The treatment of throat carriers of haemolytic streptococci proved disappointing, as was anticipated. Nevertheless it is of interest that they became negative while undergoing treatment, and, in the case of the medical student described, this fact proved of practical value.

In the small series of patients so far treated it appeared that surgical conditions of the mouth and throat could be kept free from pathogenic organisms during administration of the pastilles, with marked symptomatic relief.

On bacteriological grounds faucial diphtheria should be an indication for treatment with penicillin pastilles. Unfortunately we have as yet been unable to obtain suitable cases, but it is hoped to publish these results later in a fuller report.

We would like to express our gratitude to the Penicillin Clinical Trials Committee of the Medical Research Council and Prof. L. P. Garrod for providing the penicillin which made the investigation possible, and to the latter for his encouragement and helpful criticism. We are indebted to Miss G. E. Root for grouping the streptococci and cheerfully accepting other onerous duties. We would also like to thank Dr. Paton, the matron, and staff of the Sisters' Hospital for Infectious Diseases, St. Albans, for their kind co-operation; Lieut.-Col. O'Connor, and Captains Battson, Fairhurst, and Patterson of the Army Dental Corps for their help in referring cases of ulcerative gingivostomatitis to us; and many members of St. Bartholomew's Hospital Staff at Hill End E.M.S. Hospital, St. Albans, for kindly allowing us to treat their cases. We are greatly indebted to Mr. L. T. Martin, of the dispensary, Hill End Hospital, for making the pastilles.

AN ANALYSIS OF 259 OF THE RECENT FLYING-BOMB CASUALTIES

BY

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This is an attempt to present a picture of the recent flying-bomb raids as seen in a small E.M.S. hospital. For those interested in figures I have included tables. We admitted anyone requiring treatment that the rest centres could not provide. The selection was quite varied: by no means all our patients needed dramatic surgery to staunch a sea of blood, and some of our bizarre cases presented interesting problems. Not the least was a poor soul who had been blown into a tank of dirty industrial oil and appeared in the midst of a rush of casualties: we used our gas-decontamination centre for the first—and we hope the last—time.

In order to keep on admitting every day, every night—sometimes several times in the same night—we convoyed our patients as soon as they were fit to travel. Convoying has its own advantages and disadvantages. The former are obvious in the large turnover possible; the latter only appear later. We became the first cog of a large wheel: we admitted; we provided immediate treatment; we darned and patched and then transferred our patients at the first possible moment, accompanied by only brief notes. Continuity of treatment is bound to suffer, and it is very difficult to estimate the success and failure of one's efforts. This is the great weakness of the service. Some of our cases went as far afield as Wales: of their progress we knew nothing until discharge notes—quite as brief as ours had been—came trickling in. Later still a few of the patients themselves began to arrive as out-patients for review, but many have fallen by the wayside. There are great gaps in the story—inevitably so; some so gross that I wondered if it were possible to hold the interest with our jumbled facts and many loose ends; but I felt that if each link in the chain were pieced together—the casualty hospital, the base hospital, the ambulance trains, the distant evacuation centres—the story would be worth while.

In all we dealt with 222 out-patients and 259 in-patients, with 18 deaths. Our story began in June, 1944, when the first large incident occurred near by. Twenty-six casualties were admitted and 12 required theatre treatment. This proportion remained fairly constant throughout the series. Altogether we had 83 theatre cases out of 259 admissions, and had to send 35 cases on untreated, most of whom required the theatre. In this first incident no fewer than 16 of the casualties were

due to flying glass. It was noticeable how the proportion of glass injuries dropped as the importance of taking adequate cover was realized, while the percentage of crush injuries increased from people being trapped by falling masonry.

In July we admitted 32 patients from a neighbouring hospital which had been hit, only to send them on in a few hours, to the great grief of the nursing staff, who had just succeeded in disentangling prostatic tubes from false teeth and restoring order out of chaos.

