free iron reaction. The spleen contained pigment in leucocytes and endothelial cells and also free. The kidneys showed some pigment, probably malarial, in some of the glomerular capillaries. The tubules were catarrhal and contained much broken-down material, evidently consisting of partially disintegrated red corpuscles. There were also numerous casts. The broken-down material was most abundant in the collecting tubules. The bone marrow was myelocytic but showed no great change. The heart muscle was atrophic; there were a few haemorrhages between the fibres. The right lung showed croupous pneumonia.

Case 5.

A Greek, admitted on September 25th, 1918, after four days' journey. He was anaemic and yellow, and passed blood-stained urine in bed. The spleen was enlarged, the lungs seemed healthy, but the heart was dilated and the pulse was almost imperceptible. He received an intramuscular injection of quinine bilydrochloride, 20 grains, at 2 p.m., and as the pulse had improved he received an intravenous injection of 20 grains at 6 p.m. This was repeated the next day in a pint of saline solution. Malignant tertian parasites were found in the blood. He died at 2.50 p.m. The temperature had never exceeded 99° F.

Post-mortem examination showed a dilated heart with flabby muscle. The lungs were congested, the liver pale and fatty, and the gall bladder distended. The spleen was six times the normal size. The kidneys were dark in colour.

Microscopic examination of the liver showed extreme fatty degeneration. Every here and there were necrotic areas. The cells contained much brown pigment, and a small portion of this gave the free iron reaction. The spleen showed fibrosis and great masses of brown pigment in endothelial cells and large leucocytes. The kidneys showed catarrh of the convoluted tubules. There were blood corpuscles and detritus in the collecting tubes and ascending limbs of Henle's loops—most in the former. The bone marrow was myelocytic. The giant cells were numerous and appeared healthy. The heart muscle was extremely atrophic with exudation between the fibres.

I wish to submit that these cases strongly support the view that blackwater fever is a manifestation of malaria, and that the onset of the haematuria or haemoglobinuria may be determined by exposure to cold. The majority of my Serb patients had taken part in the attack that led to the Bulgar capitulation, and all of them had suffered cold and privation.

Tropical haemoglobinuria or haematuria is commonly recognized in three forms—(1) malarial haematuria, (2) quinine haemoglobinuria, (3) blackwater fever.

Malarial haematuria is characterized by the presence of malarial parasites and the absence of jaundice. In an experience of some 20,000 cases of malaria¹ I have only seen one example, and I regard the condition as due to a localization of parasites in the urinary passages or a local lesion resulting from the parasite or its toxins, and comparable to malarial appendicitis, pneumonia, or keratitis.

Quinine haemoglobinuria is widely recognized, but I have never met with it in spite of the fact that all my malaria cases never received less than 30 grains of quinine daily for many successive days, and I have given as much as 60 grains intravenously within an hour.

The arguments adduced against the malarial origin of blackwater fever are the following:

1. The rarity of blackwater fever in places where severe malaria is prevalent. This seems to me a doubtful proposition. The incidence of blackwater is often transient, and I agree with Parsons and Forbes² that it is often overlooked.

2. The seasonal incidence of blackwater fever differed from that of malaria in Macedonia, blackwater being most common in the winter months. I think that this may be accounted for by the factor of exposure to cold.

3. It is frequently stated that the administration of quinine often causes blackwater fever, and that blackwater fever is not benefited by quinine. I am prepared to controvert both statements. Of course blackwater fever may follow the administration of quinine if the dosage is inadequate or if a sufficient number of corpuscles has been affected before it is given. I have administered quinine intravenously in large doses in blackwater fever at every stage and have never seen harm follow, and latterly intravenous quinine in saline was my routine treatment. In that practice I was by no means alone.³

4. It is frequently stated that malaria parasites are rarely found in blackwater fever. This is contrary to my experience.

Noël Paton⁴ and I pointed out in 1903 that haemolytic agents fall into two groups:

1. True haemolytics, such as glycerin and distilled

water, dissolve out haemoglobin, which is set free in the plasma and appears in the Bowman's capsules in the kidneys.

2. Toxic agents, such as toluylene-diamine and phenylhydrazin, poison the corpuscles but do not liberate haemoglobin. Very large doses of phenylhydrazin kill animals with the formation of a brown pigment in the blood resembling but not identical with methaemoglobin and with haematuria. Haemoglobin does not appear in the Bowman's capsules, but blood pigment appears in the urinary tubules and in their epithelium. In smaller doses there is no haematuria, but pigmentary changes occur in the liver, spleen, and kidneys.

