Intestines.—The appendices epiploicae of the transverse colon were swollen and haemorrhagic. The mesentery contained many calcareous masses as large as small haricot beans. The lymphatic glands were not enlarged. The presacral haemolymph glands were enlarged.

Kidneys.—Weighed 7 oz. each. On section they were pale in colour and in the pyramidal portion of each kidney were two pale-green areas about the size of a large pea. The other abdominal organs were apparently normal.

Marrow.—The shaft of the tibia contained marrow of a pale yellow colour with complete absence of any red coloration; that in the head of the tibia was pale yellow. The marrow of the ribs and sternum was greyish-brown in colour.

Microscopic Examination.

Heart.—The spaces between the muscular bundles were infiltrated with leucocytes of the myeloblastic type.

Liver.—The periphery of the lobules was packed with cells with the appearance of myeloblasts. Much free brown-coloured pigment was present towards the periphery of the lobules.

Kidney.—A section through one of the pale-green areas mentioned above revealed a mass of cells resembling myeloblasts closely packed together, with atrophy of the uriniferous tubules. Other portions of the kidney were almost entirely free from blood cells.

Spleen.—The Malpighian bodies were apparently normal. In the pulp were many myeloblasts and much free brown pigment.

Marrow.—Smear. Almost all the cells were myeloblasts. No nucleated reds or polymorphonuclears could be seen.

Section (after hardening). The bulk of the cells seen were myeloblasts. A few eosinophile myelocytes, an occasional normoblast, and an occasional giant cell, but no polymorphonuclears, were to be seen. On attempting to stain a hardened section of the marrow from the shaft of the tibia the section almost completely dissolved in the xylol, leaving only amorphous débris.

In conclusion, I should like to express my best thanks to Deputy Surgeon-General H. W. G. Doyne, R.N., for his kind permission to publish the case, and to Staff Surgeon S. F. Dudley, R.N., for his ungrudging work in preparing the sections and much valuable advice.

GRAFTING WITH FROG SKIN.

BY

H. W. M. KENDALL, CAPTAIN R.A.M.C.(T.C.).

THE idea of grafting granulating surfaces with frog skin was put into practice by me as far back as 1886-7 in India, at Cluniar, Bengal, where some of the men were affected by ulcer of the legs more or less indolent in character. I cannot say certainly now how I got the theory, but think it was suggested through some native source. At any rate, as frogs, ulcers, and time were plentifully at my disposal, I experimented, with satisfactory results to the patients, gratification to myself, and the least possible inconvenience and injury to the frogs. My reason for recalling the matter is that being quartered in France, where demand and supply of material are both abundant, I have been enabled to reapply the method with again the same gratifying results. The large number of open granulating wounds, caused chiefly by shrapnel, which are slow in healing and in which a contracting scar is likely to give possible inconvenience later on account of position, friction, etc., induced me to resort again to this method of grafting. During the past month I have collected fourteen cases as follows:

1. Sgt. W. S. Shrapnel wound, left thigh, July 14th, Contalmaison. Graft applied August 6th. Unsuccessful. This wound was suppurating profusely and the graft did not adhere. Another was applied August 17th; healed August 30th.
2. Pte. A. G. Shrapnel wound, right thigh, July 7th. Grafted August 27th; healed September 2nd.
3. Pte. H. J. Arm grafted August 5th; healed September 2nd.
4. Cpl. G. D. Shrapnel wound, left arm, July 15th. Grafted August 3rd; healed August 25th.
5. Pte. J. S. W. Shrapnel wound, right arm, July 24th, Beaumont Hamel. Grafted August 6th; healed August 17th.
6. Pte. W. B. Bullet wound, left upper arm, High Wood. Grafted August 3rd; healed August 19th.
7. Sgt. A. F. Bullet wound, right upper arm, July 18th, Longueval. Grafted August 3rd; healed August 20th.
8. Lce-cpl. F. R. Shrapnel wound, left arm, Thiepval Wood. Grafted August 3rd; healed September 2nd.
9. Gnr. E. S. Wounded by bomb, July 3rd, Aveluy. Grafted August 24th; healed September 2nd.
10. Pte. A. E. McD. Bullet wound across left breast, July 25th, at Pozières. Grafted August 26th; healed September 8th.

11. Pte. G. F. H. Bomb wound left buttock, July 20th, Armentières. Grafted August 24th; unsuccessful.

12. Pte. E. E. T. Shrapnel wound, back, July 25th, Ypres. Three grafts applied August 17th; healed August 30th.

13. Pte. A. T. M. Gunshot wound, back, July 25th, Festubert. Two grafts applied August 17th; healed August 30th.

14. Pte. R. I. S. Shrapnel wound, side, July 4th, Pozières. Three grafts applied August 26th; one successful, healing well at date.