A night in July began our peak period. We admitted 24 cases, 6 requiring theatre treatment. Next morning, at 10 o'clock, a flying bomb dropped in a near-by market-place. The incident caused the highest number of casualties of the whole London attack. We admitted 74 to the wards and dealt with over 90 in the casualty department. At one time we had ambulances evacuating the night's casualties waiting their turn with ambulances bringing fresh wounded. In 24 hours over 100 patients were wards. This is the brighter side of the convoy system. As we could not deal with all the cases in our single theatre in reasonable time we re-evacuated 35 patients after rest, cleaning, and first-aid attention, and 15 more who had had minor operations. The most gravely injured we retained. In the tables T refers to the transferred cases, and any remarks about them are more liable to error since only a clinical diagnosis was made at the bedside and was unsupported by further investigations.

So much for the conditions. It was impossible to obtain complete accuracy when the cause of every death could not be proved by necropsy and some of the cases were whisked away with only a partial diagnosis.

Air-raid casualties may be divided into two great groups: (1) those who require surgical treatment, and (2) those who do not.

GROUP 1: REQUIRING SURGERY

These cases are best described in reference to the agent which caused the injury. Any patient may fall into more than one such category.

A. Flying Glass

This was the most frequent cause of injury, totalling over 100 casualties in all. Many included severe damage to the eyes. It is noticeable that most of the injuries were above the nipple line, chiefly of the face and neck: a large proportion were received when looking out of windows—a modern version of curiosity killing the cat. We had five cases of perforating wounds of both eyes and ten perforating wounds of one eye. The globe was usually completely destroyed. Many of these injuries were avoidable, and therein lay their great sadness.

The penetrating power of flying glass is, in the main, low. It is unusual for it to pierce the deep fascia: usually it lies just under the skin in the fat, but when present in hundreds of pieces it presents a problem which has not yet acquired a satisfactory solution; nor has the condition made its way into the textbooks of war surgery. Often the gashes are also begrimed with earth, wood, and stones: orthodox surgical toilet is an impossibility, or at least ill advised. We had two outstanding examples of this condition, which may stimulate interest and which are quite comparable in that the wounds were of roughly the same intensity and situation and both patients were very bad surgical risks—fat, heavy, and chronic bronchitics.

Case I (Miss X., aged 58)

This patient was admitted on June 23 suffering from compound fracture of the medial epicondyle of the left humerus, with surrounding destruction of skin and subcutaneous fat for an area of three-quarters of a square foot on the posterior surface of the arm. There was a similar wound on the posterior surface of the right arm, except that it was without bony injury. Her back was lacerated by flying glass—there were probably 100 cuts in all. On admission she was barely conscious, with a blood pressure of 90/70, and her pulse was scarcely perceptible. She was treated for shock by morphine, rest, hot-water bottles, and hot sweet tea. She was given A.T.S. 3,000 units and A.G.G.S. 4,000 units. An attempt to administer intravenous fluids by the legs failed owing to previous extensive ligation and injections for varicose veins, and her arms were unsuitable for intravenous therapy because of the many cuts. Some six hours after admission her condition had considerably improved; blood pressure had risen to 110/80, and she was quite rational and complaining of pain. She was taken to the theatre,

where both arm wounds were carefully cleaned and the soiled tissue excised; the wounds were packed with sulphathiazole and proflavine, 1%, with vaselined gauze, and the arms put in plaster. As her condition was deteriorating, the wounds of the back were washed with half-strength dettol, dusted with sulphanilamide powder and proflavine, and a vaselined gauze roll was applied. Many pieces of glass were removed from the gashes, most of which had penetrated the superficial fascia only. An intravenous drip was put into the long saphenous vein in the groin. The total time on the operating table was 2½ hours. On return to the ward she was given 2 pints of blood and 2 pints of glucose-saline within the next 12 hours. Her condition on the following day was quite satisfactory, considering her physique—temperature 99°, pulse 120, respirations 28. On account of her emphysema she was given breathing exercises and, anticipating sepsis of the wounds, she was put on sulphapyridine, 1 g. 4-hourly. By the fifth day after operation her condition began to deteriorate; she was eating little and became drowsy. There was no anuria or oedema of the feet. On the sixth day her temperature began to climb to 100°; she complained of severe abdominal pain, and the pulse, having been down to 90, rose to 110, and the respirations to 35. She had signs of a consolidation at the base of the right lung and the abdomen was distended. She died in the afternoon of the seventh day after operation with gross dilatation of the abdomen.