The distribution of damaged blood corpuscles and pigment appears to be identical in blackwater fever with that found in animals poisoned with the second class of haemolytics. Blackwater fever is therefore regarded as due to destruction of blood corpuscles by the malarial parasite. The parasites associated with blackwater fever are the malignant type which does most damage to the corpuscles, has the greatest tendency to cause local symptoms, and sporulates and liberates toxins mainly in the internal organs. A moderate amount of damage may lead to jaundice only. A greater destruction of red corpuscles may be more than the usual haemolytic organs can deal with, and blackwater fever results. The influence of cold is, I think, an important causal factor. W. Hunter⁵ showed that normal animals became more deeply jaundiced than spleenless animals after poisoning with the second class of haemolytics. Paton⁴ and I confirmed this observation, and concluded that the greater jaundice in the normal animals was simply due to a more rapid fixing of the poisoned corpuscles in the portal system.

One does not overlook the important influence that cold has been shown to exert in determining an attack of paroxysmal haemoglobinuria, but it is unnecessary, I think, to invoke immunity reactions to explain its influence in blackwater fever. Cold may be regarded as acting much in the same way as the spleen does in the experimental animals, by retaining a larger proportion of corpuscles in the internal organs, and thereby exposing them to a larger contact with the haemolytic organs. Such a view might afford a simple explanation of apparent anomalies in the incidence of blackwater fever both as regards time and place.

Summary.

Fourteen cases are tabulated. In twelve of these malaria parasites were found. All the cases were treated with large doses of quinine and twelve recovered. It is contended that malaria is the essential cause of blackwater fever, and that exposure to cold may be an important factor in determining its onset.

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RESUSCITATION IN DEATH UNDER ANAESTHESIA.

BY

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THERE appears to be a need for the greater advocacy of cardiac massage as a measure of resuscitation in death and impending death under anaesthesia. Records of fatalities still appear without mention of cardiac massage having been practised, and without any reason for its non-employment being advanced. Such a case, for instance, was described last year, and not one of the twenty-six contributors to the correspondence which followed made any comment upon the statement that "artificial respiration was carried on for nearly two hours, but there was never the slightest response." It is true that the means employed for resuscitation of this case—death occurring during an adenoid operation—was not the issue particularly raised for discussion; but the absence of comment could not but have implied acquiescence in the correctness and adequacy of the treatment. To those, however, who have proved the merit of cardiac massage the case is but one of many which clearly indicates that this operation has

not yet received the recognition which it deserves as being the only measure that can with any reliance be counted upon to re-establish the heart's action when it has been suddenly arrested under anaesthesia.

The living tissues of the body, according to their nature, retain a varying measure of vital force and survive for varying periods the suspension of their blood supply. The more lowly their origin the more durable is their life. The connective tissue and epithelial elements may survive for days, as is shown by their preservation if kept cool for purposes of grafting. Muscle may preserve its vitality for hours, but the delicate fabric of the central nervous system, upon which vital systemic processes depend, does not survive for more than thirty minutes at the most deprivation of its vascular nutrient supply. Accordingly, experience of cardiac massage has shown that cessation of the circulation for thirty minutes means inevitably the termination of life, so that after a longer period cardiac massage and artificial respiration alike are futile.

If early and appropriate treatment is pursued the patient, upon recovery from the effects of the anaesthetic, will often appear to be none the worse for his adventure, except for a protracted period of somnolence, which would seem invariable. So grave is the cerebral irritation set up by a prolonged cerebral anaemia, however, that a state of unconsciousness with incontinence may occur, and mental disturbance and convulsive rigidity and choreic movements will ensue, which either prove temporary and controllable by depressant drugs, or increase in frequency and force until death occurs. A case has been graphically recorded by Mr. Mollison¹ of a boy aged 6 who, after suddenly expiring during a tonsil and adenoid operation, was revived by cardiac massage instituted about twenty minutes later. It was about five weeks before his nervous system recovered and he entirely regained his normal mental standard. If such a state of dangerous nervous disturbance is to be avoided, cardiac massage must be begun earlier than in this case, probably within ten minutes at latest. Every medical man should familiarize himself, by practice on the cadaver, with the procedure of cardiac massage, as with that of tracheotomy, which all are schooled to perform and which requires greater skill.

