THE GREAT-TOE JERK

BY

G. A. RANSOME, F.R.C.P.

Professor of Medicine, University of Malaya

Wartenburg (1945), in the introduction to his book on the examination of reflexes, gives a healthy warning on the fallibility of describing new reflexes without first inquiring deeply into the literature of the subject. He says many a reflex has been discovered by one author after another, often at intervals of several decades. The authors, anxious to attach their own names to new reflexes, have completely neglected the work of their predecessors. Foster Kennedy, in his foreword to the same volume, whimsically describes the hunting of the reflex as though it might have been the Snark.

Nearly every muscle in the body can be made to contract when it or its tendon is struck; so that the phenomenon I am going to describe is in no way new, though personally I have not seen it used elsewhere, nor is it described in the standard works (Purves-Stewart, 1937; Wartenburg, 1945; Robertson and Robertson 1947; DeJong, 1950; Monrad-Krohn, 1954). That it is useful in ordinary practice I have no doubt, and therein lies my reason for presenting it.

Characteristics

The jerk is probably that of the extensor hallucis longus, and perhaps may be better described as the great-toe dorsal spring reflex, for it is felt more than seen. It is obtained in most normal people between 7 and 70 and can be elicited in cerebellar disease. It is difficult to obtain in very young children.

Its root value is fourth and fifth lumbar, and it is most useful as an objective sign in disk lesions between the fourth and fifth lumbar vertebrae, as it is abolished very early in this condition, even before an objective weakness can be demonstrated and before a sciatic radiation of pain.

The extensor muscles of the legs react more readily to noxious stimuli than the flexors, and the great-toe jerk is therefore more delicate than the ankle jerk. It is particularly useful in the detection of early peripheral neuritis as in typhoid, diphtheria, and diabetes, and may be absent in subacute combined degeneration and tabes. It is also useful in early poliomyelitis.

In view of the fact that testing for the power of the extensor hallucis longus has long been a useful and routine neurological and orthopaedic procedure, it seems strange that it has not become a routine to test for its tendon reflex. The probable reason for this lies in the difficulty in learning the technique of eliciting it, combined with the slow development and scarcity of really efficient tendon hammers. On reading through the old textbooks on the subject of jerks one is impressed with the immense amount of work that has gone into their elucidation, and one is also struck with the rather slow way in which the tendon jerks of to-day came into use as a routine practice.

Study of the history of the tendo achillis jerk is very illuminating. Although it was described by Westphal *et al.* in 1876, clear descriptions of it are not prominent in the textbooks of Bramwell (1884), Wood (1887), and Gowers (1895). Much more attention is paid to ankle clonus. In 1896 Pierre Marie wrote an excellent description of the ankle jerk and stated that by then most of the younger men were readily obtaining it. R. T. Williamson (1908) gave a masterly account of the jerk and mentioned the conditions in which it was lost; he also quoted Rolleston's work on

the jerk in diphtheria. It is interesting to note that in a number of cases of treated diphtheria the toe-jerk may be lost but there may be an exaggerated ankle jerk.

Commenting on the tendon jerks of the upper extremity Wood (1887) wrote: "It seems to be affirmed by Weir Mitchell and Lewis (1886) that elbow, ankle, and knee jerks may be obtained in normal individuals. I have, however, rarely been able to demonstrate them, and the ready production of any of these jerks in any individual is a strong indication of the existence of disease." Bramwell (1884) wrote that deep reflexes could sometimes be obtained from the upper extremity but were seldom present in health, and were chiefly valuable as evidence of secondary descending degeneration.

Nowadays, using a Babinski hammer, most trained doctors can easily obtain the deep reflexes of the upper extremity, biceps, triceps, and supinator. The earlier observers were extremely fine clinicians, but gradually over the years their skill in obtaining these jerks became standardized, and it is through observation of skilled performers that the modern doctor has learned to use his hammer with effect, the skill having been passed on. It is only necessary to give, shall we say, a nurse a hammer, and let her try to elicit some of the more difficult jerks to realize this truth.

