CASE II.—Wounded July 1st. This patient presented two healed wounds of entrance and exit at the outer side of left arm, a little below the axilla. Abduction was feeble, the forearm wasted, and the grasp very weak. On August 31st rather less than a Sabouraud dose of rays given. This was followed by a steady gain of strength. On September 14th a full Sabouraud dose of rays was administered. Improvement continued; the grasp has become now quite firm. He is to have another dose on September 28th, after which we hope to discharge him for service. As in Case I, the rays were discharged in the direction of the bullet track.

CASE III.—Wounded July 1st. A scar, 8 in. long, of a gutter wound, extending across the elbow-joint, was steadily contracting; a hard fibrous band stood out as a ridge in front; it was hardest where it stretched across the elbow-joint. The patient was sent to York Place Hospital for a plastic operation. On September 3rd an area of scar 5 in. long, the centre being at the elbow-joint, was given a full Sabouraud dose of filtered rays. On September 6th tracings of the elbow-joint showed a distinct increase of the power of extension, which previously had been steadily diminishing. On September 10th the extension was about the same; on September 13th it was not quite so good, but better than before the rays were given. The central (rayed) part of the scar band was decidedly softer than the extremities (before treatment it was harder). In view of the fact that contraction was progressing again, it was considered better to do a plastic operation, and the x-ray treatment was suspended.

CASE IV.—Bullet wound, July 25th, at radial side of forearm between the upper third and centre. The bullet was not extracted. The radiograph showed a shrapnel bullet. When admitted to York Place Hospital, under the care of Captain Gamlen, I.M.S., on September 1st, the wound was healed. There was considerable pain on movement in the middle of the front of the forearm; also spontaneous attacks of darting pain. There was no loss of sensation in the arm, but slight weakness. Very light pressure—mere stroking—on the surface of the scar caused the patient to flinch, owing to pain shooting down arm and hand; pinching the scar sideways caused intense pain. On September 13th a full Sabouraud dose of filtered rays was given. The next day the patient felt less spontaneous pain, and this, as also the sensitiveness of the scar to pain on pressure, diminished daily. On September 25th he had no spontaneous pain, even the tingling which at first replaced the pain was almost gone. Firm pressure on the surface of the scar caused only a slight tingling down the thumb, no actual pain; pinching the scar sideways still caused some pain, but very much less than before the administration of the rays.

THE TREATMENT OF WOUND INFECTION.*

BY

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ABOUT a year ago I invited attention to the results I had obtained by treating desperate cases of infected railway wounds by four-hourly irrigation with hot peroxide solution (3ij to litre), followed instantly by hot carbolic lotion (3ss to litre), and the application of hot mercury perchloride fomentations (wrung dry). A recent interesting summary by Captain d'Este Emery of his laboratory experiments with different antiseptics encourages me to again ask surgeons to give this method a trial alongside similar cases treated by other methods.

I have given most antiseptics a trial during a continuous hospital experience of twenty-five years, and I hoped that eusol would prove equally efficacious, as the "peroxide carbolic" combination is a serious item of expenditure when used on a large scale in a general hospital. Eusol was employed exactly as prescribed and applied by its Edinburgh advocates in severe cases, like compound fractures, in which streptococci and gas bacilli were in abundance, but it became very soon obvious, when treating similar cases alongside each other by the two methods, that "peroxide carbolic" was far superior; and, moreover, it was frequently noted that, in cases treated with eusol, in which failure was very evident, a remarkable change occurred within three days after the "peroxide carbolic" was substituted, the granulations promptly assumed a healthy bright red appearance, the quantity of pus diminished, the stench disappeared, and there was marked diminution in general toxic symptoms. Both were also tested side by side in cases of pelvic infection (*Bacillus coli*), and the results were identical to those obtained in bemuddled mangled wounds of limbs. We have found eusol useful for some indolent wounds, and far superior to any other application in the treatment of bedsores.

* Owing to considerations of space this paper has been shortened by the omission of some paragraphs, but its argument is not thereby altered.

Some ten years ago I commenced to use peroxide irrigation prior to employment of carbolic lotion; testing them side by side, I found that the results of the combination far exceeded that obtained by their separate use. Some cases of streptococcal tonsillitis happened to be in hospital at the time, and the same experiment was carried out with a similar result. We consider the joint use of both (gargle or spray every two hours) as specific in cases of common "sore throat." During the past ten years thousands of irrigations have been made with carbolic acid lotion in the British Hospital, and in not a single instance has carboloria been observed.

As to hypertonic solution, with its hydraulic paraphernalia, it suffices to mention that, in 1898, we gave salt solution an ample trial, and found it absolutely useless, not to mention the waste of valuable time, and the superintention of an epidemic of sepsis which I have not seen the like of before or since.

