Treatment by extracts of endocrine glands is disappointing. When signs of thyroid deficiency are obvious the administration of thyroid gland will cause a general improvement in health, and with this an improvement in symptoms of menorrhagia; but it is quite unusual to find these signs in a woman who is suffering from excessive bleeding about the time of the menopause. Pituitary extract is certainly useful for its immediate effect on the uterus, but its effect is not prolonged. In slight cases a series of injections of pituitary extract are useful in tiding a patient over a prolonged or excessive period. These are the only two extracts which can be relied upon in the treatment of bleeding at the menopause. The various forms of ovarian extract, corpus luteum extract, and combinations of these with other extracts, have no action which can be relied upon. It is probable that the preparation of the extracts destroys the active principle. Occasionally good results will be obtained, but these are so rare and uncertain that use of these extracts cannot be considered therapeutically scientific. The excessive bleeding results from retrogressive changes in the uterus which cannot be controlled or affected by ovarian medication.

2. IRREGULAR AND EXCESSIVE BLEEDING.

Carcinoma of the cervix uteri is very common; some irregularity in bleeding, or blood-stained discharge, or bleeding, it may be slight, on examination, or after coitus, is usually present, but the onset may be very insidious, and the first unmistakable sign may appear only when the disease is well advanced; this is especially true when the growth has originated in the cervical canal. It has thus become the accepted rule that any, and every, woman who complains of any excessive or irregular bleeding or blood-stained discharge, particularly about the time of the menopause, must be examined with the greatest care; if there is no palpable or visible sign of carcinoma of the cervix there still remains the possibility of carcinoma of the cervical canal or body of the uterus. This may necessitate careful examination under an anaesthetic; the cervical canal and uterine cavity must be thoroughly dilated and examined, and the scraping or curettage sent for microscopic section. The importance of diagnosis and treatment at the very earliest moment may be emphasized if it is realized that in the out-patient departments of hospitals two cases of carcinoma too advanced for operation are seen for every one that is operable.

The best treatment of carcinoma of the cervix is by an operation removing the whole uterus and appendages with a cuff of vagina, as freely as possible, with the cellular tissue round the cervix and the iliac glands. The results of this operation, when performed by those who have made themselves familiar with it, are surprisingly good; roughly 40 per cent. of the cases are cured and free from recurrence after five years, according to the latest expert figures available. The primary mortality is quite small; patients who suffer a recurrence have a period of from one to five years of freedom from pain, even from discomfort, and the terminal stages are characterized more by a general debility than by the awful bleeding and foul discharge which is present when no operation has been done. This radical operation is undoubtedly the best treatment so long as the condition is operable. The treatment by radium cannot compare with this, and as a curative agent it must take second place. Its effect is to cause improvement in the local condition for from six to twelve months. As an adjuvant, or in the treatment of inoperable cases or for early recurrences after operation, its palliative effects may be beneficial.

3. BLEEDING AND BLOOD-STAINED DISCHARGE OCCURRING AFTER THE MENOPAUSE.

This always suggests malignant disease; but whereas before the menopause and the age of 45 cancer of the cervix is twenty times more probable than cancer of the body of the uterus in women who have borne children, as the age of 50 is approached the probability of carcinoma of the body of the uterus becomes equal to that of carcinoma of the cervix.

Cancer of the body of the uterus starts in the epithelium or glands of the endometrium and is less rapid in its growth, remaining local for a much longer time; except in its advanced stages it can only be diagnosed by exploratory curettage or digital examination of the uterine cavity. The large majority of cases are operable when first seen, and the operation of pan-hysterectomy is followed by very good results. Patients in this class must generally be given an anaesthetic to confirm the suspicion of cancer of the body; if cancer of the body is not present, senile endometritis will be found, and this will be cured by curettage.

When cancer of the body of the uterus has become inoperable palliative treatment alone is left; the growth extends to the surrounding structures and the intestines, and neither radium nor x rays can be used with safety.

THE EPIGLOTTIS IN RESPIRATORY OBSTRUCTION UNDER ANAESTHESIA.

BY

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RESPIRATORY obstruction under anaesthesia is a matter of considerable importance to every anaesthetist, but of vital interest to the throat surgeon. I do not propose to deal with the minor crises which arise during the course of an anaesthetic, and are overcome by such simple but all-important manipulations as forcing apart the clenched teeth, gagging open the mouth, holding the jaw forward, pulling out the tongue, swabbing mucus or blood out of the throat, and performing artificial respiration. My object is to push a step further in the knowledge of causes of dyspnoea in the normal air passages. The emergencies I have in mind are rare, but when they do occur, usually result either in the performance of a tracheotomy or in the death of the patient, or sometimes both.