Many medical men are unfamiliar with cardiac massage: some are prejudiced against it. There is also a fear of peritoneal contamination consequent upon hasty and inadequate preparation; but such a contingency is extremely unlikely, even though the skin of the epigastrium be unprepared or only smeared with iodine. Such a consideration should not influence the decision of the surgeon who is confronted with an occasion of grim emergency that imperatively demands quick intervention if life is to be restored. Undue time is apt to be lost by the preliminary trial of other measures, particularly of artificial respiration, which has so long been the accepted practice that it is still resorted to, even when the heart has ceased beating. In such a case there is scant likelihood of artificial respiration meeting with any success.

Beyond a period of half an hour no measure whatsoever will avail.

The question arises as to whether the external manipulations of artificial respiration are ever capable of restarting the heart-beat. Conceivably they are, for doubtless the chest movements have some effect (especially in young subjects with pliable thoracic walls), by reason of the rhythmic variations of intrathoracic pressure which they produce, in mechanically promoting a blood flow, and by reason of transmitted pressure, in stimulating the heart. This conception affords sufficient justification for artificial respiration to be given a trial for a minute or two, not longer. Argand's finding that mechanical stimulation of the heart acts best when applied to the auricular region has led to a practice of applying jabbing intermittent pressure over the upper epigastrium during the performance of artificial respiration. But it would be vain to place reliance on such external means, whose success at best has proved rare and haphazard. The case of new-born infants is different. Mr. E. Ward² advocates and vouches for a method of external cardiac massage which, owing to the pliability of the chest wall, would appear to be an invaluable and successful innovation in the treatment of asphyxia neonatorum, especially the white form with weakened or imperceptible umbilical pulse. On the operating table it is customary to employ either Sylvester's method of artificial respiration or a method

of grasping and compressing the chest which has a similar if not more beneficial effect. These manipulated movements do not of themselves suffice to afford an adequate respiratory tide; it will be profitable to examine their influence and to assess their value.

In the inanimate state the diaphragm is inactive, atonic, and relaxed, and moves only passively, subject to mechanical laws; consequently the normal chest capacity is reduced by the increased response of the diaphragm to negative pressure above and positive pressure below; this reduction is greater when the subject is in the inclined plane. When Sylvester's inspiratory manipulation is made the chest is expanded, but the advantage gained is less than would at first sight appear; the diaphragm rises further in consequence of the increased negativity of the thoracic pressure brought about by the expansion of the chest and of the increased intra-abdominal pressure consequent upon stretching of the abdominal parietes as the arms are raised and pulled. At the expiratory manipulation the amount of air expelled is less than might be anticipated, for whereas the capacity of the chest is reduced by its compression, the diaphragm descends, as is seen by the bulging abdomen; here again there is a discount to the advantage gained. Thus, contrary to normal action, the diaphragm moves upwards at inspiration and downwards at expiration—a to-and-fro movement that weighs against effective costal respiration, upon which Sylvester's method depends entirely for its success. This tends to respiratory stasis, and—in the young with pliable chest walls, by the superabounding effect of compression—finally to lung collapse. A case was narrated to me by Dr. Charles Hadfield of death due to respiratory failure under anaesthesia. Sylvester's unaided method of artificial respiration was employed upon a child for a long period without any evidence throughout of lung ventilation being obtained. At the autopsy there was no sign of obstruction in the air passages, and the lungs were found in a state of collapse. I think the interpretation I have given is applicable—that owing to contrary movement of the diaphragm the influence of costal movements was negated, and chest compression prevailing, the air was gradually eliminated and finally expressed from the lungs. I have seen a similar condition of the lungs at autopsy in a baby which succumbed to severe rickets, with extreme costal recession from marked softening of the ribs.

It is imperative, therefore, when employing Sylvester's method to augment lung ventilation by Howard's modified plan, an assistant making expiration more effective by the application of pressure over the epigastric zone and so elevating the diaphragm, and supplementing the inspiratory movement by suddenly removing the pressure exerted; this effects a simultaneous descent of the diaphragm and costal elastic recoil.

