported show the effect of peripheral irritation of the respiratory mucous membrane on the heart. It would be interesting to note whether the rate of the pulse is actually diminished by placing the curette in the vault of the pharynx in all or only in selected cases. Dr. Makuen said also that an inspiratory crowing sound always takes place in one of his patients whenever any topical application is made to the mucous membrane of the nose, and that such phenomena are not surprising when we con-

8. Jour. Phys., vol. xxvi.

9. Jour. Phys., vol. vi.

10. Lowe: British Med. Jour., 1877, vol. II.

11. Edward Martin: Proc. Philadelphia County Med. Soc., March 31, 1903.

sider the complexity of the network of nerves in this region. A reflex arc, in its simplest form, consists of an afferent sensory nerve, an efferent motor nerve and a cerebrospinal center or ganglion, which latter may also be connected with the higher cortical centers of the brain and to some extent controlled by these centers. It is only by keeping in mind the structure and functions of this arc that we can understand or explain the nervous phenomena that may occur during an intranasal operation. It is probable that no untoward symptoms will arise during such operations, provided the reflex arc is in good condition functionally and organically, and it is only when this reflex arc is impaired in whole or in part that we are liable to meet with accidents. Take a patient having what we call an unstable nervous system and prepare him for intranasal operation. He probably goes through several days of anxious thought about it. Cocain is then applied, the mechanical effect of which is sufficient in some cases to cause immediate disagreeable symptoms, and the systemic effect, a little later, coupled with the psychic impulses arising from the fear and dread of the operation, are often sufficient to cause the patient to collapse. When the operation is begun the patient grows pale, breaks out in a perspiration and, to use the common expression, faints. Is this collapse due to cocain poisoning, to some psychic impulse of the brain, or is it the result of cardiac inhibition from the mechanical effect of the operation? This differential diagnosis is important. If the cause is found in the heart we should use more cocain. If it is the result of cocain poisoning then we should diminish the amount. The time may come when we shall be able to determine definitely just how much cocain may be used in a given case.

DR. GEORGE L. RICHARDS, Fall River, Mass., said that he had operated on a child of 6 years for adenoids. The child was etherized by an expert nurse and yet cyanosis and complete apnea resulted before the operation was begun. The mouth was forced open with the finger and afterward artificial respiration was performed until at length a gasp came. The operation was completed without further anesthesia. He considered the facts that the adenoid was large and practically filled the nasopharynx and that the child was a mouth breather, as the explanation. When the anesthesia was complete there was complete closure of the mouth with resulting asphyxia.

DR. S. SOLIS-COHEN, Philadelphia, said that he avoids apnea from anesthetics by having the nostrils closed by the assistant before administering the anesthetic, and that he also avoids the use of anesthesia in operations on the air passages wherever it is possible to do so. In tracheotomy the patient loses his breath for a moment or two after the larynx is opened, and in removing growths from the trachea, irritation of the posterior wall of the trachea will sometimes affect respiration.

DR. EMIL MAYER, New York City, said that it would be of interest if Drs. Harland and Good would throw some light on why certain people are especially susceptible to this form of cardiac inhibition. We have known for a long time that it is to be looked out for, especially when chloroform is being used. The only death Dr. Mayer ever saw from chloroform was in a laryngologic case with a foreign body in the larynx. Adrenalin is of great value in cases where there is great danger of collapse. It should be added to the list of remedies recommended.

DR. E. PYNCHON, Chicago, divided the subject into two parts, because the prostrations which occur with general anesthetics are generally different from those resulting from cocain. In general anesthesia the patients are usually at a hospital where assistance can be had, while prostrations from cocain most often occur at the office, when no one else is present. In fifteen years' use of cocain, Dr. Pynchon had had his share of prostrations, but no deaths, and in several cases the prostration was considerable. He has frequently applied cocain to the fauces in strong solutions with a cotton applicator, and has never had prostration from its use in this locality and in this manner. Collapse has always occurred while applications were being made to the nose or when injected about the tonsils hypodermatically. Prostration was not due so much to the effect of the cocain as to the irritation of the nasal mucous membrane. He mentioned the case of a healthy girl of 18,

who had been operated on several times, the tonsils and ridges from the septum having been removed. Applications of cocain had in each case been made without any unfavorable manifestations. Lastly, there remained one other condition which demanded operation, and in cocainizing the middle turbinal a small applicator was pressed in between it and the septum. She had epileptiform convulsions, differing materially from cocain prostration. Some time afterward he attempted to repeat the operation, using a weaker solution of cocain, but the introduction of the probe in the same manner produced the same results.