Having had the opportunity of dealing satisfactorily with a number of these cases, and of making certain definite observations in the course of treating them, I feel justified in making some suggestions as to a routine method of procedure to be followed during the very short interval of time which elapses between unrelieved respiratory obstruction, subsequent cardiac failure, and the patient's death.

There can never be any doubt as to the identity of this clinical picture, which must be diagnosed from cardiac or respiratory failure due to shock, chloroform poisoning, or depression or poisoning of the respiratory or cardiac centres in the central nervous system.

The patient's colour affords the first indication that all is not well. The cyanosis is often concurrent with difficult or poor respiratory movements. This change of hue gradually becomes intensified and is soon dark blue with a blackish tinge. Respiration ceases altogether, and the pulse becomes rapid and feeble. The mouth is gagged open, the tongue pulled out, and artificial respiration is performed, but without effect. The pharynx is swabbed clear of mucus and an oxygen tube introduced in vain.

There is clearly some laryngeal obstruction, and if this is relieved at once the situation is saved, but if not the heart finally ceases to beat, the colour turns from blue-black to white, the skin surface turns cold, and the flesh when cut no longer bleeds. At this point the patient is technically dead, but may be resuscitated within two minutes.

I propose to deal with this type of crisis in two stages: (1) When respiration ceases, and efforts to restore it have failed owing to an obstructed airway, but the circulation is still maintained. (2) When respiration has ceased for so long that the circulation fails also. The treatment of stage 1 is so closely concerned with the epiglottis that I cannot do better than discuss this structure from the point of view of anaesthesia.

THE EPIGLOTTIS.

Where there is no laryngeal disease the epiglottis is the key to the lower air passages. Although the laryngeal sphincter, consisting of the arytenoid, thyro-arytenoid, and thyro-aryepiglottidean muscles, may be thrown into spasm, this only occurs when anaesthesia is so light that the laryngeal reflex is present. The spasm passes off of its own accord in a short time and does not occur under deep anaesthesia.

Anatomical Varieties of Epiglottis.

(a) The epiglottis may be of the "overhanging" variety. That is to say, that when observed with a laryngeal mirror the larynx cannot be seen, but only the anterior surface of the free part of the epiglottis. The upper end is closely approximated to the posterior pharyngeal wall, even when the tongue is pulled forward, as is usual during indirect laryngoscopy. It is easy to understand that if the tongue falls back under anaesthesia, such an epiglottis will lie right over the laryngeal and oesophageal openings.

(b) The epiglottis may be of the "dead leaf" type. That is to say, it is curled laterally upon itself, the two sides being bent backwards and approximating to the centre. This type also hides the glottis to a certain extent, and may overlap it under anaesthesia.

(c) The epiglottis may be quite normal in appearance and yet have the following slight variations: It may be comparatively long, short, thick, thin, broad, narrow, hard, soft, rigid, or pliable. And yet if it was to be examined during an autopsy it would not attract any attention. I have known an epiglottis (which was a little long, thin, soft, and pliable) nearly cause a patient's death by becoming impacted over the larynx. But when examined *in vivo* afterwards by the indirect method it looked the same as any other epiglottis, with the exception of the slight divergencies mentioned.

When I refer to the length of the epiglottis I mean its projection above the base of the tongue. This will be found to vary in different individuals.

The Physiological Functions of the Epiglottis.

The epiglottis serves two important purposes, apart from its influence in modulating the voice:

(a) It acts as a protection to the larynx from the normal secretions in the mouth. If it were not for its position and formation saliva which now collects either in the valleculae or pyriform fossae would drip into the trachea and cause constant coughing.

(b) Opinions differ as to its exact function in swallowing. It was held at one time that during deglutition the epiglottis was folded over the laryngeal aperture like a covering, but more recently other observers, notably Professor Anderson Stuart, have shown that the larynx is shut off by the sphincteric action of the thyro-arytenoid and arytenoid muscles, and that the epiglottis is only curved backwards by the thyro-aryepiglottidean muscles so as to form a slight cowl-like protection.

But bearing in mind the various anatomical and physiological details of this region, the projection of the epiglottis above the tongue, and the powerful muscular action of swallowing, it seems impossible to avoid the conclusion that so flexible a structure, even if not pulled over the laryngeal aperture by muscular action, could hardly avoid being swept down on to it by the passage of a bolus which fits accurately against the whole circumference of the pharynx. In fact, although it is not possible to bring forward any definite proof, it seems extremely likely that we swallow our epiglottis as far as it will go at every act of deglutition, and it would probably cause us to choke if it were not for the normal interval of reflex respiratory cessation after swallowing which allows it to recover its normal position.