At necropsy all the coils of gut were distended from paralytic ileus, and there was oedema of the lower lobes of the lungs. After removal of the plaster the arm wounds were absolutely clean and appeared just as they had left the theatre. The wounds of the back were surrounded by nothing more than a small area of oedema with a little reddening, and many of the wounds were oozing a serous discharge—a picture of indolence. The gut was grossly distended, as it had been just before death, from paralytic ileus. Histological examination of the liver showed marked cloudy swelling and fatty degeneration, with toxic changes in the spleen.

In retrospect several points stand out about this case. First, our experience, and that of other hospitals in the district, has shown that it is most unwise to allow an operation to extend for more than one hour in these very shocked patients. After an hour their blood pressure falls and their general condition deteriorates very rapidly. One should curtail one's activities within this time limit. Our careful surgical toilet of the extensive arm wounds probably cost the patient her life, since as the wounds were unchanged after seven days one can assume that the patient's resistance was very low, and there was no attempt at repair or reaction against the bacteria which must have been present. Secondly, I think she was taken to the theatre too soon. We gained the impression that the tendency is to operate too early—before the patient has recovered from profound shock, both psychological and cardiovascular—rather than too late. We allowed far longer for recuperation in the later cases of the series, with improved results. Thirdly, the object of the plaster was to immobilize the soft-tissue wounds, as advised by Trueta, in order to avoid pain and to prevent bacterial spread via the lymphatics. Both these objects were achieved, but psychologically I think it was unsound to imprison both arms of this type of patient, which made her feel still more helpless.

Case II (Mr. Y., aged 63)

This patient was admitted on July 3, 1944, with multiple cuts of the back and arms, which were very dirty, with earth and grit driven into the depths of the wounds. He was very shocked, with blood pressure 75/50, but conscious and able to drink. He was therefore given hot sweet tea and 1/4 gr. morphine, with A.T.S. 6,000 units and A.G.G.S. 22,500 units intravenously. It will be noticed that the latter was in accordance with the new instructions of the E.M.S. Memorandum, and a considerable increase on the dose given in Case I. His wounds were wrapped in sterile towels and he was left for a time, since his condition was considered to be almost hopeless and more promising cases demanded attention. About an hour after admission he was given 1 pint of plasma intravenously, followed by 3 pints glucose-saline in the next 12 hours. On July 4 he had not passed urine for 24 hours and, although the bladder was not palpable above the symphysis pubis, he was given carbachol 0.5 c.cm., and the dose was repeated half an hour later. Following this he passed about 10 oz. of urine. His condition next day had considerably improved, and his blood pressure rose to 100/80. His wounds had been entirely untouched apart from wrapping in the sterile towels. In view of our previous experience the correct course of treatment was debatable. We decided not to take him to the theatre; instead, his back was merely washed in the ward with dilute dettol, followed by half an hour's radiant heat, after which it was dusted with sulphanilamide powder, vaselined gauze and proflavine were applied, and the sterile towels were

replaced over the wounds. The next day (72 hours after admission) his blood pressure had risen to 120/80, and it was decided to take him to the theatre. There a large piece of wood, 4 in. long and 1 in. in diameter, was removed from his back and a few pieces of glass were taken from the cuts, but no extensive exploration was carried out. His back was sprinkled with sulphathiazole and proflavine, 1%, and he was returned to the ward within 15 minutes, having had under 0.75 g. of pentothal. I feel that this visit to the theatre was superfluous, apart from the removal of the large piece of wood, which we had not been able to do in the ward. As he was a very fat and flabby man of 63, he was given breathing exercises daily. On July 6 he started having hot normal saline baths, which relieved his pain considerably. After the first day he was allowed to sit up in the bath and use ordinary soap, which he did with very great enthusiasm. His progress from then onwards was highly satisfactory; every day saw marked improvement. After the baths his back was dusted with sulphathiazole, and dry dressings were applied, kept in place by three many-tailed bandages. On the seventh day, at his own request, he was transferred to another hospital, where his wife, also an air-raid casualty, had been taken. Nearly all the small cuts of the back had healed, leaving five or six of the larger ones a little septic and gaping, the worst being a gash some 1½ in. wide.

