

This reaction also occurs when the scarification method is used, but is obscured by the trauma.

In conclusion, there is a tendency on the part of an operator carrying out this method for the first time to think that the small quantity of lymph carried into the layers of the skin on the point of the needle will be inadequate to result in an efficient vaccination, but practical experience will dispel this idea.

I am indebted to Dr. T. Gwynne Maitland, medical superintendent of Messrs. Cunard White Star Limited, for the records of a large number of vaccinations carried out intra-epidermally; and to Dr. F. C. Logan, medical superintendent of the County Mental Hospital, Gloucester, for suggesting the method of transferring the lymph from the tube to the arm.

A NOCIFENSOR LESION OF THE HAND

A SYNDROME FOLLOWING TRAUMA AND ASSOCIATED WITH ADDUCTION OF THE SHOULDER

BY

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During the past two years we have been greatly interested in five patients with peculiar circulatory and sensory disorders of the hand following injury to the upper extremity but not due primarily to injury of the hand itself. Most of us are familiar with cases in which after a direct blow to the carpus with or without fracture a profound circulatory stagnation occurs in the hand with an extreme form of osteoporosis in its skeleton. The present cases are different, however, for, as I shall show, the cause of the circulatory disturbance in them is to be found in the shoulder region. I have thought it worth while drawing attention to these cases because a knowledge of the possibilities may enable one to be on guard to prevent them and because I believe an appropriate demonstration is provided of a type of disorder recently described by Sir Thomas Lewis as of the "nocifensor" system.

Symptoms and Signs

All five patients were women between the ages of 40 and 50 who had suffered some trauma to the upper limb between two and four weeks prior to the onset of symptoms in the hand. The original trauma varied—there were two cases of Colles's fracture, one of fractured olecranon, one of fractured clavicle, and one of traumatic arthritis of the shoulder-joint. In four out of five cases the right upper limb had been injured. In every case the arm had been immobilized by the side since the injury. The symptoms complained of were pain in the region of the shoulder-joint, severe constant burning pain in the hand and fingers with increasing stiffness, and extreme sensitiveness both to touch and to changes of temperature. The signs were practically constant in each case. There was marked limitation of movement of the shoulder, with generalized tenderness around the joint. The patients with a traumatic arthritis of the shoulder-joint and with a fractured clavicle were the only two giving a history of injury in that region.

The skin of the hand and fingers was smooth and shiny. The colour varied from red when warm to blue when cold. There was hyperalgesia to pin-prick and hyperaesthesia to light touch over the affected area, more marked, as one would expect, on the flexor aspect. The

interphalangeal joints were stiff and painful. In the older cases trophic changes were commencing in the nails and the fingers. In short, the general picture was similar to that of causalgia. Further clinical examination revealed several features of interest. In two of the patients the pupil on the same side was larger, suggesting some degree of cervical sympathetic irritation. This was supported by the finding of a blood pressure raised by ten millimetres of mercury in the affected arm in three patients, one of whom had an enlarged pupil. Radiographic examination was made of the cervical spine, shoulder, and hand in each patient. One had evidence of the common mild cervical arthritis. No cervical ribs and no bony changes in the shoulder were demonstrated. In two patients there was definite osteoporosis of the bones of the hand. This is a common finding in any hyperaemic condition of long standing.

Outstanding Features

In these five cases there are three outstanding features. First, they represent only a fraction of the injuries of the upper limb treated in a similar manner; secondly, they showed evidence of sympathetic stimulation at a high level; and, lastly, there were peripheral circulatory disturbances of a constant type resulting from injury at various levels. It remains to demonstrate an organic lesion capable of producing these features, each of which will be discussed in turn.

There can be no doubt that immobilization of the upper limb and shoulder girdle must tend, especially in middle-aged women, to produce not only some drop of the shoulder girdle in relation to the bony thorax, but also some distraction of the humerus from the scapula at a lax joint which is dependent more than any other upon muscle tone. This second factor might well be the cause of the constant periarticular adhesions of the shoulder-joint. This downward drag must tend to put the lowest trunk of the brachial plexus on the stretch as it runs over the first rib.

Telford and Stopford, following the work of Todd, have shown by histological studies that the sympathetic connexions of the lowest trunk of the brachial plexus are generally found scattered within the trunk. They drew attention, however, to the fact that in a certain number of cases these sympathetic fibres may lie close to the periphery and even form a distinct separate bundle in the inferior part of the trunk that is nearest to the first rib. In such a position the sympathetic fibres are more exposed to the risk of irritation or drag across the rib, and give rise to vascular symptoms. We have considered that such sympathetic irritation, with resultant arteriolar spasm, would account for the rise of blood pressure on the affected side in our cases, and that drag upon the inferior cervical ganglion or its branches would result in similar irritation and be responsible for the slightly dilated pupil.

In searching for the cause of the peripheral circulatory changes we are upon even less certain ground. For many years the posterior nerve roots were thought to contain fibres concerned only with sensation. Then it was found that if posterior nerve roots or sensory cutaneous nerves were cut and their peripheral ends stimulated flushing of the skin was produced. Sir Thomas Lewis showed that these antidromic impulses in the sensory nerves produced in the skin a substance like histamine which dilated the cutaneous vessels, a response favourable to trauma and inflammation. He has recently shown that these impulses are not antidromic, but are carried by hitherto unknown efferent fibres travelling to the periphery in the sensory nerves. Stimulation of these fibres produces throughout

the area of the cutaneous nerve in which they run not only a flush but, indirectly, also hyperalgesia. He is inclined to attribute the pain to the liberation in the skin of a substance which in turn directly stimulates the known pain-nerve endings. To this efferent system, which is essentially protective, he has applied the term "nocifensor." He considers that the clinical picture known as "causalgia" results from stimulation of nocifensor fibres by an irritative lesion of a nerve.