It may seem paradoxical, but it is nevertheless true, that the manipulations of cardiac massage fortuitously produce a better amplitude of respiration than is obtainable by the external artificial methods. It is difficult, therefore, to understand the reason for carrying on artificial respiration concurrently with cardiac massage, as is so frequently reported. If cardiac massage is being performed lung ventilation at once ceases to be a matter of concern; any accessory means employed is redundant. In the bimanual manipulation of cardiac massage the dome of the diaphragm is forcibly raised simultaneously with compression of the front of the chest, and a forced and complete expiration is thus brought about. This is followed, as the pressure is suddenly released and the descent of the diaphragm is aided by that of the liver (which is levered down by the back of the hand) by a deep inspiration. In comparison with Sylvester's method, given previous trial in a case, the effect upon the freedom of respiration is audibly greater; this is what would be expected if one considers that the diaphragm, the chief factor in the respiratory act, is directly brought into play. It is important to bear in mind this contingent incident of cardiac massage, for in cases of respiratory arrest with gradually weakening heart-beat an earlier decision can be made to undertake a procedure by which not only the circulation but the respiration will derive advantage.

Cardiac massage has an influence upon the circulation that I have not seen previously described. Well before a first heart-beat is initiated a change in the appearance of the patient is witnessed, the pallor of the skin gradually being replaced by a perceptible flush. This indicates in the first place that the manipulations supply a part of the necessary force—previously in abeyance—to propel the blood stream, and by the agency of the intracardiac valvular arrangements set in motion an artificial circulation that is comparable to a physiological model made up with tubing and a Higginson's syringe. In one of my cases the intraocular tension was observed to improve, and in Mr. Mollison's published case the pupil of the eye

was observed at this time to become smaller. The heart is at first uncertainly palpable in its extreme diastolic flabbiness, but prior to the occurrence of its first contraction it is felt gradually to become more firm. The first heart-beat is minimal, and of the character of a "twisting kick," and the contractions, once started, assume regularity and gain strength as the manipulations proceed, until after some six to twelve contractions a maximum excursion is reached, which remains constant, at remarkable vigour. The staircase phenomenon of progressive augmentation is attributed to the beneficial effect of contraction. The extraordinary force of the maximal cardiac contractions is regarded as dependent upon increase of muscle fibre length that occurs with exceptional ventricular relaxation and distension. Other influences that may work to the same end are the unprecedented cardiac rest, the enhanced coronary circulation consequent upon massage, the persisting abeyance of governing inhibition, and cumulative muscular and augmentor stimulation mechanically induced. However this may be there appears reason to continue with massage until automatic contractions are well established at maximum vigour, as reflected in the radial pulse. In a case in which I ceased massage before the heart-beats had become maximal they again stopped, and failed to recur in spite of renewed intervention. In cardiac massage the auricular parts of the heart are not accessible to the manipulating hand, approach being hindered mesially by the inferior vena cava, and from before by the coronary ligament. Practically it is the ventricular part of the heart only which is squeezed; if an attempt is made to include the auricular portion within the scope of the operation, the heart is lost from the grasp, and the respirations become inadequate or cease.

It would appear that in the initiation of the heart-beat artificial circulation must constitute an initial causal factor that is of paramount importance whatever may be the actual determining exciting cause. Possibly an artificial circulation through the cardiac and central nervous tissues is all-sufficient, by its influence upon elimination and supply, to reconstitute a normal state in which functional activity becomes spontaneous. The cause of the heart-beat according to present physiological teaching is said to lie in the cardiac muscle, the salts of the blood supplying the osmotic conditions that lead to its irritability and contractility, and affording the necessary constant stimulus for the heart's automatic action. But it is difficult to conceive in cases such as emotional syncope, where these conditions have been little disturbed, why the heart should remain permanently arrested in action and not spontaneously restart beating. Some other than an inherent exciting factor would seem, therefore, not to be precluded. It is possible that once nutritive conditions are restored and the irritability of the heart is raised again to a susceptible threshold, it responds by a first beat to the mechanical stimulation of the hand (or to an artificially produced intracardiac tension, as demonstrated experimentally by Gaskell with the apex of a frog's heart).

Further observations, corroborative and otherwise, are required of clinicians who have occasion to resuscitate by cardiac massage cases of death under anaesthesia, and it will be of great help if an understanding of the processes concerned is quickened by a clear pronouncement by physiologists, to whom we must look for guidance and more definite direction.

Methods of Performing Cardiac Massage.

