or reinforce the failed inguinal canal. This applies to the long-standing oblique hernia, for the control of which a truss has frequently been employed for varying periods up to several years, and to all cases of direct hernia.

The supplementary measures recommended for use in the Army involve the employment of fascia in various ways. The supplementary procedure adopted in this series of cases is that of silver filigrees. No case has been subjected to this procedure unless the indications have been perfectly clear. In other words, 130 of the 200 cases have been of such a nature that cure could not have been expected without resort to this or some other method of supplementary repair.

Textbooks are in substantial agreement that the treatment of direct hernia is modified by the fact that this type of lesion usually occurs in elderly men. I believe that direct hernia at earlier ages occurs more frequently in men of the Merchant Navy than in other walks of life. Whether this be so or not, it is significant that of the 200 cases operated upon 103 have belonged to this category, that 27 of these have come to operation at or under the age of 40, and that direct hernia has been found at the early age of 23. In connexion with the question of age, it is noteworthy that 53 hernias in this consecutive series occurred in men of over 45. I suggest that in none of the three recognized fighting Services would men of such an age apply or be referred for operation with the sole objective of resuming or maintaining their active and hazardous participation in the prosecution of the war.

Sepsis.—The Memorandum previously cited refers to "sepsis in hernia wounds." "Sepsis," it states, "is relatively common." In this consecutive series sepsis has been entirely absent except for an occasional transient superficial affection of the skin margins. I attribute this to the fact that the so-called non-touch technique has been the ideal aimed at. Skin towels are invariably used, handling of the tissues in the wound is reduced to a minimum and in most cases rigidly excluded. This technique has been facilitated by the routine use of the central-eyed or double-pointed needle (Cole).

4. *Post-operative Management of Filigree Cases.*—Following a filigree operation patients are confined to bed for three weeks. Normal activities are gradually resumed until full work is undertaken at the end of four months. No systematic post-operative exercises have been prescribed.

End-results

Return to Duty and Morbidity.—It is significant that all cases operated upon have been returned to the reserve pool, and, so far as I know, have resumed their duty at sea. Morbidity even has been negligible. In only one case was return to duty delayed beyond the normal period. This was due to the occurrence of femoral thrombosis on the opposite side some weeks after operation.

Recurrences.—Of the 22 recurrences in this series four occurred, as noted, after a primary filigree operation. Repair in each case was by additional filigree, with uniform success and return to work.

Filigree Recurrences in the Merchant Navy.—In the 10-year period 1930–9, 202 recurrences were met with out of a total of 2,015 operations, and of these recurrences only 12 followed a filigree operation. The number of filigree operations performed in this period was 448. The filigree operation has been largely confined to the Dreadnought Hospital for many years, and it is not unreasonable to suppose that cases of recurrence following its performance would return, be returned, or be reported. It might be suggested that the 12 recurrences met with in 1930–9 were partly applicable to a preceding period when few such operations were undertaken. This objection is answered by the fact that in the preceding five years—1925–9—287 cases were dealt with by this method. In view of the high operability rate and of the fact that the operation is reserved for cases that demand some supplementary method of repair, a high group incidence of recurrence might well be expected. The figures cited clearly suggest that the recurrence rate attaching to this operation is remarkably low.

The method of filigree repair has been accorded a recognized place in current surgical practice in the pages of the most recent—third—edition of *Modern Operative Surgery*, and the

editor, Prof. Grey Turner, in a short historical survey states that "the lapse of time is showing that this plan has attained more success than has been acknowledged."

Details of the technique will be found in an article contributed by me to the *British Journal of Surgery* (Cole, 1941).

Illustrative Cases

1. Second Officer, aged 27. Six months' history. Right inguinal hernia. Operation March, 1942. *Small direct bulge*. Repaired by two filigrees.

2. Navigating Officer, aged 27. Right inguinal hernia *gradually coming on for six years*, with more rapid increase lately. Operation Nov. 16, 1942. Conjoined tendon very poorly represented. Hernia presented as *diffuse direct bulge*. Deep epigastrics tied. Repaired by two filigrees.