He reported again on Oct. 3. The back was then completely healed.

TABLE I.—Glass

Description	No.	Remarks	Deaths
Lacerations of face, scalp, and neck ..	77	19 T	—
Perforating wounds of eye ..	15	5 cases bilateral 2 T	—
Cut hands ..	9		
Severe multiple lacerations ..	6	1 T	1
Other injuries ..	5	—	—

Any patient may appear in two or more tables.

B. Bomb Splinters

A striking feature was the low incidence of penetrating wounds of the body cavities. We did not have a single penetrating wound of the abdomen; and there was only one of the chest—giving rise to a haemopneumothorax. This is excluding two patients with multiple perforations who died a few minutes after admission, the cause of death being unknown, as necropsies were not performed. There were two perforating wounds of the cranium. This contrasts with the injuries of bullets and heavy bomb splinters. I think it is due to the shape of the fragments, which tend to be small flat pieces of metal, often about the size of a halfpenny, or smaller, and the thickness of a sixpenny piece. These disks have a high coefficient of friction and probably a low velocity. The longest track we discovered was some 5 in. through fat and muscle, in the region of the hip, and this patient had been lying within 20 yards of the crater edge.

Occasionally the bomb fragments are large tangled masses of crumpled sheeting, weighing a pound or more, and these may cause very severe injuries. One man hit by such a fragment had his right humerus shattered and some 6 in. of the triceps muscle torn away; another had his thigh nearly severed, with severe comminution of the femur.

Apart from the small splinters at very close range and the massive fragments mentioned above, the bomb splinters did little serious damage. There were six cases of injuries by wood splinters, which were confined to the soft tissues and did not penetrate to any of the body cavities. One patient had a large piece of wood driven between the head of the radius and the ulna in an antero-posterior direction and projecting 5 in. each side of the arm, yet, miraculously, no important structure was damaged.

TABLE II.—Bomb Splinters (24 Cases)

Description	No.	Remarks	Deaths
Multiple perforations all over body ..	2		2
Multiple perforations of face and head ..	1		1
Abdominal and buttock wounds, not entering peritoneum ..	3		
Perforating wounds of cranium ..	1		
Perforating wounds of chest ..	1		
Fractures { Major ..	5		
Minor ..	3		
Soft-tissue lacerations ..	9		
Wood splinters ..	6	1 T	

C. Masonry

At the beginning of the series these injuries were uncommon. Later they became more frequent as adequate cover was taken, and instead of being killed the victims were buried with varying degrees of trauma. We did not have a single case of crush syndrome with oedema of the injured part, anuria, and uraemia. This is probably due in great measure to the increased speed of the A.R.P. rescue service, and possibly to a lessening in the enthusiasm for intravenous plasma therapy. The injuries tended to be severe, and there was a proportionately high death rate—9 out of 52.

TABLE III.—*Masonry (52 Cases)*

Description	No. and Remarks	Deaths
Fractures of limbs and pelvis	23 (16 severe; 7 minor) 1 T	3
Fractures of skull	7	6
Dislocations:		
Hips	1	
Tarsus	1	
Shoulder	2 2 T	
Lung injury	1 (with surgical emphysema and haemoptysis)	
Bruising	17 3 T	

D. Blast

(a) *Affecting the Lungs.*—It was difficult to estimate the number of patients whose lungs were affected by blast and to assess the relative damage caused by blast in contradistinction to the other agents. Three patients, however, presented a clear syndrome not confused by other lesions. They had severe pain in the chest, breathlessness, and traces of blood in the sputum, without any visible lesion of the bony cage in the radiograph. One of these died, and he provides the one certainty.