Subdiaphragmatic Massage.—An opening is made in the epigastrium to the left of the middle line, and large enough to admit a hand, which is passed, palm upwards, between the left lobe of the liver and the diaphragm. The fingers are pushed well backwards and upwards against the left cupola of the diaphragm, and a forced jabbing movement is made behind the ventricular region of the heart, so as to squeeze it effectively against counterpressure made by the other hand on the precordial region of the chest wall. The compressions are repeated at a rate of about forty a minute (a more rapid rate is not practicable), and are carried on until the heart-beat is re-established with regular rhythm and maximal power as reflected in the pulse. The abdominal wound is then sutured.

Transdiaphragmatic Massage.—This is a technique devised by Captain T. C. Bost.³ The abdomen is opened as before, and the further steps are only proceeded with if subdiaphragmatic massage fails. The costal attachment of the diaphragm is divided sufficiently to force an opening into the left pleural cavity, through which the right hand is insinuated, and the heart grasped and squeezed as it lies in its pericardial sac.

Artificial respiration must be carried on throughout the operation. In the case recorded by Captain Bost the measure met with success after failure of the subdiaphragmatic method.

Transpericardial Massage.—This very difficult method has not in practice met with gratifying results. A flap of the precordial thoracic wall is raised, the pericardium opened, and the heart directly squeezed.

Supradiaphragmatic Massage.—This method affords ready access. A lower intercostal space on the left side is quickly opened by a lengthy incision, well retracted, and a hand is introduced into the left pleural cavity. The heart, enclosed in its pericardial sac, is grasped and squeezed. I have seen no mention of such an operation being designed to meet the occasion. With failure by subdiaphragmatic massage it arises as an alternative to the method designed by Captain Bost, who claims as an advantage of his plan that occurrence of pneumothorax is practically precluded by the close fit of the diaphragmatic opening to the wrist, and that artificial respiration can be efficiently carried on.

Record of Cases.

CASE I.

On April 14th, 1917, a man aged 54 was brought to the theatre for radical excision of an advanced epithelioma of the chin. He struggled somewhat whilst being anaesthetized with chloroform, and as the chin and neck were being smeared with iodine he became pallid, the heart stopped beating, and respiration ceased. Artificial respiration, begun at once, was practised for a time without avail. As slight tremulous epigastric movements were observable (probably from ventricular fibrillation) artificial respiration was resumed, but it became evident that the man was dead, for there was not the slightest sign of respiratory movement, heart-beat, or pulse. Eye reflexes were unobtainable, the lids open, pupils dilated, and eyeballs flaccid. At this stage the epigastrium was rapidly smeared with iodine, an opening made into the abdomen, and cardiac massage begun. At first no cardiac contraction could be felt, but in a minute or two a first beat was felt, and the beats that followed increased in strength and became regular. With the establishment of a strong bounding pulse the massage was stopped and the abdomen sewn up. Free respirations occurred with the manipulations, and prior to the initiation of the heart-beat surface flushing was observed to take the place of extreme pallor. The man's condition remained good, and in view of his unhappy history I resolved to proceed with the operation. This took nearly two hours, being an extensive procedure necessitating excision of a portion of the mandible together with the soft structures and glands implicated, the whole being removed *en masse*.

There was some loss of blood and the patient was weak, but after a lengthy period of somnolence he made a good recovery, and was ultimately discharged well. Animation was computed to be suspended for a period of about ten minutes. The catastrophe occurred during induction by chloroform, and appears to have been a cardiac syncope precipitated by undue haste in preparation of the operation area in a subject afflicted with fears. Inhalation of iodine vapour may have been the deciding factor.

CASE II.

