"DEAD HAND": A LESION PRODUCED BY RAPID VIBRATION.*

By Robert C. Cummins.

The occupational lesion hereunder described is of sufficient rarity and of such immediate medico-legal significance as to justify the report of a single case.

History.—The patient, a male, aged 38 years, stated that he had enjoyed perfect health until he consulted me in June, 1938, complaining of "rheumatism of his hands". His hands alone were affected. At first inspection he appeared to be suffering from some form of infective arthritis.

The hands were larger than normal, being tender, hot and swollen. The swelling was most marked over the metacarpo-phalangeal joints, and the middle phalangeal joints of the fingers, giving them a fusiform appearance. Stiffness and limitation of movement was marked, particularly in the right hand. The swelling and tenderness seemed to be confined to the periarticular and soft tissues. The joints themselves were free from evidence of synovitis or arthritic changes.

Pursuing the suggestion he had given of rheumatism, a close search for a septic focus was made. None was discovered, either in mouth, throat, nose, internal ears, gallbladder or appendix. There was no history of gonorrhoea, syphilis or rheumatic fever, no evidence of any metabolic disorder such as gout or diabetes. He mentioned that the hands gave a sensation of numbness, and sometimes "a prickling or tingling". They were stated to be intolerant to heat and cold, perspiring freely on the one hand, becoming numb and blanched on the other. On extending the fingers they were observed to become blanched and to remain blanched longer than normal. Except for slight impairment to touch, his discrimination for heat, cold and pain were normal. It seemed unusual that a condition suggestive of infective arthritis should be confined to the hands alone, and the vasomotor disturbances were puzzling. His occupation was investigated.

He was an expert motor mechanic. Three months previously he had taken up the work of making cutlery. The process he was employed on consisted in grinding the rough blades on a revolving grindstone driven at high speed, and later polishing them on a more finely surfaced revolving stone. Asked if much vibration was transmitted to his hands in the course of his work, he admitted that this was so. As no other cause could be found to explain the condition of his hands, he was advised to give up his occupation completely for a month. This, together with rest, formed the most important part of the treatment. He was told that this was both for diagnostic purposes, as well as for ameliorating the condition.

Marked improved followed; in a month, the hands were nearly normal. So much did the improvement appear to confirm the opinion formed as to the cause that he was advised to give up his occupation, or if he resumed it, only to act in a supervisory capacity, as it was considered that the vibrations were the cause of the condition.

He was not seen again until April, 1939. He then stated that after a fortnight his hands felt so well that he had recommenced work, doing two hours a day at first. He immediately noticed a return of the symptoms, but he forced himself to continue for eight months, when incapacity prevented him from continuing. On this occasion all the symptoms and signs observed on the previous occasion were present in an aggravated form. He was unable to move his fingers independently, except the index finger slightly and slowly. The vasomotor changes were more marked. The hands perspired freely and became swollen on use. Slight swelling remained over the carpo-metacarpal joint of the right thumb. He found great difficulty in dressing himself.

His general condition suggested much nervous irritability on this occasion. He had a worn appearance, with frequent twitching of the

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facial muscles. All these symptoms, together with the swelling of the hands, subsided, but the condition of incapacity and crippling of the hands remained unaltered, and appears permanent. The slightest use aggravated the symptoms.

The cause of the condition cannot be questioned. It led to medical consultation three months after the occupation started. It disappeared after six weeks’ rest. It reappeared at once, on his resuming his occupation. It became aggravated as he persisted; eight months were sufficient to incapacitate the hands completely. It was considered that it could have been caused only by the vibrations transmitted by the machine.

A closer investigation was made into the use of vibratory machines and their effects, and the nature of the machine on which he was employed.

Pneumatic drills are used by road workers and miners, pneumatic hammers by rivetters, and vibratory machines of various sorts in other industrial processes. Their use has increased enormously in recent years.

It has been found that after a time certain of the workers with some of these machines complain of numbness, pain, prickling sensations and weakness, and develop a syndrome, which they describe as "dead hand".

The symptoms are identical with those presented by the patient. As the condition progresses decalcification of bones and cyst formation are described as occurring, particularly in the carpal bones, and leading even to spontaneous fracture.

It will be noted that the main incidence of pressure and vibration with the pneumatic drill is on the palms of the hands, hence decalcification of the carpus.

Further, a gust of cold air issues from the handle of the drill, and this is said to be an aggravating factor in producing "dead hand", of which the victims complain bitterly. The particular machine employed in this case was a circular grindstone. The rough cast knife blade is held in the fingers of the right hand, steadied by the thumb. The left hand is placed on the right wrist, to give support, and the projecting blade is pressed with considerable force on the edge of the stone. The main incidence of pressure and vibration falls on the distal ends of the metacarpal bones.

Dr. Fielding kindly x-rayed the hands, and for comparative purposes a motor mechanic was used as a control. No evidence of decalcification was observed.

It was found on investigation that the circular grinding stones were first mounted in a wrong position, the driving-belt being close over the workers’ heads. They had to press up against the lower segment of the grindstone; in consequence, they had to put greater strain on the hands than if pressing down on the upper segment. Also the machine was set on a timber instead of on a cement base, which increased the amplitude and violence of the vibrations. These faults were not rectified until after the patient had given up work.

Other factors of importance with these machines are: The rate of vibration. 2,300 vibrations per minute appears to be