The above wounds varied roughly from $1\frac{1}{2}$ in. to 4 in. in length by $\frac{1}{2}$ in. to $1\frac{1}{2}$ in. in breadth. No. 1 was unsuccessful on account of the condition of the wound at the time of grafting, the profuse suppuration washing off the graft. In No. 11, the wound being on the buttock, dressings were difficult to keep in position, and in No. 14 two out of the three grafts failed to adhere for the same reason.

The ideal wound to graft is flat, without much suppuration or excessive protuberant granulations. The rapidity with which the wound commences to heal after the graft has successfully adhered is in marked contrast to its sluggishness before the operation.

The wound having been gently cleaned without antiseptics and as gently dried, the loose skin on the inner side of the frog's thigh is carefully pinched up in a pair of dressing forceps, snipped off with scissors, spread out and applied by its under surface to the wound. A strip of gutta-percha tissue smeared with some mild and soft non-irritating emollient is then placed over it, fixed in position at its ends by adhesive plaster, and a dry dressing applied over all. The whole is gently removed in three days, when the site of the graft will be noticed as a purplish spot branching outwards to the periphery of the wound. A similar dressing is again applied for two days to avoid unnecessary interference, after which the wound may be dressed daily, without the gutta-percha tissue, with some simple, non-irritating ointment, such as boracic, until healing is completed.

The gap in the skin's continuity is by this process filled up and unsightly or inconvenient contraction avoided.

I have tried frog skin grafting once only in this interval of thirty years, in New Zealand, after a radical mastoid operation, but have no knowledge of the ultimate result as the patient left, I believe, for her home in Germany shortly afterwards.

In addition to leaving a supple scar this method has the advantage of transplanting skin free of hair, and is free of diseases possibly conveyed in human skin. My reason for not using antiseptics is to avoid destroying the delicate epithelium formed from the graft in the same way that injudicious antiseptics may render a vaccination inert.

I think the method would prove useful in many kinds of slowly healing sores, varicose ulcers with or without a tendency to adhere to the bony tissues beneath, burns after the acute stages have passed, large abrasions or ulcerating surfaces on the face or exposed parts or in mastoid cavities where transplantation of skin is indicated.

THE USE OF GLYCERINE AND ICHTHYOL IN THE TREATMENT OF SEPTIC WOUNDS.

BY

MAJOR THOMAS W. A. DAMAN, R.A.M.C.(T.F.).

In the case of some wounds more or less septic it does not seem to matter much what kind of dressing they receive. They will heal, and nothing, so to speak, in the way of wet or dry dressing will prevent their healing. Those in which the circulation has been originally extensively interfered with, or where extensive induration has taken place in consequence of sepsis and of the blocking of vessels, will not heal readily under the ordinary methods of dressing.

At the Military Hospital, Lincoln, under Major Duggan, remarkable and altogether surprising results are the rule, especially in cases of severe suppuration and sloughing accompanied by oedema and induration of the surrounding tissues. The immediate results are rapid reduction of swelling and induration, and almost instant easing and removal of pain. Rapid cessation of sepsis and of purulent discharge follows, accompanied by the quick formation of

healthy granulation tissue and equally quick production of a covering of skin, and, finally, complete healing by cicatricial tissue, the cicatrix invariably being a good one. It is, of course, taken for granted that any foreign body, such as dead bone, clothing, or piece of metal, has been removed, or is not present.

Continual irrigation with saline solution, as again suggested by some surgeons, I remember being used with success for extensive and severe forms of sepsis when I was attending hospital practice at Edinburgh. Boiled boracic and boiled saline solutions were then employed. This method I also followed when senior house-surgeon in the Lincoln County Hospital in cases of severe injury with much sepsis. It is a clean method, though possessing, one would imagine, only feeble osmotic action. Threads of woollen skein or lint formed the siphon. There is also the saline bath and boracic bath for arm or leg, which method is clumsy and gives very slow, painful, and uncertain results; hot moist dressings ease pain but make the tissues soft and boggy. These methods seem to me to fail to do the one thing necessary towards healing—that is, the calling up of a better blood supply to the injured surface, which can only occur after the barrier of induration is broken down.

A good blood supply brought to an injured part by an uninjured artery has its beneficial effect very much restricted if there is little or no chance of its being carried on to the seat of injury, as is the case when a more or less dense and impervious barrier exists, in which the smaller vessels, arterioles, capillaries, and venules are pressed upon by the swollen tissues and so occluded. It is evident that in such a state of affairs only a very sluggish supply of the healing serum, if any, can reach the injured surface, and repair, when taking place only from the proximal side of the barrier, must be a much slower process than when the aid of an osmotic action produced at the surface or distal side of that barrier is received coincidentally. The period of stagnation or stasis in the smaller vessels is shortened and the danger of the occurrence of more or less chronic fibroid changes is diminished, while the eventual cicatrization will take place more rapidly and with a reduced tendency to deep scarring and deformity.

The happiest results would appear likely to be attained if the osmotic action of a glycerine preparation could be set up at the earliest possible moment after the wound had been received, in order to prevent absorption of toxins and to destroy and throw off invading germs whose irritating presence gives rise to subsequent oedema and induration.