This man had been repairing a cinema roof when a bomb fell about 100 yards away. He lay down on the tiles, but the left side of his body caught the full force of the blast. On admission he was concussed and irrational; he appeared to be drunk. Later he was taken to the theatre for repair of a facial gash made by flying slate. His confusion increased after the operation, and he died two days later with signs of consolidation of the left lung. At necropsy he was discovered to have: (i) a gross contusion of the left side of the brain; (ii) a gross contusion of the left lung; (iii) a small split in the capsule of the spleen, with a little free blood in the abdomen; (iv) a haematoma over the lateral side of the left femur. Microscopy showed blood cells among the brain tissue and blood cells in most of the alveoli of the left lung. Many of the alveolar walls were torn.

(b) *Affecting the Eyes.*—Again it is difficult to decide on the exact part played by blast in eye injuries. From personal experience of a flying bomb at 400 yards in the open, when lying down, there were a few seconds of smarting and a feeling of pressure on the eyes, comparable to that of the impact when diving 10 ft. into water. There were four hyphaemias, which were not explicable except as the result of blast; in other cases the cause was obscured by the presence of dirt, debris, or perforating wounds of the globe.

(c) *Affecting the Brain.*—Once more there was great difficulty in deciding whether blast had been the sole agent, but the cases recorded in Table IV almost certainly were due to blast alone.

TABLE IV.—*Blast Injuries (26 Cases)*

Description	No.	Remarks	Deaths
Eyes:			
Hyphaemia	4		
Injured iris	2		
Subconjunctival haemorrhage ..	3		
Contusions	2		
Lungs	1 T		
Cerebral concussion	4		
Cerebral contusion	3	Two cases had blood in C.S.F. One had free blood cells in brain tissue (see above). One had sudden paralysis of left arm	2
Severe bruising	2		

E. Burns

The number of burns (9) in the series was low (Table V). All these burns appeared to be of partial skin thickness, but it is impossible to tell accurately until they are five days

TABLE V.—*Burns (9 Cases)*

Description	No.	Deaths
Extensive partial-skin-thickness burns of body	6	1 died a few minutes after admission
Burns of hands and arms	2	
Burns of face	1	

old, owing to tissue coagulation due to heat. Of the three with more than half the body involved, one died shortly after admission and the other two were conveyed a few days later. They were treated initially for shock by fluids, plasma, morphine, etc., and then subjected to a quick clean in the theatre with cetab or half-strength dettol (depending upon the surgeon), taking care not to spend at the outside more than 10 minutes over the toilet. The areas were then dressed with sulphanilamide powder and tulle gras or vaselined gauze roll. The use of any agent which obscures the future view of the wound is unsound. When the dressings required changing the patient was put in a normal-saline bath and the dressings soaked off. The final results, so far as we have been able to determine, have been quite satisfactory.

GROUP 2: NON-SURGICAL CASES

These fell into five categories:

A.—Cases transferred from other hospitals and requiring food, clothes, and a wash.

B.—These were cases of the crippled and infirm who could not be dealt with by a rest centre. We had several paraplegics, diabetics, etc. In all there were 15 in this category.

C. *Hysteria, Fear, and Other Psychological States.*—Some of these cases were interesting. A man was admitted who had been about 100 yards away from a bomb. For some hours afterwards he continued his work (heavy rescue) and then collapsed and began to count "one, two, three, four, five, six" over and over again. He was quite rational, and complained bitterly of the compulsion to count. He was given a sedative, and next morning appeared to be normal. Another man was admitted in an extreme state of acute fear, with grossly dilated pupils which did not respond to light. We had a second case of paralysis of the pupillary constrictor mechanism through chronic fear.

An intelligent woman (aged 24) was admitted with widely dilated pupils; the right was quite irresponsive to light, and the left contracted only very slightly. There was also marked sweating. In a few days the left eye had improved a little. She was sent away from the bombing to the country, but even then took about six weeks to make a full recovery.

One woman in an acute anxiety state required heavy doses of paraldehyde to keep her at all manageable.