DR. R. C. MYLES, New York City, said that it is difficult to account for these idiosyncrasies. It has always seemed to him that there was some condition of shock. The most difficult case he had ever had was that of a man on a football team, and he tried seven times before he was able to do the operation. The patient was an athlete of the higher order, but could not face the idea of having an operation performed. This condition is not confined to any one class of individuals; the point is to watch the patient and by studying him try to anticipate the result. Tracheal injections sometimes produce the same condition. Dr. Myles said he had injected solutions of vaselin into the trachea with the same results as from cocain. Whenever he has occasion to try it now he first tests the case, especially if it is to be an application to the trachea, under a general anesthesia, and is particularly careful, because he once lost a patient on the table and could never account for the death. The patient was frightened. The anesthetic was administered by an expert. Investigation shows that the majority of deaths from anesthesia occur in operations about the throat, and a little preliminary tickling of the mucous membrane is the thing to do as an experiment.

DR. C. M. COBB, Boston, said that, in the removal of adenoids, he had had patients do almost everything except die, and that he did not feel justified in submitting a patient to ether in adenoid operation unless he had a mouth gag in use. It saves time lost in forcing a spasmodically contracted jaw open, possibly two minutes. It is just as easy to put the mouth gag in and have absolute control of the patient, and it may save the patient's life in an emergency. These adenoid patients are doing business on a small amount of oxygen, and the slightest disturbance of the mucous membrane makes them close the mouth and they can not breathe through the nose. Since he has adopted the practice of instructing the house physicians to put in a mouth gag as a routine measure he has had much less trouble.

DR. B. R. SHURLY, Detroit, said that we are coming to use nitrous oxid more and more, and that it deserves a much wider use. He asked if any use of it has been made in the experiments.

DR. W. H. GOOD, said that it is very easy to prove this cardiac inhibition on rabbits by applying irritants such as ether to the nasal mucosa. The heart, normally beating at the rate of 300 a minute, immediately falls to about 60 a minute. Inflation of the lungs removes this inhibition, the heart running rapidly up to 300 beats or more a minute. In cardiac inhibition the thing to try first is simple inflation of the lungs for four or five seconds, repeating until the heart recovers. The apnea can be overcome by artificial respiration. It is the cardiac inhibition that kills these patients. The heart of a patient from whom a dentist was removing a carious tooth suddenly stopped, and after trying a number of things, he inflated the lungs. The heart started to work, but again stopped, and he repeated the process. The next day the cardiac inhibition returned without the loss of consciousness. The patient was at home, and the husband, who had been present at the dentist's office, blew into his wife's lungs and she recovered. Dr. Good said that adenoids make a very sensitive pharynx, and ether could have caused the condition without the blocking of the passage; he said he was unable to answer the query in Dr. Mayer's case. Adrenalin to be of service should be given intravenously, but he did not think it would overcome any of the indications. It causes increased blood pressure, but that is already present and it does not de-

crease the cardiac inhibition. He said that clonic convulsions almost invariably result from irritation of the mucous membrane of rabbits. Nitrous oxid had not been used in any of the experiments. When a patient is under the influence of any anesthetic this inhibition may occur. With cocain the sensory endings of the nerves are paralyzed and inhibition does not occur. Using cocain locally and giving a dose of atropin to paralyze the peripheral ends of the vagus in the heart prevents inhibition.

THE RADICAL TREATMENT OF NON-STRANGULATED INGUINAL HERNIA FROM THE STANDPOINT OF THE MODERN SURGEON.

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MANILA, P. I.

It has been well said that, owing to the anatomic construction of the inguinal canal, the occurrence of rupture in the human species must have been coeval with the appearance of man on the globe, and this being the case, it would not be preposterous to assume that to some early descendant of Adam belongs the credit of having invented the first crude retention apparatus.