3. A big stout man, aged 60. Irreducible left inguinal hernia. Operation June 16, 1941. Sliding hernia of the sigmoid. Repaired by two filigrees. Thereafter hernia developed on right side (a tribute, surely, to the efficacy of the left-sided repair). Operation June 26, 1942. Direct bulge. Repaired by two filigrees.

4. Master, aged 52. Weight 12 st. 8 lb. Saddlebag type of sac. *Diffuse direct bulge* of the posterior wall, continued behind epigastric vessels into the cord. Epigastric vessels tied. Repaired by two filigrees.

5. Quartermaster, aged 54. Left inguinal hernia of 10 years' duration; right inguinal hernia of 9 years' duration. Wearing truss for 9 years. Operation Aug. 31, 1942: *Direct* left inguinal hernia repaired by two filigrees. Sept. 14, 1942: *Direct* right inguinal hernia repaired by two filigrees.

6. Steward, aged 51. Six months' history. Chronic cough. Right inguinal hernia. Operation June, 1942. *Direct bulge*. Lipoma of cord excised. Repaired by two filigrees.

7. Tug driver on the Thames by night and day, aged 59. A big stout man of 14 st. Right inguinal hernia for 20 years, at first reducible, but lately becoming irreducible. Operation only alternative to giving up his employment. Operation Nov. 27, 1941. Large oblique sac to which omentum was adherent and of which 4½ lb. was ligatured and removed. Repaired by two filigrees. Has gained over 2 st.—16 st. 8 lb.—and has forgotten about his hernia. In a letter received Aug. 25, 1944, he states: "I have never felt better. I am still at work, and have not lost a day's work since you discharged me. I have felt no effects of my hernia." This has been confirmed since by personal contact.

REFERENCES

- Army Medical Department Bulletin, Feb., 1943. Supp. No. 4.
Block, W. (1933). *Arch. klin. Chir.*, **175**, 607; **176**, 812.
Cole, P. P. (1941). *Brit. J. Surg.*, **29**, 168.
Edwards, Harold (1943). *Ibid.*, **31**, 172.
Gallie, W. E., and Le Mesurier, A. B. (1924). *Ibid.*, **12**, 289.
Ogilvie, W. H. (1937). *Proc. roy. Soc. Med.*, **30**, 532.
Page, C. Max (1934). *British Medical Journal*, **2**, 896.

Medical Memoranda

A Fatal Case of Tetanus despite Toxoid

Active immunization against tetanus was introduced into the Army in 1939, Boyd (1938) doing the preliminary work. The present practice is to give a primary inoculation of two 1-c.cm. doses of tetanus toxoid spaced six weeks apart, and 1 c.cm. thereafter yearly as a recall dose. All available figures (Bensted, 1940; Smith, 1941) confirm that good protection is given thereby, but individual exceptions may occur as in the comparable immunization against diphtheria. Knowledge of the duration of protection rests at present, however, almost wholly on laboratory studies. A number of non-fatal cases of tetanus despite toxoid have been described, but reported fatal cases are rare (Boyd and Maclellan, 1942; McGill, 1943; Norman, 1943).

CASE REPORT

An Anglo-Indian aged 40 came under treatment on Feb. 7, 1944, for prolapsed, inflamed, and ulcerated piles. These were ligatured and excised ten days later under stovaine analgesia. On Feb. 26, seven days after the operation, uncontrollable jerking of the legs began, and on Feb. 29 spasms of the abdominal muscles and fever followed. Next day the neck and jaw were stiff, and infrequent short opisthotonic spasms began. On March 2 fully developed tetanus was present, with severe spasms, each lasting a second or two, and recurring every half-minute or less.