On May 5th, 1917, a soldier, aged 30, was prepared for amputation of the right thigh, which had become necessary on account of prolonged suppuration, with recurring secondary haemorrhages, attending severe offensive sloughing gunshot wounds of the leg with comminuted fracture of the tibia. The femoral artery and vein in Hunter's canal had been tied on March 28th, but the septic condition of the limb had become aggravated and haemorrhages had recurred. When the patient was brought to the theatre he was pallid and in a septic state. After he had been lightly anaesthetized with ether, Clover's inhaler being used, he suddenly ceased breathing, the heart stopped beating, and the pupils dilated widely. Artificial respiration was at once performed and saline was infused. Much time was expended in employing the usual means towards resuscitation, but they all failed, and after about twenty minutes the patient was left as dead. The surgeon in charge of the case acceded to my solicitation that cardiac massage might be performed. Without any preparation, I rapidly opened the abdomen and began the manipulations, which met with success after they had been practised for about three minutes; the same sequence of events was observed as in the previous case during their performance. The heart was beating with great force and regularity and the pulse was strong before the manipulations were stopped. The abdominal wound was then sewn up and I myself continued the anaesthetic whilst the thigh was amputated at the lower third, the operation being completed with success. The patient left the ward for the theatre at 1.30 p.m. and returned to the ward at 4 p.m. His temperature was then 96° F., and he was collapsed. A rectal injection of 1 drachm of spirit of ammonia in 5 oz. of water was then given. Twenty minutes later, $\frac{1}{10}$ grain strychnine hydrochloride was injected hypodermically and 10 oz. of saline were ordered per rectum, half-hourly. About 5 p.m. spasmodic convulsions commenced and continued until 6 p.m., when they became less frequent. At 6.30 p.m. the temperature was 102° F. One ounce of brandy was ordered three-hourly. The seizures recurred half-hourly, the spasmodic rigidity affecting chiefly the left arm and the neck muscles. Respirations became increasingly rapid and distressed, the pulse imperceptible, and the patient died at 10.28 p.m., about six hours after resuscitation. Consciousness was never regained. He exhibited slight movement at times

and opened his eyes, which were turned to the ceiling. Prolonged suffering illness, sepsis, and repeated haemorrhages must have rendered the case particularly vulnerable, and it is doubtful under the circumstances if the cerebrum could have withstood a less protracted arrest of its circulation. As there had been a good deal of muscular tremor prior to the operation, an investigation was made after death as to the presence of tetanus, but this was excluded. The operation had not been begun at the time of the catastrophe.

CASE III.

An elderly woman in a state of collapse was undergoing operation for strangulated femoral hernia when the heart stopped beating. Cardiac massage was at once performed and spontaneous contractions occurred. As the abdomen was being closed the heart again stopped beating, and a second attempt with cardiac massage then failed. Although the patient was a poor subject, this experience seems to indicate that massage should be carried on until contractions are established at maximal strength, the task not being considered complete merely upon their reappearance.

CASE IV.

In this case general adhesions were found in the upper abdomen, and it was not possible to insert the hand below the diaphragm or below the liver. Pressure below the stomach immediately forced gastric contents out of the mouth. Methods 2, 3, or 4 were indicated but not tried.

CASE V.

On February 7th, 1918, a case of perforated gastric ulcer in a man aged 38 years came under my care. The operation was performed fourteen hours after perforation, and the abdomen was found full of gastric contents. There was a large opening in an indurated ulcer at the lesser curvature of the stomach. It was impracticable to treat this otherwise than by passing a tube to the opening. Suprapubic and loin drainage was provided. Whilst the wound was being sewn up the patient expired. Cardiac massage was unsuccessful. Success was not to be anticipated, as the subject was devitalized.

CASE VI.

On June 13th, 1917, a glass cutter, aged 43 years, was struck on the left leg during an air raid. Severe bleeding, which preceded admission, continued from two deep contused wounds. There was tearing of muscle and comminuted fracture of tibia and fibula at their upper third. The patient was restless and anxious, and had no feeling in the toes. Operation was performed, shrapnel being removed and the punctured anterior tibial artery ligated. Gangrene appeared on the second day and amputation was performed at the middle of the thigh, the flaps appearing suspicious. The patient sank during the operation, pulse and respiration ceasing. All methods to revive him, including cardiac massage, failed, as was to be expected in such a case of toxæmia.

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HEAD OF RYE GRASS IN THE LUNG REMOVED FROM PLEURA.

BY

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THE following is a case in which an ear of rye grass (*Lolium perenne*) was inhaled, and after producing symptoms of an unusual character was extracted from the pleura.

Children, in this part of the country at least, play games with ears of rye grass. If one of the ears is placed on the back of the neck, bristles upwards, it gradually disappears down the back. Another game is to throw the grass at one another, the sharp bristles readily adhering to the hair or clothing. A third, and more dangerous game, is to place the grass on the tongue, when it slowly creeps backwards towards the throat.

The patient in this case, a boy aged 14 years, having put an ear of rye grass into his mouth, felt it pass into the throat, and was aware of a strong prickling sensation in the pharynx. The prickling suddenly disappeared after some hours. As there was no coughing or disturbance of any kind it was assumed that the grass had been swallowed.