To prove how the absorption of toxins is lessened and prevented by this method one only has to watch the constitutional disturbance of the patient as evidenced by the temperature, which falls in from two to five days, unless there happens to be any pocket of pus present which has escaped observation, and when this has been set free the temperature never again rises.

It follows that Major Duggan's method of using glycerine immediately assists nature's healing process, attacking as it does the swollen indurated and septic tissues, from the wound surface, by means of a quickly established and free osmosis. This not only commences to break down the barrier from the distal surface, but at the same time greatly aids the natural evacuation of debris and prevents further sloughing and destruction of tissues.

Most of the usual modes of dressing fail entirely to do these things or lend only a feeble aid to nature, and some must even retard healing to a greater or less extent. Take, for instance, the action of some of the strong irritant and corrosive lotions sometimes employed—1 in 20 and 1 in 40 carbolic, corrosive sublimate, etc.—which by their destructive action may tend even to determine the death of portions of wounded tissues which apart from their action might have lived. This class of dressing has also to be changed frequently, and each dressing will destroy embryonic granulation tissue and newly-formed skin cells, however carefully it is removed. The more frequent the dressing the more local damage is done, and in addition to this the multiplication of painful dressings must cause increased suffering to the patient and so debilitate him, to say nothing of disturbing his hours of sleep.

The glycerine and ichthyol dressings need, at the most, be applied night and morning, and in many cases one dressing in the twenty-four hours is amply sufficient.

One more point is that osmosis ensures the calling up of a supply of blood serum to those tissues which need repair,

which is good, but what is better, of a supply of an antogenous serum full of antibodies, which have been called into existence by the infecting germs themselves, and can be used in the annihilation of those germs.

To Edward Hort we owe a great debt for his demonstrations of the healing effect of normal horse serum when applied to surface wounds and ulcers, as well as to ulcers of the stomach and duodenum. To Major Duggan we now owe a second debt, for he has demonstrated how by osmosis we can use the patient's own serum over the wound surface, and so obtain a rapid healing.

One of the best dressings now in use in some of the military hospitals is a solution in water of magnesium sulphate with the addition of glycerine. Magnesium sulphate would help osmosis, but the added water would appear to be likely to lessen the osmotic effect of the glycerine, and to this extent diminish its usefulness. This is a later method than Major Duggan's plan of treatment, and though an enormous stride in the right direction, and in every way superior to the usual methods employed, it lacks the intenser osmotic power of the pure glycerine, and in this way is inferior to the method which we are now considering.

Major Duggan uses a mixture of ichthyol and glycerine in varying strengths; and the results are satisfactory and the method well worthy of employment in every case of an open wound, accompanied by sepsis, induration, and pain.

MEMORANDUM ON TETANUS.

BY

THE WAR OFFICE COMMITTEE ON THE STUDY OF TETANUS.

The following notes on the prophylaxis and treatment of tetanus have been compiled with the authority of the War Office Committee for the Study of Tetanus, and are to a great extent based on experimental and clinical evidence which has become available since the beginning of the present war.

The memorandum was first issued in August, 1916, but as a good many questions have been asked in regard to various points, it has been thought better to issue a revised edition.

The Prophylactic or Preventive Treatment of Tetanus.

The prophylactic value of injections of antitetanic serum is beyond all question, but there is strong experimental evidence that in about ten days the immunity conferred by the primary injection is to a great extent lost.

It is, therefore, the general opinion that a second subcutaneous injection should be given in all cases of septic wounds, and in order to anticipate the total disappearance of the antitoxin from the body the second injection should follow the first at an interval of seven days.

In cases of long-continued septic wounds, particularly those caused by shell or bomb, third and fourth injections at seven-day intervals are recommended.

It is self-evident that if it is considered necessary to give a second injection, then it is equally necessary to give a third or fourth or more prophylactic injections, as the passive immunity conferred by the antitetanic serum is of short duration.

It may be definitely stated here that the danger of anaphylactic shock is negligible when prophylactic doses of 500 U.S.A. units contained in 3 c.cm. of horse serum are given subcutaneously, whatever the interval after the preceding injection.

Dosage in Prophylactic or Preventive Treatment of Tetanus.

The primary injection should consist of 500 U.S.A. units, and the second and following injections should be, for the present, of the same amount.

The primary injection is given as a rule at a dressing station or field ambulance as soon as the wounded soldier is removed from the firing line. The second and following injections will most frequently be given at home hospitals. The ordinary phial usually contains 1,500 units of tetanus antitoxin. One-third of a phial should therefore be injected into each wounded man. There is no necessity to sterilize the syringe after each injection; the serum is aseptic, and moreover contains an antiseptic; it will be sufficient if a freshly sterilized needle is used for each case.

Precautions to be Taken Before Operating on Wounds.

When operations are performed at the site of wounds, even if they are healed, a prophylactic injection of serum