In Table VI it will be seen that I have used the terms "psychological" and "surgical" shock. Psychological shock was a term we coined to cover hysteria, fright, and mental upset requiring only rest and reassurance. Surgical shock was used for patients who had had some physical injury and whose pulse or blood pressure had been affected but who did not need theatre treatment.

D. *Dust.*—Two organs were affected by this agent. Corneal abrasions were very common—so common that they were reported in the notes only if they were severe. The 17 cases in Table VII therefore represent only the more serious lesions. As a routine, any affected eye was irrigated with boric acid, and sulphacetamide drops, 30%, were instilled. Some received atropine drops, 1%, in addition. The respiratory system also suffered from the effects of dust. At operation the anaesthetist remarked time and time again on the dirt in the pharynx and trachea. Unfortunately no record was kept of these cases, but standing out in my memory are two in which the inside of the trachea was quite black and dry with caked dust. Both patients died a few hours later; one almost certainly through the respiratory condition. Of the cases in which the dust lesion was the main injury, in one a severe cough developed in a young healthy male, and he was too ill to convey for several days. In another the dust inhalation precipitated a severe asthmatic attack. I happened to mention these two cases to an

air-raid warden, who told me that several of the dead found by his rescue party had been suffocated by dust—the mouth, nose, and throat being completely blocked, while no other injuries were visible.

E. Oil.—The last physical agent we encountered was oil, and the only problem was to clean the victim up in the midst of a heavy rush of casualties. The gas-decontamination chamber provided a satisfactory answer.

TABLE VI.—Non-surgical (132 Cases)

Description	No.	Remarks	Deaths
Chronic sick transferred from other hospitals	32	4 T	
Crippled and infirm	15		
Psychological shock	39		
Surgical shock	28		
Dust:			
Corneal abrasions	17	Eyes affected as well	1
Respiratory tract	4		
Oil	1		

Conclusion

An attempt is made to review 259 air-raid casualties admitted to an E.M.S. hospital in the recent flying-bomb attacks and to analyse the types of injuries and the agents which caused them. I include three further tables to aid the analysis.

TABLE VII.—Eye Injuries (52 Cases)

Agent	No. and Description	Deaths
Glass	20 eyes with perforating wounds 1 conjunctival abrasion. (2 T)	1
Dust*	17 corneal abrasions and conjunctivitis	
Blast	1 traumatic iritis 1 ruptured iris 2 contusions 3 subconjunctival haemorrhage 4 hyphaemia	
Bomb splinter	1 perforating wound of globe	
Fear	2 cases of acute dilatation of the pupils, which did not contract to light	

* It is probable that many of these lesions were due to blast and that the presence of dust was coincidental. In several cases the corneal and scleral epithelium had been wiped off, leaving a denuded circular area of varying diameter, the largest about half an inch.

TABLE VIII.—Fractures (39 Cases)

Agent	No. and Description	Deaths
Masonry	23 (mostly severe fractures), 1 T	3
Glass	4 minor fractures	1
Bomb fragments	5 severe 3 minor	
Cause unknown	4	

TABLE IX.—Head Injuries (23 Cases)

Agent	No. and Description	Deaths
Masonry	7 cranial fractures 1 cerebral irritation (blood in C.S.F.) 1 unconscious	6
Blast	1 paralysis of left arm 1 partial paralysis of left arm 1 mental confusion 3 contusions 4 concussions	
Cause unknown	1 unconscious	
Bomb splinter	1 contusion 1 concussed (4 hours' retrograde amnesia) 1 lodged in frontal lobe (now convalescent)	1

Guidance to local authorities in England and Wales as to the lines on which proposals to provide temporary housing should be framed is given in a memorandum entitled *Temporary Accommodation* by the Ministry of Health and the Ministry of Works (H.M. Stationery Office; 6d.). This matter, it says, should not be considered in isolation but in relation to the whole housing programme of the authority. The use of temporary accommodation will, the Government believes, make it possible approximately to double the number of dwellings which could otherwise be provided with the limited amount of skilled labour available in the first year after building can be resumed. The temporary scheme must not be allowed to stand in the way of the permanent scheme, and it will be for each authority to whom temporary houses are allotted to ensure that both sections of its programme can proceed side by side without stultifying one another. Temporary houses will be provided and owned by the Government; they will be erected on sites acquired and developed by the local authority.