Seeing that the coughing reflex is abolished before that of swallowing, it follows that there is an interval of time when the epiglottis may be drawn over the larynx by a swallowing movement while the protective cough reflex is absent.

IMPACTION OF THE EPIGLOTTIS OVER THE LARYNX UNDER ANAESTHESIA.

I have not entered into these anatomical and physiological details in order to prove or support any particular theory, but to try to find some explanation for a clinical fact which I have repeatedly experienced—that is, complete obstruction to respiration under anaesthesia caused by the epiglottis alone. It is most often to be found when the patient is in the tonsil position with a sandbag under the shoulders, but may occur in other circumstances also. In these cases I have made the following observations by digital examination.

1. A long epiglottis is sometimes found tightly impacted over the laryngeal aperture, with its extreme end curved up and closely applied to the posterior pharyngeal wall (see diagram). This type is difficult to disimpact owing to the awkwardness of passing a finger between the opposite surfaces of epiglottis and pharynx. But as soon as the epiglottis is pulled forward and pressed against the base of the tongue with the finger a free airway is instantaneously restored.

An epiglottis so impacted acts as a valve allowing air to escape from the chest, but none to re-enter, and affords an obvious explanation why artificial respiration in such a case is foredoomed to failure until the airway is cleared.

2. An epiglottis which, although not tightly impacted, is nevertheless lying in contact with the posterior pharyngeal wall. It is possible that this type is an early stage of the first; and only requires a vigorous inspiratory effort to draw it on to the larynx by suction. It is common to find this clinical feature in many cases of respiratory difficulty, from the mildest to the more severe. To raise the epiglottis, and press it against the base of the tongue with the finger, again affords instantaneous relief, and artificial respiration can then be applied with confidence and success. If for any reason this fails to secure a free airway, a laryngotomy can, of course, be performed. But I have never failed to secure a free airway by these methods, and such a case has never got worse progressively until the heart ceased to function, except in cases where there was obstruction due to actual laryngeal disease.

If, however, the condition has progressed to stage 2 before it is relieved further measures must be taken.

Diagram showing how a long and flexible epiglottis sometimes lies over the laryngeal aperture under anaesthesia. E, Epiglottis. O, Oesophagus. The author has seen three cases of complete, and many cases of partial, obstruction to respiration from this cause. Its pernicious valve-like action is also seen. Air is able to leave the chest, but inspiration is prevented by the epiglottis being drawn on to the larynx by suction. Artificial respiration is of no avail until it has been raised by the finger and pressed into its normal position against the base of the tongue, where it is held until danger is past.

TREATMENT OF FAILURE OF RESPIRATION AND CIRCULATION DUE TO RESPIRATORY OBSTRUCTION.

A. "No Man's Land."

There is a certain region which lies between the domains of "life" and "death." All the signs of death are present: there is no breath, no visible, audible, or palpable sign of a heart beat or pulse, the surface of the skin is cold, the colour is a bluish-white, and when the flesh is cut the wound does not bleed but yields only a few drops of dark fluid. No one knows definitely how long a man may stay in this region and still climb back to life. The most optimistic would not put it at more than three minutes or the most pessimistic at less than two. So that when a patient under anaesthesia loses both respiration and circulation, the surgeon, anaesthetist, and theatre staff have only a short time at disposal, and they must use this time to the greatest possible advantage in restoring him to life.

B. Minimum Requirements for Resuscitation.

These are mainly physiological, and consist of (a) a free airway; (b) the presence of sufficient oxygen in the lungs to oxygenate the blood in the alveolar capillaries to the fullest extent possible; (c) the passage of that blood into the left auricle; and (d) sufficient movement of the heart to force some oxygenated blood through the aortic valve so as to enable it to circulate through the coronary arteries, and supply the heart muscle with enough oxygen to allow it to contract automatically. I make no mention of the respiratory and circulatory centres in the central nervous system, because our knowledge of them is theoretical rather than practical, we cannot exert clinical influence upon them in the time at our disposal, and we know that local treatment of the lungs and heart will produce the desired effect if accomplished in time.

To elaborate these requirements in terms of practical performance is a simple matter.

1. As soon as the emergency arises one individual must start doing artificial respiration and maintain it continuously and without ceasing for any reason, being relieved by another at any necessary intervals. Artificial respiration should be regular and unhurried, but very forcible; and should compress both lungs and heart.

2. Simultaneously another gags open the mouth, and introduces the finger as far as the larynx, raises the epiglottis and presses it forwards against the back of the tongue. If the airway is now quite free the fact will be obvious because the breath will be heard coming and going easily under the force of artificial respiration. If not, a laryngotomy or tracheotomy should be performed immediately and without hesitation, a laryngotomy being quicker and easier than a tracheotomy.