In accordance with the trend of modern thought on the descent of man, we may with propriety consider this tendency to hernia on the part of the human race as one of the penalties resulting from the action of Adam and Eve in abandoning the quadruped method of progression of their immediate simian progenitors, and assuming the erect carriage which has since characterized the human family. The erect posture has certainly placed man, with his weakly constructed inguinal canal, in the very best position for the gravitation of a coil of the intestine into a patulous internal abdominal ring, and for its being forced through the opening and into the canal during strain of the abdominal muscles.

THE FIRST SUCCESSFUL METHOD OF CURE.

From the earliest times until the present day men of advanced ideas in our profession have persistently pursued the chimera of the radical cure of hernia, with ignominious failure as the constant reward of their efforts, and the treatment of hernia has, until the very present, continued to be the greatest opprobrium of those posing as the healers of the ills of humanity. Suffering mortals have continued to die from strangulated hernia with persistent regularity, and the coffers of the truss makers have grown full to overflowing. It remained for the surgical genius of the present day to devise a safe and permanent radical cure for this distressing and common infirmity, and from the publication in December, 1889, of the method of Halsted of Baltimore, and in 1890 of that of Bassini of Padua, must the radical cure of hernia be considered to date.

These methods, independently evolved by their distinguished authors and fulfilling the same indications, have solved the surgical problem of the ages. In this connection it is interesting to note that in 1890, just prior to the publication of Bassini's method, Dr. Bull of New York City published a paper giving the results in 134 cases of hernia subjected to operation in the preceding four years, with three deaths and 38 per cent. of relapses. In the paper referred to, Dr. Bull says: "In reflecting on the experience of these cases, I am obliged to conclude that in these methods which I have faithfully tried, there is no prospect of obtaining a radical cure in any form of hernia, and the majority

of cases will be found to relapse if followed for a sufficient time." Sir William MacCormack states in his Bradshaw lecture for 1893 that of the cases of non-strangulated hernia operated on in the London hospitals, 6 per cent. died. The opinions of such men, with such results as they recorded, served to create in the minds of many conservative men a serious prejudice against the radical operation for hernia, which has only been mitigated within the last few years, owing to the brilliant results obtained under our present system of aseptic technic by the methods of Bassini and Halsted.

The views expressed by Dr. Bull in 1890, which were formulated prior to the publication of the Bassini method, and which were founded on the results of operations since abandoned, are still quoted by some, against the radical operation. It is interesting to note in this connection that within a few years after the publication of this paper, Dr. Bull himself had become one of the ardent advocates of the radical operation for hernia by the Bassini method, and I had the opportunity, in the autumn of 1895, of seeing him perform this operation several times at the Hospital for the Ruptured and Crippled in New York City, where, with Dr. Coley, he was paving the way for the great permanent popularity of this operation in our own country.

Looking back at the infinite series of failures in the efforts to secure a radical cure for hernia already referred to, we, with our present knowledge, are not surprised that success was not attained. Such a fortunate result was impossible prior to the introduction of our modern aseptic surgical technic, no matter how ingenious or how well executed the method of operating might have been. The introduction of the absorbable animal suture has also had a great influence in making the radical operation for hernia a success, although it must be confessed that Halsted invariably uses silver wire for his buried sutures, while Bassini, at least in his earlier operations, used silk for the same purpose.

REQUIREMENTS FOR SUCCESS.

In order that an operation for the radical cure for hernia may be successful, the following indications must be met:

1. A perfect aseptic technic must be followed in all its details.
2. The hernial sac must be obliterated.
3. The internal abdominal ring must be narrowed closely around the cord or a new internal ring made.
4. The inguinal canal must be reconstructed.

The three anatomic indications are fully met in both the methods of Halsted and Bassini.

Without a perfect aseptic technic general sepsis or septic peritonitis may follow the surgeon's efforts, or if such serious dangers to life are avoided, suppuration in the deep portion of the wound will be almost certain to result with a consequent failure in the efforts to effect a cure. This was the rock on which were wrecked the hopes of countless numbers of operators, who essayed to cure hernia with the knife prior to the introduction of our present aseptic methods.

The internal abdominal ring should be narrowed to closely embrace the spermatic cord, for it is a self-evident fact that unless this step is carefully carried out a fresh protrusion of intestine will work its way by the side of the cord down into the canal through the patulous opening thus left.

It is equally evident that the hernial sac must be obliterated, else a trap for intestine will be left, and it is