The word "tap," probably popularized through Gowers's work on the front tap reflex, has obscured the method of using the hammer to full effect. We know nowadays a tap or peck should not be used. It should be a long follow-through, using the weight of the hammer. Even now many hammers on sale are inadequate.

Method of Obtaining the Reflex

In order to obtain the great-toe reflex the patient should be lying flat in the dorsal position, and the foot should be extended and slightly inverted. The index finger of the observer's right hand is placed on the terminal dorsal surface of the terminal phalanx of the great toe, and downward pressure should be nicely exerted until a feeling of elastic stretch is obtained (see Fig.). Getting this feeling of stretch is the most difficult thing to be done, and can be learned only by practice. The examiner's finger is then struck with the hammer, using a wrist follow-through movement. When done properly the great toe can be seen and felt to extend. It feels alive, whereas if the jerk is absent there is a feeling of deadness and no response. I cannot stress too strongly that this reflex needs a great deal of practice to obtain with ease, and even a skilled neurologist may not obtain it easily at first. Like the finger jerk, it is learned by practice and perseverance.

It is probable that this jerk will not be universally employed for some years, but eventually I think it will become part of the routine physical examination.

Method of obtaining the reflex.

REFERENCES

- Bramwell, B. (1884). *Diseases of the Spinal Cord*, 2nd ed. Young J. Pentland, Edinburgh.
- DeJong, R. N. (1950). *The Neurologic Examination*. Hoeber, New York.
- Gowers, W. R. (1895). *Clinical Lectures on Diseases of the Nervous System*. Churchill, London.
- Marie, P. (1895). *Lectures on Diseases of the Spinal Cord*. New Sydenham Society, London.
- Mitchell, S. Weir, and Lewis, M. J. (1886). *Med. News (Phlad.)*, 48, 169, 198. Quoted by Wood (1887).
- Monrad-Krohn, G. H. (1954). *The Clinical Examination of the Nervous System*, 10th ed. Lewis, London.
- Purves-Stewart, J. (1937). *The Diagnosis of Nervous Diseases*, 8th ed. Arnold, London.
- Robertson, W. E., and Robertson, H. F. (1947). *Diagnostic Signs, Reflexes, and Syndromes*, 3rd ed. Davis Company, Philadelphia.
- Wartenberg, R. (1945). *The Examination of Reflexes*. Year Book Publishers, Chicago.
- Williamson, R. T. (1908). *Diseases of the Spinal Cord*. Oxford Medical Publications, London.
- Wood, H. C. (1887). *Nervous Diseases and their Diagnosis*. Lippincott, Philadelphia.

OBSERVATIONS ON THE ANTI-HUMAN-GLOBULIN TEST IN MALIGNANT DISEASE

BY

J. O. W. BEILBY, B.M., B.Ch.

Blood Transfusion Department, Bland-Sutton Institute,
Middlesex Hospital

It has been known for some time that positive anti-human-globulin reactions do occur in certain cases of malignant disease (Hyman, 1954; Rosenthal, Pisciotto, Komninos, Goldenberg, and Dameshek, 1955), and no claim to disprove this is being made. However, it was found that the high percentage of positive reactions recorded by Green, Wakefield, and Littlewood (1957) was at variance with our experience here, and this stimulated a survey of a series of cases of various types of cancer at this hospital.

Methods

1. *Direct Anti-globulin Test*.—This was performed by the method described by Dunsford and Bowley (1955). A 50% suspension of four-times-washed red cells was made and one drop of this added to one drop of anti-human-globulin serum on an opal glass tile, which was rocked gently and read after seven minutes. For these tests the following anti-globulin sera were used: (1) standard rabbit anti-human-globulin serum, as supplied by the M.R.C. Blood Group Reference Laboratory; (2) rabbit anti-human-globulin serum, as supplied by Burroughs Wellcome Ltd.; (3) hyper-immune horse serum, as supplied by the Pasteur Institute, Paris; and (4) goat anti-human-globulin serum, as supplied by Dr. J. S. Campbell, Aberdeen and North-east Scotland Blood Transfusion Service. All the tests were carried out at four dilutions from 1:10 to 1:80 in the hope that the lower dilutions might demonstrate an antibody not evident at the dilution optimal for rhesus work. The sera 1, 3, and 4 contained anti-non-gamma-globulin fractions.