Specific treatment consisted of 1 c.cm. of tetanus toxoid, and of 1,010,000 i.u. of serum spread over the next four days. Avertin and intravenous nembutal were used symptomatically. He died on the eighth day of the disease (March 5), and, apart from bronchopneumonia, the necropsy revealed nothing. The operation wounds

were quite healed. His pay-book showed that he had received two tetanus toxoid inoculations, one each on Oct. 18 and Dec. 18, 1941.

COMMENT

Clearly no massive amount of antitoxin was produced here, and the inference is that the immunity resulting from his prophylactic inoculations was slight or absent. Inoculations with tetanus toxoid cause antitoxin to appear in the circulation, but, more important, they also sensitize the reticulo-endothelial system, so that subsequent toxoid or toxin results in a rapid rise in circulating antitoxin. Data regarding the minimum protective level of antitoxin are based upon animal experiments, figures ranging from 0.001 to 0.1 i.u. of antitoxin per c.c.m. of serum being given. A primary two-dose inoculation of toxoid rarely produces more than 0.1 i.u. of antitoxin per c.c.m., whereas a recall dose later on causes a marked rise (2-50 i.u.). This level falls steadily thereafter, but is readily raised again by further recall doses (Wolters and Dehmel, 1943).

Hence it is unlikely that a high level of circulating antitoxin was ever established in this case, and in the ensuing 26 months it must have fallen very low. There is therefore no need to postulate any original failure to form antitoxin, or any original absence or subsequent loss of reticulo-endothelial sensitivity, in order to explain the fatal outcome.

Although not proved bacteriologically, the clinical course suggests that the anal region was the source of the infection, and that the tetanus bacilli were introduced at the time of the operation. Such a hypothesis puts the incubation at seven days, which accords with his rapid death. Possibly it would have been better to delay operating; the current practice (Naunton Morgan, personal communication) is that with inflammation, thrombosis, or ulceration of internal haemorrhoids, operation is not undertaken for about six weeks.

A recall dose of toxoid a week before operation might well have protected this patient, and it is suggested that this would be a reasonable precaution in such cases.

My thanks are due to Brig. W. Foot, M.C., for permission to report this case.

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REFERENCES

- Bensted, H. J. (1940). *Lancet*, **2**, 788.
Boyd, J. S. K. (1938). *J. R.A.M.C.*, **70**, 289.
— and MacLennan, J. D. (1942). *Lancet*, **2**, 745.
McGill, R. J. (1943). *British Medical Journal*, **1**, 40.
Norman, H. B. (1943). *Lancet*, **1**, 557.
Smith, E. J. R. (1941). *Proc. roy. Soc. Med.*, **35**, 340.
Wolters, K. L., and Dehmel, H. (1943). *Abstr. Bull. War Med.*, **4**, 175.

The Demonstration of Schüffner's Dots in Benign Tertian Malaria

Although the demonstration of Schüffner's dots is not necessary for the recognition of *Plasmodium vivax* infections, the inexperienced malariologist will be more satisfied if these are seen. The method described has been in use for some months, and has so far never failed to demonstrate the dots; it depends entirely on the control of the pH of the staining solution at pH 7.0, for an identical procedure carried out at pH 6.4—that usually advised for blood films—fails entirely.

The stock buffer of pH 7.0 is M/2 phosphate, containing 2 molar proportions of the disodium to one of the monopotassium salt. 29.85 g. of $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ (or 19.85 g. of anhydrous salt) and 5.67 g. of KH_2PO_4 are dissolved in water and diluted to 250 c.c.m.; this solution is nearly saturated, and keeps indefinitely at room temperature in a glass-stoppered bottle containing a few drops of chloroform. For use, 5-15 drops of stock buffer are placed in a test-tube and about 15 c.c.m. distilled water is added. Giemsa solution is prepared by adding 1 drop of Giemsa stain (Gurr's R 66) to each c.c.m. of dilute buffer, and is used within 30 minutes of dilution.