3. While this is going on a third person has brought forward the oxygen cylinder and turned on the oxygen with propulsive (but not explosive) force, and holds the tube ready to the operator's hand when he calls for it, which he does the moment the airway is free.

As soon as the operator has established the airway and holds the oxygen tube in his hand, he first tests the power of the stream of oxygen and then introduces it into the laryngeal aperture or directly into the trachea in the case of a laryngotomy or tracheotomy. The lungs are thus, in the shortest time possible, flooded and washed out with oxygen aided by powerful artificial respiration.

If these three people know what to do beforehand and act simultaneously the utmost relief is supplied within a few seconds, which is an all-important factor in treatment. The necessary movements of the heart to induce the initial automatic contractions can be brought about in the majority of patients by the vigorous passive movements of the chest wall which I have already described. Special attention must be paid to compressing the cardiac area, and this can always be done, with the possible exception of certain individuals with unusually rigid chest walls. As soon as this is accomplished and the alveolar air has been flooded with oxygen, the heart, which has been stimulated and supplied with oxygenated blood, starts to beat and the crisis is relieved.

C. The Opening of the Abdomen below the left Costal Margin and Massage of the Heart through the Diaphragm.

I mention this procedure because it has received a certain notoriety, but I doubt its applicability to the obstructive type of case, whatever its merits may be in primary cardiac failure when the airway is free. It is obviously useless to compel the heart to circulate fresh quantities of the venous blood which in the first place brought it to a standstill. Such an action is bound to have a deleterious effect upon the heart muscle, and possibly accounts for the occasional failures of this operation. But if the lungs have previously been flooded with oxygen in the way I have described, and fresh supplies of arterial blood laden with oxygen are occupying the pulmonary veins and left auricle and merely awaiting a beat or two

of the heart to put them into circulation, then such an operation may possibly be justified. The only thing against it is that it is then usually unnecessary. The heart in most cases is readily susceptible of stimulation through the chest walls except in those whose ribs are unusually rigid, and I think this abdominal incision of problematical efficacy should be reserved for such cases. When it is employed, artificial respiration should be interrupted for as short a time as possible while the operation is actually taking place.

The Use of Drugs.

While the usual cardiac and respiratory stimulants may be of some avail when once the circulation is restored, it must be obvious that no medicines can supply oxygenated blood to the left side of the heart and so to the coronary arteries, which is the fundamental requirement at these critical moments. Nor can they reach the structures they are intended to influence until the restored circulation will carry them to their objective.

Equipment.

When there is so short a time in which to act, it is obvious that unless the necessary instruments are ready to hand the surgeon and anaesthetist will be seriously handicapped in their efforts at resuscitation. I would therefore suggest that the following instruments should be added to the usual list and kept under cover on the anaesthetist's table instead of on a shelf or in a cupboard in the operating theatre or instrument room.

1. A spatula with a blade long enough to reach the epiglottis. People with short fingers find great difficulty in holding up the epiglottis for any length of time because of the weight and power of the tongue. If such a spatula cannot be obtained, a closed sponge-holder will sometimes suffice, using the teeth of the upper jaw as a fulcrum. But the best instrument is the forefinger.

2. A scalpel.

3. A laryngotomy tube with introducer.

4. A "bi-valve" tracheotomy tube. This needs no introducer, and is the easiest type to insert.

5. A tracheal catheter.

In addition to these a properly mounted oxygen cylinder is of great use. It should either be full or have a reserve cylinder alongside. The cylinder in use should have a coarse and fine adjustment. The oxygen outlet should be ready fitted with a long rubber tube to give to the operator without delay. If it is necessary to deliver oxygen directly into the trachea, the tube can be fitted over the tracheal catheter.

CONCLUSION.

Never having heard of the part played by the epiglottis in respiratory obstruction until I discovered it for myself in making a digital examination of the larynx in a patient who was in *extremis*, I have since found this knowledge of great value on several occasions. It enables a tracheotomy or laryngotomy to be avoided, it makes it possible to complete an operation which might otherwise have to be abandoned, and it may save life where instruments for tracheotomy or laryngotomy are not available.

My suggestions as to resuscitation are the result of observations on two successful cases where both respiration and circulation had entirely ceased, and where cardiac massage through an abdominal wound was found to be unnecessary. While there is nothing new in clearing an airway, performing a laryngotomy, flooding the lungs with oxygen, performing artificial respiration, or stimulating the heart through the chest wall, I was nevertheless impressed with the advantages afforded by simultaneous team work in providing thorough treatment at the earliest possible moment. I was further influenced by the reflection made at the time, that to have interrupted this work in order to perform an abdominal operation, however short, would probably have resulted in the patient's death, since, as it was, there appeared to be hardly a moment to spare from the task of getting oxygen into the alveolar air.