We have already some evidence of sympathetic irritation near the lowest trunk of the brachial plexus. Coincident stimulation of nocifensor fibres in this trunk would account for the vascular changes and hyperalgesia in the hand, the part of the limb which is supplied very largely from this trunk.

Treatment

The treatment has aimed at the elimination of this source of irritation. In each patient the shoulder-joint was manipulated under anaesthesia in two or three stages to stretch periarticular adhesions. After each manipulation an abduction splint was used, accompanied by treatment with radiant heat, massage, and exercises to the shoulder and hand. In every case the colour changes and hyperalgesia in the hand improved rapidly. The raised blood pressure and dilated pupil became equal within a fortnight. The pain and stiffness in the shoulder resolved next, but the complete return of movements in the fingers has been tardy.

The relative infrequency of these cases would not appear to justify the universal use of abduction splints in arm injuries, but the study of such cases indicates the need for special watchfulness in middle-aged women with injuries to any part of the upper extremity, the early mobilization of their shoulder-joints so as to prevent adhesions and brachial plexus drag. Should such lesions develop the treatment by manipulations, abduction, and physical therapy offers a good chance of cure but demands considerable patience on both sides.

I am indebted to Mr. Norman Capener for permission to report these cases and for his interest and help in preparing this report.

The fourteenth issue of the *Proceedings of the University of Otago Medical School* is dedicated to Sir Lindo Ferguson. This tribute marks Sir Lindo's retirement from the post of Dean of the Medical School, which he has held since 1914. He was the first trained ophthalmic surgeon to settle in New Zealand, whither he emigrated in 1883 for reasons of health. During his tenure of the office of dean two important measures were carried through, largely by his efforts: the extension of the medical curriculum from five to six years, and the transference of the departments of anatomy and physiology from the main University to fresh buildings adjoining the new Medical School. Besides tributes to Sir Lindo Ferguson the issue contains, among other interesting articles, papers on hydatid disease and goitre, the two principal objects of medical research in New Zealand. In a study of the mortality from hydatid disease in that country, estimated at roughly 15 per cent., sepsis is reported as the commonest cause of death. The Hydatid Registry, recently instituted by the Australasian College, is making a complete survey and analysis of this condition; at the beginning of 1936 its case records already numbered 630. With regard to endemic goitre, the results of a survey of urinary excretion of iodine in certain districts of New Zealand and in the islands of Samoa give support to the thesis that lack of iodine is the predominant factor in causation.

Clinical Memoranda

A Case of Bronchostaxis

In view of the recent article in the *British Medical Journal* (January 16, p. 109) on bronchoscopic findings in some cases of haemoptysis, the following case is of interest, as it emphasizes the position of bronchoscopy in unexplained haemoptysis.

CASE REPORT

A man aged 48 years was admitted to St. Nicholas Hospital complaining of having coughed up about a cupful of light red frothy blood. The patient, on direct questioning, stated that he had lost some weight during the past eight months, and had had a slight cough for six months. He had also had a fair amount of worry during this time. There were occasional vague pains in the chest and some shortness of breath on exertion, but no other symptoms. There was no family history of any chest trouble.

On examination the patient was seen to be a healthy-looking man with a somewhat anxious expression. The mucous membranes were of good colour. His dental condition was good, and there was no bleeding from the gums; the throat was healthy. No cardiac enlargement was detected by clinical examination or by x rays. The heart sounds were natural, and there were no added sounds. The vessels appeared to be healthy. The blood pressure was 130/80. With regard to the respiratory system, the chest was found to be symmetrical; both infraclavicular regions were a little flat, but the tone of the pectoral muscles was good. The right upper zone appeared to move a trifle less than the left. The percussion note appeared normal. On auscultation the breath sounds were slightly weaker over the right upper zone. They were vesicular, and there were no added sounds. The trachea was in the mid-line. There was no clubbing of the fingers. No abnormality was detected in the digestive and the central nervous systems.

The patient continued to cough up bright red frothy blood for three days after admission. There was no pyrexia. On investigation the sputum was repeatedly found negative for tubercle bacilli and the Wassermann and Kahn reactions also were negative. Radiographs showed that the heart was not enlarged. Those taken of the lungs revealed a condition of the left apex which the radiologist described as an old healed lesion. There was no evidence of neoplasm. Lipiodol examination showed no evidence of bronchiectasis.

The haemoptysis did not recur, but it was felt that in view of the possibility of a small bronchial neoplasm and the above negative findings a bronchoscopy was indicated. The patient was anxious to know his position, and gladly accepted the advice. He was accordingly transferred to St. Giles Hospital for bronchoscopy by Mr. Cawthorne (ear, nose, and throat consultant surgeon to the London County Council), to whom I am indebted for the following report:

"*Right side*: A reddish patch of mucosa about the size of a sixpenny-piece in the main bronchial wall just distal to the opening of the upper lobe bronchus. This bled on touching it. The middle and lower bronchi were normal. *Left side*: Normal. *Summary*: A bleeding patch on the right bronchus rather similar to the condition of the nasal mucosa in epistaxis."

CONCLUSION

A case of bronchostaxis is described, and the value of bronchoscopy is emphasized as a means of establishing the diagnosis in cases of haemoptysis, and also, in this case, of relieving the anxiety of the patient.

I am indebted to Dr. P. Hamill, consulting physician to the London County Council Medical Services, for his advice; to Dr. Rae, consulting radiologist to the London County Council, for the radiological findings; and also to Sir Frederick Menzies, Medical Officer of Health, London County Council, for permission to publish.

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