Some years ago I was induced by a paper by Sir William Watson Cheyne to give recent infected wounds one liberal saturation with pure carbolic acid; for the first few days after each application we found that there was an apparent lull in the infective process, but invariably by the end of a week or ten days the germs of destruction were in full swing, and I came to the conclusion that such treatment only deferred the issue, and consequently was bad practice.

I hope Captain d'Este Emery's report will tend to dispel another illusion. Many surgeons still advocate the use of strong mercurial lotion in septic wounds along with carbolic or peroxide or both. I abandoned mercurial irrigation in the Nineties, as I came to the conclusion that any substance which tends to form an albuminate in the tissues is a bad weapon to use against germs.

My clinical experience is quite in harmony with Captain d'Este Emery's deduction that we should not employ any antiseptic that is easily quenchable, and I am of the opinion that the use of any chemical in any strength which may be deleterious to the vitality of the cells, or which may detract from the defensive properties of the serum is only helping the enemy. Consequently, while I am a firm believer in the employment of "peroxide carbolic" lotions, I maintain that both should be used in a strength not sufficient to cause instant death to the invader, but sufficiently powerful to attenuate his virulence.

I am in complete accord with those who state that, without a free exit for discharge, antiseptics are hopeless, and I strongly recommend that, when the general symptoms, as indicated by elevation of pulse and temperature and coated tongue, are combined with a foul discharging wound, ether should be administered, a tourniquet applied well above the lesion, and a few (four to six) incisions made into parts in which fluctuation or bogginess is indicated on digital palpation, always carrying one or two such incisions into or from the original wound. The edges of the wound are drawn apart with retractors and the field mopped dry with gauze sponges. A careful inspection is then made of the interior, while digital pressure is made all round the exterior of the wound; if any leaking into the cavity is observed, a closed forceps or director is pushed into the track, the secondary collection located, and a direct incision made into it. When infection is confined to the subcutaneous tissues one need not worry about drainage if the incision is of such a size as to eliminate the possibility of retention of discharge underneath overhanging edges. The existence of the latter, particularly at the angles of the wound, is proof that the incision is inadequate. The cardinal factor is the conversion of a septic cavity or cavities into one large open sore, and, in nine cases out of ten, if this be properly done, and followed by irrigation every four hours with hot "peroxide carbolic" lotions and hot fomentations, with absolute rest on a splint, the onset of repair is only a matter of hours, or at most a few days. When feasible, submersion in warm peroxide lotion, once or twice daily, is a useful adjunct.

It may be stated that, with rare exceptions, when the seat of infection is situated beneath muscles or between muscular planes, drainage cannot be properly effected without the aid of gravity, and, in order to obtain this, a large counter incision must be made at the most dependent level. As there is a tendency for the edges of tunnel wounds, irrespective of size, to adhere within forty-eight hours, I always pass two large rubber drainage tubes right through such wounds to act as props, in order to secure

the subsequent patency of the opening; these are changed on the second day, and, if the general and local conditions are satisfactory, the case is left in charge of the sister, who continues four-hourly irrigation and fomentations until the whole wound is free from pus and covered with healthy granulations.

I now wish to invite attention to some details in this method of treatment:

1. As a useful guide to a good counter incision I have found a closed large straight blunt scissors very handy; it can be safely pushed through the tissues, and when approaching the posterior subcutaneous area, expanded to the full (3 to 4 in.), thus indicating two definite distant points for one sweep of the knife. With the same scissors closed, as a blunt separator, the intervening tissues are promptly opened up to a diameter corresponding to the superficial incision.

2. As to the method of irrigation suitable to cases in which there is always danger of contamination, particularly when a number have to be treated simultaneously in hospital, I strongly advocate the use of a one or two litre enamel jug, as more efficient lavage can be obtained by pouring the lotion in a steady flow from it.

3. It is most essential to apply a tourniquet in these cases, as otherwise the part becomes obscured with blood and secretion. When the tourniquet is removed, all spurting vessels are seized with forceps and ligated with fine catgut; any oozing which may continue is checked by the subsequent irrigation with hot "peroxide carbolic." If the latter should not be successful, I pack the bleeding area firmly with large bibules soaked out in hot peroxide; these are removed in six to twenty-four hours by irrigation and gentle traction.

4. The limb is always fixed on a splint by separate bandages above and below the lesion, so that subsequent irrigation can be carried out without removal of splint; soiling of the latter is prevented by the insertion of a piece of rubber tissue between it and the affected portion of limb.

5. When possible, all serious cases should be kept permanently in the open air under a shelter roof, and if champagne is procurable, a really desperate case should not be denied a few bottles of it.