A thin blood film is allowed to dry, fixed in Leishman's stain for 15-60 seconds, and the stain diluted with about two volumes of dilute buffer. After 10-15 minutes the stain is poured off, any precipitate removed by rinsing in Giemsa solution, and Giemsa solution left on for 20-30 minutes; the film is rinsed in buffer solution, blotted, and dried. Schüffner's dots are so prominent that they are more easily seen than the malaria parasite.

The quantities of each solution and the times of staining are not critical, but the times given are minima, for it is very difficult to overstain. Similar results can be obtained by several hours' staining in Giemsa at pH 7.0, but not with Leishman's stain alone. Several batches of Leishman's stain provided by the L.C.C. Pathological Service have proved entirely satisfactory.

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Reviews

THE ELECTROCARDIOGRAM

The Electrocardiogram. Its Interpretation and Clinical Application. By Louis H. Sigler, M.D., F.A.C.P. (Pp. 403; illustrated. \$7.50 or 42s.) New York: Grune and Stratton; London: William Heinemann.

The Electrocardiogram by L. H. Sigler is an interesting book. This rather technical subject is made more easily understood because it is presented in a sensible manner. There is as full reference as possible to the physiological aspect of the abnormality under discussion, so that as early as possible a link is established with the first foundations of clinical knowledge. The whole subject has now been in existence long enough for it to be possible to give a short historical account of the growth of knowledge and formation of ideas on the various topics. This helps to keep matters in correct perspective. The pathological changes in the myocardium which underlie abnormal curves are well described where this is possible. There is also a full clinical description of each subject, so that the book is far from being merely an academic discussion, but keeps the practical application in view. For anyone unacquainted with electrocardiography, study of the first three chapters will provide a sound introduction, for the basic principles are clearly described. The complicated subject of the electrical axis is well set out. Sections are devoted to changes in the curve due to artefacts, which are traps for the inexperienced. The effects of body build and drugs and chemicals are included. The arrhythmias are dealt with in the usual classification. An excellent account is given of the various types of bundle branch block and of other miscellaneous varieties of abnormality in the QRS. There is a chapter on the abnormalities of the coronary circulation, and two others on acute and chronic coronary insufficiency. These are all very good. Trauma of the heart receives full discussion; also myocarditis, in which is included pericarditis. An informative chapter on the various important precordial leads concludes the book.

The illustrations are very complete, and nothing seems to be omitted. They are fully documented from the clinical aspect. Unfortunately they appear as direct positive prints and are sometimes rather faint and indistinct. It is particularly satisfactory that progressive changes in curves are well shown. A full and up-to-date list of references ends each chapter. The exposition is for the most part clear. The author does not hesitate to put forward his own theories, but always finds place for a fair discussion of debatable points. Here and there are some slips, among which the "tetralgia" of Fallot needs correction. This useful book can be recommended to anyone starting to learn the subject, and to the expert for reference.

OLD AGE IN HEALTH AND DISEASE

Old Age. Some Practical Points in Geriatrics. By Trevor H. Howell. M.R.C.P.Ed. (Pp. 50. 4s. 6d.) London: H. K. Lewis and Co. 1944.

The somewhat sudden realization that we are an ageing community has caused more interest to be taken in the science and art of geriatrics. The special value of Capt. T. H. Howell's contribution to the subject is that it is based on his own experience as deputy physician and surgeon at the Royal Hospital, Chelsea, which gave him ample opportunity of studying old age in health and disease. Degeneration, chronic infections, and ischaemia are the predominating troubles of the aged. Attendants upon them tend to coddle their victims and to regard them as lacking in common sense: "they forget that old age is not always synonymous with delicate health and stupidity. . . . Anything tending to self-pity must be avoided . . . it makes a poor tonic for old folk." At the Royal Hospital, Chelsea, it is noteworthy that the fittest veterans are the men who keep their own plot of garden and who enjoy a game of bowls. (It has been well said that the Psalmist's declaration concerning threescore years and ten has been responsible for much premature senility: for ageing is often a matter of the mind.) The author's observations do not support the statement often made that temperature either rises