would be 44,080.⁹ This result encourages us to believe that the $SbCl_3$ test is trustworthy for assaying the vitamin A value of halibut-liver oils of high potency. We are inclined to believe that solvent extracted oils, of which some are on the market, should be examined by applying the test to the unsaponifiable fractions.

It is a curious fact that, although the liver of the halibut may contain 20 to 30 per cent. of oil, the direct treatment with live steam—such as will readily liberate the same proportion of oil from cod livers—does not break up the tissue and release the oil. Considerable modifications of the steaming process have to be employed before the yield is entirely satisfactory. Lovern¹ has also reported the poor yield derived from direct steaming. In order to ascertain whether this curious difference in behaviour is due to the fat being distributed in a different manner in the two tissues, sections of the two livers were submitted to microscopical examination after staining with Sudan III, but except for the fact that halibut liver appeared to contain slightly more connective tissue than did the cod liver, no marked difference was observed. As soon as fresh livers become available from the spring catch this problem will be further examined.

Our thanks are due to Dr. MacWalter for his spectrophotometer determinations, and to Mr. G. Napier for assistance in making the estimations of the "blue value" of various oils and concentrates.

REFERENCES

- ¹ Lovern: *Nature*, 1932, cxxix, 3263.
- ² Heilbron, Heslop, Morton, Webster, Drummond, and Rea: *Biochem. Journ.*, 1932, xxvi, 1178.
- ³ Drummond and Hilditch: Empire Marketing Board Report No. 35, 1930.
- ⁴ Macpherson: *Biochem. Journ.* (in the Press).
- ⁵ Emmett and others: *Ind. Eng. Chem.*, 1932, 1073.
- ⁶ Evers and Smith: *Quart. Journ. Pharm.*, 1932, v, 331.
- ⁷ Tsujimoto: *Journ. Soc. Chem. Ind. Japan*, 1928, xxxi, 3813 (English Supplement).
- ⁸ Channon: *Biochem. Journ.*, 1928, xxxiii, 51.
- ⁹ Carr and Jewell: *Nature*, 1933, cxxxi, 92.

EFFERENT FIBRES IN THE ILIO-INGUINAL NERVE AND THEIR RELATION TO INCISION FOR APPENDICECTOMY

BY

HENRY J. WADE, B.Sc. MANCH.

(From the Department of Anatomy, University of Manchester)

A number of observers have noted that a right inguinal hernia may follow the McBurney muscle-splitting incision, and one authority has placed its occurrence as high as 30 per cent. The cause of the hernia has not been exactly determined, but Southam¹ has recently advanced evidence which strengthens considerably the view that this unfortunate sequel arises from interference with the ilio-inguinal nerve. At the operation for the cure of the inguinal hernia a piece of the ilio-inguinal nerve was excised in three cases. Subsequent examination of the excised portions of nerve showed partial degeneration, and the histological appearance was consistent with compression at a higher level by scar tissue. It is well known that the ilio-hypogastric nerve may partially or completely replace the ilio-inguinal, and there is reason to believe that both should be under suspicion when one attempts to discover the origin of the inguinal hernia after the muscle-splitting operation. Most anatomical books refer somewhat vaguely to the distribution of these two nerves to the muscles of the abdominal wall, and it was with the intention of procuring more precise knowledge that twenty dissections have been undertaken.

After exposure of the muscles of the lower part of the abdominal wall the ilio-inguinal nerve was secured in the inguinal canal, and carefully traced proximally and distally to its finest ramifications. A gross study was

made, and, in addition, several pieces of muscle were removed with the endings of the nerve and were subjected to microscopical examination. The results of this investigation may be summarized as follows:

1. The lower fibres of the transversalis abdominis and internal oblique muscles—including those which are inserted by the conjoint tendon—receive a considerable supply from the ilio-inguinal nerve, and also from the complex plexus formed by this nerve and the ilio-hypogastric as they lie between the two muscles.
2. The presence of a constant branch from the ilio-inguinal, or the nerve replacing it, to the region of the anterior superior iliac spine to supply the oblique muscles and the integument.
3. The dissections showed that the ilio-inguinal and ilio-hypogastric nerves are closely related and form a plexus, but it is evident that the former is distributed to the internal oblique and transversalis (and in a few instances also the external oblique), while the latter innervates only the oblique muscles.

It is apparent from this investigation that a considerable proportion of the lower fibres of the internal oblique and transversalis muscles receive their innervation from the ilio-inguinal and ilio-hypogastric nerves, and that interference with the function of the former alone is likely to cause appreciable muscle weakness and predispose to the development of an inguinal hernia. My dissections show that the McBurney muscle-splitting incision may lead to implication of these nerves above the point at which fibres are distributed to muscles, but it does not seem possible for any motor disability to result from damage to the nerves in the field of the operation for the radical cure of an inguinal hernia. As regards the ilio-hypogastric nerve, the latter statement is supported by Andrews,² who failed to obtain any muscular contraction on stimulating the distal end of the nerve in the inguinal canal.

CONCLUSIONS

1. Injury to the ilio-inguinal nerve, especially if it is associated with damage to the ilio-hypogastric nerve, will lead to appreciable weakness of the fibres of the internal oblique and transversalis muscles which are inserted by the conjoint tendon.
2. Such weakness must predispose to the development of an inguinal hernia.
3. Muscular weakness will follow injury to the nerve, or nerves, at the level of the McBurney muscle-splitting operation, but not from damage in the inguinal canal.

REFERENCES

- ¹ Southam, A. H.: *British Medical Journal*, 1931, i, 258.
- ² Andrews, E.: *Ann. of Surg.*, 1926, xxxviii, 79.

Vol 83

Memoranda

MEDICAL, SURGICAL, OBSTETRICAL

SIGMOID IMPLANTATION OF URETERS FOR GROSS VESICO-VAGINAL FISTULA

The condition of those patients suffering from intractable vesico-vaginal fistula is so utterly miserable that any means available for their relief should be tried, even though of a drastic nature. The two patients whose cases are here reported were in a horrible state, offensive alike to themselves and to their neighbours. Constantly soaked in urine, and suffering from extensive and painful excoriation of the thighs, they deeply appreciated the relief obtained by the diversion of urine to the bowel, and the mental and physical change effected was a pleasure to see.

CASE I

A married Turkish woman, about 35 years old, had a difficult confinement in her village two years previously, following which she was extremely ill for two weeks. During