PERIPHERAL NERVE SURGERY—REVIEW OF INCISIONS FOR OPERATIVE EXPOSURE. PRELIMINARY REPORT*

CAPTAIN EMIL SELETZ, M.C., A.U.S.

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IN THE military service during war, injuries to peripheral nerves are amongst the most commonly observed in the wounded soldier that survives. This is easily understood when one realizes how multiple are the penetrating wounds that may be suffered by a single man, from the spraying of shell fragments. Because of the penetrating quality of, and multiplicity of fragments from highly explosive shells and land mines, nerves that are normally well-hidden and protected are just as vulnerable as are those near the surface. The purpose of this paper, therefore, is to review the most logical approaches for adequate exposure of the various nerves and to present new incisions developed on the Neuro-Surgical Service at Wakeman General Hospital.

These modifications are based on the study of 1567 peripheral nerve lesions.

In devising the new incisions, adherence to the following surgical principles was found to be of great advantage.

(1) Adequate exposure of the injured nerve.
(2) The approach to deeply lying nerves is made through fascial planes, rather than by penetrating through muscle substance.
(3) If a muscle must be penetrated, it is always split in the direction of its fibers.
(4) When a muscle must be divided, it is severed only at its point of fascial attachment, so that it may be easily repaired.
(5) Shortening of a normal long bone, or resection of a clavicle are avoided when possible.
(6) Skin incisions that are perpendicular to flexion creases must be avoided, since a traction scar will invariably result. Not only is the skin involved in the production of traction scars, but subcutaneous tissues and fascial layers as well.

The incisions of the extremities have for the most part been divided into three parts. This is especially true for incisions about the cubital and popliteal fossae. One part alone is usually sufficient for repair of the nerve, while two or all three parts may be used when rerouting as well as repair is necessary.

INCISIONS IN THE UPPER EXTREMITY

The Median Nerve. The median nerve in the arm, above the elbow joint, is easily explored through part 1, Fig. 1; this consists of a longitudinal incision over the mesial surface of the arm. It lies in the plane between the bor-
ders of the biceps and triceps muscles. The median nerve in the forearm is exposed through a longitudinal incision on the volar surface of the forearm. It is usually placed mesial to the border of the brachioradialis muscle (part 3, Fig. 1). Through this incision the pronator teres muscle is exposed and split in the direction of its fibers where deep within its substance the median nerve courses. Part 2 of the incision in Fig. 1 is a transverse incision following a flexion crease in the cubital fossa. When these incisions are united, a modi-

![Fig. 1 (left). Incision for exploration of median nerve in arm and forearm.](image1)

![Fig. 2 (right). Exposure of the median nerve in the arm and forearm accomplished by the use of the combined Z-shaped incision. (A) Median nerve. (B) Brachial artery. (C) Pronator teres muscle.](image2)

fied Z is formed, thus avoiding an incision crossing a flexion crease. The flaps, a and b, are now retracted and through this wide exposure the median nerve may be traced along its course in the arm and forearm (Fig. 2). A transplantation of this nerve may also be carried out. It is possible to explore the radial and ulnar nerve as well as the median nerve through this incision. Such an incision heals without distortion and avoids the flexion contractures shown in Figs. 3 and 4.

The Ulnar Nerve. The exposure of the ulnar nerve in the arm is accomplished through the same incision as for the median nerve as shown in part 1, Fig. 5. The ulnar nerve in the forearm is explored through part 3, Fig. 5.