6. I insist on the necessity for absolute rest until the wound is healed.

Tubes do very little draining, but are useful props to keep wounds patent for the evacuation of fluid, and also serve to establish a channel for drainage subsequent to their removal. In abdominal cases I usually omit the tube on the second or third morning; this practice is the result of what I have over and over again witnessed—a considerable rush of pent-up liquid the moment the tube is removed. In other words, tubes, like gauze saturated with secretion, may act as corks, as well as irritating—if not infective—foreign bodies. I change the tube or tubes within forty-eight hours, and substitute a new one once or twice daily until the sixth day, when it should be dispensed with altogether. In septic infection, other than abdominal, I strongly recommend lavage with "peroxide carbolic" each time a tube is taken out, and before a fresh one is inserted, so as to remove the secretion and debris which always hang about the track.

I rarely employ irrigation during operation in septic abdominal cases, as I dread diffusing septic elements into the recesses of the abdomen. I rely on thorough mopping up with dry bibules, and generally insert two large tubes right down to the seat of infection. It is essential to provide ample room around the tube for free exit of secretion; the long diameter of the opening left in the parietal wall should be at least three times the diameter of the ordinary "gas-pipe" tube employed. When the prop is removed on the third morning the factors which govern natural defence have encompassed the infected field with an adhesive barrier, which safely admits of gentle irrigation of the cavity with peroxide carbolic lotions, if such be considered necessary. Tight-fitting tubes in a septic abdomen are, in my opinion, a menace to the existence of the patient.

I have on many occasions attempted to hasten the healing of large wounds by secondary sutures, and while I have had some highly satisfactory results, I must admit that I have had more disappointing ones.

As to the treatment of post-septic wounds, healing up by some intention, my favourite applications are lotio

rubri, boracic ointment (gr. x to ʒj), hot lead or boracic fomentations (ʒj of each to litre) applied three times a day, plus absolute rest on a splint, until the wound is healed. This I combine with plenty of fresh air and a glass or two of stout, beer, or good wine with meals.

NOTE ON ACIDOSIS IN CHILDREN.

BY

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It is probable that acetone, or diacetic acid, or both, are generally present in the urine of young children suffering from gastric disorders, but cases occur in which the amount of these bodies excreted is considerable, and their circulation in the blood causes a definite train of symptoms constituting a clinical entity which, for lack of a better term, may be called "acidosis." Such cases are very common, and form, I believe, a large proportion of the unexplained febriculae in children, but they are not diagnosed because the urine is not examined.

The children are usually between 3 and 10 years old, and the condition is equally common to the two sexes. A doctor is called in because the child is feverish and drowsy, or because it has been violently sick. The clinical features, varying of course in degree in different cases, are as follows:

Fever.—This may range from 100° to 103° F. or more, and in some cases is absent. In any case it is variable, seldom lasts more than one or two days, and exhibits no special features.

Vomiting.—About half the cases are violently sick, the stomach rejecting even water. These cases are those of so-called "cyclical vomiting" in children, but some of the worst do not vomit at all. The bowels are usually confined, but constipation may be absent.

Odour of the Breath.—In most of the cases the breath has an acetonous odour. This may be very faint, or so strong that it is detected on entering the room. It is, perhaps, the most constant symptom, but I have met with severe cases of the disorder in which it was absent.

Urine.—The essential symptom is the condition of the urine. This is generally pale, but it may be high coloured, and sometimes presents a peculiar greenish hue. It is acid, of high specific gravity—1025 to 1035—and contains diacetic acid, or acetone, or more often both. The amount of these bodies must in many cases be large, for a most intense colour reaction is given with ferric chloride, and the nitroprusside test for acetone acts deeply and quickly. Glucose and albumin are absent. A few cases have ended in jaundice, and then bile pigment may be associated with the poisons.

Prostration.—This is often considerable, but the urine may be loaded with the poisons and yet the patient appear fairly well. The child is, however, usually prostrated, half comatose, and obviously feels very ill. In one of my cases, a girl of 4 years, in which there was no vomiting, a definite meningism developed, with delirium attended by pronounced Kernig's sign. Complete recovery took place.

Treatment.—The obvious indications are to neutralize the poison and eliminate it. It is useless to give sodium bicarbonate. Despite the acid present, the blood still contains alkaline sodium salts, and nothing will be gained by attempting to introduce more. Potassium bicarbonate (as in the case of gout) is more effective. Reasonably full doses should be given, plenty of water administered, and fats excluded from the diet. The urine soon becomes alkaline, and the poisons disappear. The bowels should be freely opened with calomel.

I have recognized perhaps a hundred cases, and have not yet seen a fatal one, but the clinical picture is often very alarming.

As to the cause of the condition, little is definitely known. Imperfect metabolism of fats may produce the poisons, but what is the determining cause of this it is difficult to say. I have not been able to trace any case to any special error in diet. It appears to occur often in epidemics, and probably nervous disturbance, as in the recent air raids, may be a predisposing cause.