Twenty hours later he was seized with acute pain in the right side of the chest in the area corresponding to the lower lobe of the lung, and was forced to go to bed. The pain continued, and remained severe up to about sixty hours from the onset, and then abated. His medical attendant was called seventy-two hours after the swallowing of the grass. At this time the physical signs suggested consolidation of the lower lobe, and with free fluid in the pleural cavity at the level of the limit of the lower lobe. There was no cough and no sputum and the picture was one of a pleuro-pneumonia with the pleural element predominating. The temperature was 104°, and kept steadily

on this line up to admission to hospital, eleven days after it reached this level. The fluid in the chest increased until the whole right pleural cavity was filled. Only on the eleventh day was a little blood and a few spots of very foul pus brought up by coughing. Exploration of the chest proved the fluid to be very foul pus, and he was referred to me for the drainage of an empyema.

On admission his general condition was very grave, with great dyspnoea and much toxic absorption. Resecting the ninth rib in the scapula line, I evacuated about three pints of very foul pus. At the end, a complete ear of rye grass was floated out of the pleural cavity, covered with debris. No cavity could be felt in the lower lobe of the lung. Continuous drainage and lavage by Dakin's solution through a Dobson's cannula completed the operation.

On the eighth day a large slough of lung tissue was extruded from the pleural cavity, followed in two days by a similar one, at least three inches long and a quarter to half an inch thick.

The boy is making an excellent recovery. There is practically no sputum, and very little cough to be noted.

On direct examination of smears from the pus, large numbers of bacilli, Gram-positive and negative, were found, together with staphylococci and streptococci. Cultures were all overgrown with saprophytic organisms. No branching fungi of the actinomycosis order were discovered.

The following points in this case are of interest:

1. Its rarity in view of the fact that the games mentioned, especially that concerning the tongue, are so common.

2. The inhalation of the grass with the absence of the usual intense paroxysm of coughing.

3. The entire lack of cough and sputum for eleven days.

4. The rapidity of involvement of the pleura, which is almost suggestive that the ear of rye grass "forcibly crept" its way through the lung tissue and involved the pleura at so early a date that the damaged lung tissue and consequent abscess drained into the pleural cavity instead of being expectorated by way of the bronchus.

INTRANASAL DACRYOCYSTOSTOMY.*

BY

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IN summarizing the history of the various plans which have been adopted for making a permanent opening from the lacrymal excretory system into the nasal cavity, the earlier efforts may be neglected. These were designed to provide a new outlet from the nasal duct, but experience has proved that the lesion to be circumvented is rarely, if ever, situated so low down that such methods could succeed. The abnormality, usually a stenosis, is practically never at a lower horizontal level than the junction of the lacrymal sac and the nasal duct. The sac, not the nasal duct, must be attacked; to open the duct only is useless.

The first reported case of such a sac operation was that of Strazza in 1903. The technique adopted by different surgeons has varied. Yankauer's operation may be described as a plastic reconstruction of the nasal duct right up to the sac, and so approximates to the principle of an attack directed on the sac itself. Mosher removes the anterior end of the middle turbinate, and then approaches the sac via the unciform process. Beck devised two operations, in one of which he opened the sac into the nose by means of a burr introduced through a canaliculus. Von Eicken works from the antrum; but, as West remarks, only the nasal duct is accessible, and, in order to expose the sac from the antrum, a piece of the orbital floor must be removed. Choronshtzky, Wiener and Sauer force a probe through canaliculus and sac into the nose, and then remove, with the probe as guide, the debris of bone and mucosa; it will be noted that these surgeons do not undertake any formal preliminary removal of bone and mucosa so as to make a window. West, Halle and Polyak perform a formal window operation intranasally, then seize the sac and deal with it by partial excision. Of these window operations West's may be regarded as the prototype.

Broadly speaking, and apart from combined operations in which the sac is approached from both inside and outside, all intranasal manoeuvres for draining the lacrymal sac fall into one of three types.

The first is the most ambitious undertaking, in that it aims at reconstructing the lumen of the nasal duct right up into the sac. This form of operation, of which Yankauer's is the only instance, is not generally favoured. It is technically difficult of performance, and in any case is likely to fall short of its object because the lesion may

* A summary of a paper read at the Annual Summer Congress of the Laryngological Section, Royal Society of Medicine.