Brachial Plexus Avulsion*
A Review of Diagnostic Procedures and Report of Six Cases

JUVENTCIO ROBLES, M.D.†
Department of Neurology, Clinica San Lorenzo, I.S.S.T.E. Mexico City, Mexico

In 1947, Murphey and his coworkers accidentally discovered the value of cervical myelography in the diagnosis of avulsion of the brachial plexus while performing a myelogram in an attempt to rule out a herniated cervical disc in a patient with symptoms in his left arm. They found a defect which they called "traumatic meningocele." Since that time this finding has been considered pathognomonic of spinal root avulsion. Bonney introduced the axon reflex test in the differential diagnosis of avulsion and peripheral lesions of the brachial plexus. During recent years, electromyography and studies of nerve conduction have been applied to the study of brachial plexus injuries, giving helpful information in localizing the lesion.

Considering that little over 100 cases have been reported up to now, we thought that the six cases studied by us during the last few years would be interesting.

Case Reports
Our six patients, all men, ranged in age from 19 to 69 years. Each had been involved in an accident in which he had received a brain concussion and was rendered unconscious. The duration of unconsciousness varied among the cases from 15 minutes to 3 days. In each case a lesion of the brachial plexus was found, on the right side in five and on the left side in one.

One accident was industrial, three were falls, and two were traffic accidents. Cervical myelography via the lumbar route was performed on all the patients from 1 to 14 months after the accident. Results showed avulsion of one root in three cases, and avulsion of two or more roots in the remaining three cases (Figs. 1–3). Of the three cases with avulsion of one root, only one showed correlation between the clinical and radiological picture (Case 6); the lesion was more extensive in the remaining two cases. A total of 12 avulsions were demonstrated in the six cases, five at C-7 (41.6%), four at C-8 (33.3%), two at C-6 (16.6%), and one at C-5 (8.3%). Other diagnostic tests such as the axon reflex test and electrophysiological procedures, which will be discussed below, had not been introduced at the time that these cases were studied.

Only one patient underwent surgical exploration, which was extradural, and showed a peripheral nerve lesion (Case 4). Thus, this case is an example of combined intra- and extradural lesions.

The significant data on the six cases are summarized in Table I.

Discussion
The prognosis of lesions of the brachial plexus is, generally speaking, poor. For this

![Fig. 1. Left: Case 1. Traumatic meningocele at C-7 right. Right: Case 2. Small traumatic meningocele at C-8 right.](image-url)
reason, it is very important to obtain an early and accurate diagnosis of the site of the injury to be able to initiate definitive treatment of the flail arm. The possibilities of repair are very poor, even in peripheral lesions of the plexus, unless there is continuity of the nerve trunks.14

There are signs that suggest avulsion of a root from the spinal cord. Paralysis of the most proximal muscles (serratus anterior, rhomboid, and levator scapulae) as well as a Horner’s syndrome are indicative of an intradural lesion. The sensory disturbances may not parallel the motor disturbances, due to the fact that the dorsal roots seem to be more resistant to traction than the ventral roots. Lester8 mentions that lumbar puncture may sometimes yield bloody cerebrospinal fluid during the first 5 or 6 weeks.

When cervical myelography was introduced, it was thought that it would show the exact site and extent of the lesions in all cases of brachial plexus avulsion. However, several authors,5,12 including ourselves, have demonstrated that the myelographic evidence does not always correlate with the patient’s clinical symptoms. We found this so in Cases 1, 2, 4, and 5.

The myelographic findings may range from a traumatic meningocele, or dural sac,3,9 to

The linear lateral collections,9 or irregular and wavy margins,2 the medial concave,11 or lateral convex defect.8 In all our cases except Case 2, we found dural sacs, the largest being in Case 5. Case 3 also showed an irregular defect at the level of C-5 and C-6 on the right side, while Cases 2 and 3 showed a slight lateral