MASSIVE SURGICAL EMPHYSEMA DURING THE COURSE OF GENERAL ANAESTHESIA

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Surgical emphysema occurring during the course of endotracheal anaesthesia has been the subject of several reports in the literature, and much experimental work has been carried out to ascertain the cause of the phenomenon. The first mention of the subject was made in 1912 by Woolsey, who reported one case of surgical emphysema. Luke in 1913 recorded a case of gross emphysema due to obstruction of the return airway, and Georg in 1917 suggested that surgical emphysema was likely to occur if the tracheal mucosa had been traumatized during intubation. He also demonstrated the occurrence of emphysema in dogs after the use of insufflation pressures of 25 to 33 mm. Hg. Marcotte *et al.* (1940) found that an intrabronchial pressure of 24 mm. Hg usually produced mediastinal emphysema in dogs, and had seen it occur after 18 mm. In cats, lower pressures of 16 to 20 mm. Hg were sufficient to produce emphysema. Macklin (1937), by the use of very high intrabronchial pressures in experimental animals, has demonstrated exactly how such emphysema could occur in the lungs and mediastinum. He showed that air could break through in small bubbles from overdistended alveoli to the perivascular connective tissue and could track along the course of the arterioles to the great vessels.

We would like to submit the histories of two cases of massive surgical emphysema that have occurred during endotracheal anaesthesia.

Case I

A girl aged 9½ years was admitted to hospital with a diagnosis of acute appendicitis. The illness had started with generalized abdominal pain about 52 hours previously, and for the last 12 hours this had been localized to the right iliac fossa. The child had vomited on several occasions in the early stage of the illness, when a mild gastro-intestinal upset was considered probable: a dose of castor oil had been administered by the doctor in charge of the case, and the pain subsequently became localized to the right iliac fossa. When she was brought to hospital the signs and symptoms all pointed to a diagnosis of acute appendicitis, with some evidence of local peritonitis. The tongue was dry and dirty; the temperature was 101.4° F., and the pulse varied from 140 to 160 a minute. The only other abnormal physical sign was a loud systolic murmur, which was conducted well into the axilla. The heart was not enlarged. An immediate operation was advised.

Operation.—A preliminary injection of atropine sulphate gr. 1/150 was given and anaesthesia induced with gas, oxygen, and ether by means of a Clover's apparatus. The abdomen was opened by a modified Battle's incision and a large gangrenous appendix was removed without difficulty. The inflammation appeared to be well localized to the right iliac fossa. As the abdomen was being closed convulsive twitchings developed which rapidly became generalized. In an effort to deal with the situation the Clover's apparatus was discarded, and an intratracheal tube was passed with a laryngoscope, and through this tube oxygen containing a small amount of CO₂ was liberally administered. Almost immediately the anaesthetist noticed surgical emphysema of the eyelids. The condition spread with great rapidity over the face, neck, arms, chest, and abdomen. The oxygen was shut off at once and artificial respiration started, as the condition of the patient was now desperate. The convulsions continued, and death occurred within about five minutes of the first seizure. At the time of death the patient was quite unrecognizable as a human being. The features were so completely changed by massive emphysema that the eyes could scarcely be distinguished from the nose and mouth: the neck merged directly into the chin. The appearance was reminiscent of a toy balloon made to represent some animal which had been overdistended. The emphysema extended from the head to the legs. In order to improve these unpleasant appearances an attempt, after death, was made, on the operating table, to deflate the tissues by means of multiple small incisions down to the deep fascia, but no air could be expelled.

At the necropsy a tiny abrasion of the pharyngeal mucosa was discovered. The emphysema involved the glottis as well as the whole pharynx, the mediastinum, and the subcutaneous tissues. It was