INJURIES PRODUCED BY AN EXPLOSION OF
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[Communicated by the Director-General, Royal Naval Medical Service.]

On February 9th, 1897, in the afternoon, when we were lying at Zanzibar, an explosion of a dry primer for a torpedo occurred on board the ship I was then in. The primer contained $12\frac{3}{4}$ ozs. of dry gun-cotton, and the detonator 38 grs. of fulminate of mercury; the weight of the metal fittings was probably under $\frac{1}{2}$ lb. Four men were fatally injured, and two slightly.

CASE I.—A. M., aged 23, was killed at once. The body was almost severed. The anterior wall of the abdomen was blown away, the intestines protruding, and all his clothes were blown off. There were severe injuries to the limbs also, with much pulping and splintering of bones.

CASE II.—J. J. J., aged 23. The left hand was blown off, the right hand was just hanging on by a little skin and a few tendons. There was compound fracture of the left femur. Much contusion generally, and numerous smaller wounds. Shock was great. Amputation was performed in the upper third of the left thigh. Death occurred in two hours.

CASE III.—A. W. R., aged 21. Wounds of scalp (from one of which there was arterial bleeding), limbs, and trunk, especially of the right thigh, in which numerous large splinters of bone from another man (A. M.) were sticking. There was much laceration and contusion and intense shock. Death occurred in three hours.

CASE IV.—C. H., aged 20. There was pulping of the right thigh along the line of the femoral artery, a punched-out wound of the anterior abdominal wall, not penetrating, a compound fracture of the right metatarsal bones, and numerous other cuts and bruises. Shock was intense, and death occurred in five hours.

CASE V.—J. J., aged 22. Two scalp wounds, a wound of the upper lip, the alveolar margin of the upper jaw was fractured, and the central incisors were loose. There was a skin abrasion over the front of the chest, and much bruising of the face. The patient recovered.

CASE VI.—A Seedieboy, who had a slight cut of the left side of the chest, also recovered.

Although the effects of the explosion were terribly violent, they were very localised. With the exception of the Black, who was some dozen yards off, and probably struck by a flying bit of metal, all the men were within four or five yards. The scene of the accident was on the starboard side of the fore-shelter deck, which was covered with blood. The deck in places was slightly splintered, and several indentations, some of them a quarter of an inch deep, were seen in the metal fittings, where pieces of the primer itself had struck.

The injured men were all very deaf. Arterial bleeding occurred from one wound only. The most serious features were the intense shock, the number of small oozing wounds many of which had been caused by small bits of tinfoil from the primer, while from many others oil was oozing (the primer had just been cleaned with oil), and the amount of bruising. In Case IV the wound in the abdominal wall appeared to have been caused by one of his metal trouser buttons having been driven in; it was not, however, left in the wound.

The faces of all the men were easily recognisable. It is probable that A. M. had the explosive on his knees (he sitting down), and that J. J. J.'s hands were touching it at the time.

I think that this is an occasion where the "compressed air" ("projectile air") theory must be allowed to be responsible for the major injuries, partly splitting the skin itself, partly entering through small wounds caused by the tinfoil, and perhaps the oil. It is allowed that "windage" may rupture the membrana tympani; surely the skin itself may also be split by the force of impactly compressed air—it is a question of degree. Clothes may be torn and rent by the force of an explosion alone, if this force is only strong enough the tougher and more elastic skin also has to give way.

This is a very different matter from "explosive" results after a projectile has travelled several hundred yards; it is also different from "wind contusions" when a shot has gone some distance.¹ The visible wounds were no indication of the amount of injury really sustained.

It may be questioned whether it was wise to perform amputation of the thigh in Case II, but taking into consideration the facts that probably the femoral artery was pulped up, and that if he lived both forearms would subsequently require amputation, probably the course pursued offered him his only chance.

Beyond the amputation in this case, the only treatment carried out was staunching the oozing wounds by swathing them

in sal alembroth wool, and attempting to combat the intense shock. For this, 30-minim doses of tincture of opium and large doses of brandy were given. Externally, hot-water bottles were applied. Later injections of morphine with atropine were administered. (Tablets for this purpose are provided by the service.)

As to the administration of opium in shock, Surgeon-Colonel Stevenson remarks: "Opium in any form or quantity must be applied with the greatest caution, if at all, in the treatment of cases of extreme shock of collapse." In these cases, however, the accompanying pain and great mental disturbance urgently demanded a powerful sedative. I believe the classical treatment for shock is summed up in three words: "opium, food, and stimulation." (Travers). My own opinion is, that although all the patients were considerably eased, they were given too little rather than too much opium, and should I be called upon to again treat similar cases, I shall feel inclined to give the tincture in 3j doses. I think, however, that nothing could possibly have saved these men.

REFERENCE.

¹ See Colonel Stevenson's remarks on such cases in *Wounds of War*, pp. 57 and 77.

MEMORANDA:
MEDICAL, SURGICAL, OBSTETRICAL, THERA-
PEUTICAL, PATHOLOGICAL, Etc.

ANÆSTHETICS THROUGH A TRACHEOTOMY TUBE.

ANYONE who has given an anæsthetic through a tracheotomy tube in an extensive jaw or tongue operation must have often been worried by finding himself continually in the operator's way, or, trying to keep out of the way, by failing to maintain a sufficient anæsthesia; not to mention the constant soiling of the lint or towel by blood.

In administering chloroform some little time ago in an extensive Kocher's operation performed by Mr. Mayo Robson, where a preliminary tracheotomy had been done, I inserted one end of an ordinary rubber drainage tube into the outer tracheotomy tube; the other end I brought down on the patient's chest some 7 or 8 inches from the field of operation, and gave a C.E. mixture over it on a Skinner's mask with the greatest comfort to myself as well as to the operator.

Trendelenburg has an apparatus, I believe, specially made for this purpose, but anyone who tries this simple expedient will find it work admirably. It will be advisable to allow the patient to have a few breaths of air first before inserting the rubber tube.

Leads.

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STRYCHNINE IN OPIUM POISONING.

At 7.30 p.m. on May 5th I was called to see Miss A. B., a stout lady aged about 38. She was in a comatose state—the pulse at the wrist was imperceptible, the heart sounds were extremely faint, respirations gasping, about six to the minute, the pupils pinhole, the skin moist and warm. She had gone to bed at 3 p.m., having been nursing a friend the previous sixty hours, during which time she had had no sleep, and scarcely any nourishment. I found beside the bed an empty glass smelling of opium. Having tried in vain to rouse her by flicking with a wet towel and vigorous friction to the limbs, I gave her $\frac{1}{10}$ grain of strychnine hypodermically. Almost immediately the muscles of the face and arms twitched, then she opened her eyes, and when sufficiently aroused to swallow I gave her a pint of strong coffee. There was some difficulty in keeping her awake for a couple of hours. She made a rapid recovery and admitted having taken fifty minims of laudanum as she had frequently done before. She may not have taken more, but on account of the exhaustion, the opium might have taken much greater effect. This will show what an invaluable agent strychnine is in such cases. If the patient is able to swallow or a stomach pump is at hand, potassium permanganate is extolled as a specific antidote.

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