STUDIES OF ELECTRICAL SKIN RESISTANCE IN PERIPHERAL NERVE LESIONS*

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INTRODUCTION

Changes in electrical skin resistance have been reported by Richter and his associates on the basis of extensive experimental and clinical studies to provide an accurate and practical clinical test for peripheral nerve injuries. They have designed a simple apparatus for this purpose which is now on issue to the U. S. Army Medical Corps.

Areas of skin deprived of their sympathetic nerve supply show a marked increase in electrical skin resistance as compared to surrounding normal areas containing active sweat glands. This is due largely to the inactivity of sweat glands in the denervated skin. Differences in surface moisture can be usually seen or felt, and the areas of high resistance coincide with the absence of sweating, as shown by the Minor starch-iodine test. Vasodilatation plays a very small role, if any, in these skin resistance changes. Vasodilatation produced by (1) prolonged application of a blood-pressure cuff caused no consistent changes in skin resistance, and (2) vasodilatation by niacin failed to produce a significant change (confirmed by one of us in initial experiments).

The difference in resistance becomes greater and the line of demarcation between denervated skin and surrounding normal areas becomes sharper as the normally innervated sweat glands are stimulated, either by increasing the surrounding temperature, increasing body metabolism, or by certain drugs that stimulate the sweat glands through the sympathetic nervous system. Under optimal conditions, the transition from an area of high resistance to an area of low resistance is very sharp, usually detected by movement of the testing electrode about ½ of an inch. Areas of high resistance usually correspond exactly to accurately determined areas of sensory loss.

Experimental studies of skin resistance changes in animals following sympathectomy (Richter) have shown that there is an initial rise, which shortly reaches a very high level and falls, in the monkey, after several months, to a permanent level still far above that observed preoperatively.

METHODS

The methods used were essentially the same as those outlined by Richter and his associates. A small D.C. current (maximum of 50 microamperes) was passed through the skin and the change in resistance from a denervated

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to a normal skin area indicated on a sensitive meter. Representative values of resistance in ohms were recorded. In experimental studies with animals, the resistance of the central foot pad of the hind limb was measured on both sides after section of one sciatic nerve.

Various ohmmeters have been used, including several commercial instruments and special designs. Recently a new dermohmmeter has been designed by one of us which has proven most satisfactory. The details of this instrument have been described in a separate communication.* In initial experiments with animals an especially designed A.C. and D.C. instrument

![Figure 1. Photograph of dermohmmeter with ear clip attached to patient, and handle with the roller electrode inserted.](image)

was employed in order to assess the merits of these two types of measurement. Extremely high values of resistance encountered in animal studies were measured with the R.C.A. "volt-ohmyst."

The fixed electrode consisted of a silver clip which was attached to the ear. The resistance of the lobule of the ear was first greatly reduced by rubbing the lobule with electrolytic jelly. The jelly, when rubbed in, made the resistance at this point so low that it was not found necessary to puncture the skin with a pin as has been recommended (Richter and Woodruff*), even though this does reduce the resistance at this point still further.

The exploratory electrode consisted of a bakelite handle with a socket into which could be fitted various forms of electrode. These electrodes consisted of flat silver discs (4 and 9 mm. in diameter) mounted on a copper rod

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* See page 257 of this issue of the Journal.