2. *Indirect Anti-globulin Test*.—This again was performed in the manner described by Dunsford and Bowley (1955). Two drops of 50% suspension of washed group O rhesus-positive cells were added to four drops of patient's serum under test, the mixture was incubated for two hours at 4° C. and 37° C., following which the suspensions were washed four times in normal saline at room temperature and one drop of the washed suspension was added to one drop of anti-human-globulin serum on an opal tile, rocked gently, and read after seven minutes. The anti-globulin serum was used in dilutions of 1:10 to 1:80 as in the direct test.

Controls.—(a) Group O rhesus-positive cells sensitized with a weak incomplete anti-D serum. (b) The red cells under test + saline.

Results

1. *Direct Anti-globulin Test on Fresh Red-cell Samples*.—A series of 100 cases of malignant disease, taken at random, was tested. These included tumours of breast 35, the alimentary system 21, the genito-urinary system 15, and the respiratory system 6, reticulosos 10, and generalized carcinomatosis 3. Ten others, including tumours of the skin and brain, and two cases of sarcoma, were investigated. Of the cases investigated, 20% had haemoglobins below 8.7 g. per 100 ml. at the time of testing. Approximately 45% of the cases tested were known to have secondary involvement. As stated above, the series was taken at random, and consequently tests were performed in some instances prior to treatment and in others after surgical intervention or during a course of radiotherapy. In none of the above-mentioned cases was a positive direct anti-human-globulin test encountered.

2. *Direct Anti-globulin Test on Stored Red Cells*.—In six cases where the clotted blood samples had been stored in the laboratory refrigerator overnight at 4° C., positive direct tests were elicited at all dilutions of anti-globulin serum from 1:10 to 1:80. In these cases identical tests were repeated on fresh samples of blood and were found on this occasion to be negative. It was concluded that during their storage at 4° C. the cells had become coated with an incomplete cold auto-antibody (Dacie, 1950) and this had been responsible for the positive results.

Indirect Anti-globulin Test.—The sera of 40 cases giving negative direct tests were incubated with normal fresh group O rhesus-positive cells as described above, for two hours at both 4° C. and 37° C. Sensitization was achieved at 4° C. in all cases except one. The reactions were stronger at the lower dilutions of the anti-globulin serum, an observation also noted by Dacie (1950). The 40 sera were also absorbed with secretor saliva to remove the incomplete cold auto-antibody and then tested against the group O rhesus-positive cells in the same way as the unabsorbed sera. All tests were negative at both 4° C. and 37° C. except in one case. The one exception to this gave a strongly positive indirect test at both temperatures in the pre- and post-absorption samples, and the antibody was therefore apparently not related to the incomplete cold type demonstrated in the other sera. It was subsequently found, however, that this serum was from a patient of group B rhesus-negative, who had received three bottles of rhesus-positive blood six months previously, and that the serum now contained incomplete anti-D and anti-C.

Discussion and Conclusions

It was not possible to confirm the high percentage of positive results obtained by Green *et al.* (1957). Antisera were used which were known to contain "anti-non-gamma-globulin" fractions, and as all the tests were performed with the anti-globulin serum in dilutions 1:10 to 1:80, it is unlikely that an antibody would have resisted detection. A possible explanation for the discrepancy is the fact that if blood samples are stored for a period at 4° C. the cells become coated with an incomplete cold auto-antibody known to be present in all normal human sera (Dacie, 1950). That this was a possible cause was shown by the fact that samples giving a negative result when fresh became positive if allowed to stand overnight at 4° C.

An interesting case encountered during this series was that of a patient with carcinomatosis showing a haemolytic process, in whom the red-cell survival was found to be diminished (a conclusion reached by using red cells tagged with ⁵¹Cr): anti-globulin tests were performed on two occasions, and there was no evidence serologically for the existence of antibodies. The bone marrow in this patient was found to be megaloblastic.