CASE REPORT

ELECTROMYOGRAPHIC EVALUATION OF A WATER SKIING INJURY

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An Electromyographic diagnosis of an injury to the distal portion of the right posterior and medial cords of the Brachial plexus in a 40 year old male due to a water skiing accident is described.

Electromyography is an excellent objective method of examining muscles and the peripheral nervous system, Buchthal 1962, in order to determine the exact anatomical site and extent of a lesion, (Bauwens, 1960) and to make a prognosis based on objective data. A case history demonstrating the practical value of clinical electromyography follows:

A 40 year old man sustained a flaccid paralysis of his right upper extremity in a water skiing accident on August 22nd, 1976. At the time of the injury the patient was being towed on water skis, when another boat cut across his tow rope. The force of the boat hitting his tow rope, combined with the wakes of both boats, caused the patient to be thrown forcefully into the air, with his right arm forced behind his back. After hitting the water with a substantial impact, the patient noticed that he could not move his right arm. He also noted pain in the right shoulder.

Examination revealed paralysis of the right deltoid, right triceps and extensor muscles of the right forearm and wrist. There was marked paresis of the muscles supplied by the ulnar nerve in the forearm and hand. Sensation was decreased to pinprick over the skin, on the lower part of the right deltoid, over the medial side of forearm and hand and over the dorsum of the right hand.

Radiographic findings revealed an anterior dislocation of the right shoulder with a hair line fracture.

On August 26th, 1976 electrodiagnostic evaluation revealed a diffuse right brachial plexus injury at the cord level, with the major injury in the medial and posterior cords of the brachial plexus (Stanwood and Kraft, 1971). There was evidence of a mild injury to the lateral cord of the brachial plexus resubbling that of Erminio et al. (1959). The muscle groups most severely involved were the right deltoid (axillary nerve) and the muscles of the hand innervated by the ulnar nerve (Buchthal et al. 1960). The supraspinatus and rhomboid muscles were within normal limits, therefore, the injury did not extend proximally, into the upper trunk or roots of the brachial plexus. The thoracodorsal nerve and the medial pectoral nerve were intact, therefore the injury of the posterior and medial cords was in the distal portion of the cords. The serratus anterior was normal, ruling out a root injury. There was no evidence of denervation at that time. Nerve complication assessment was also carried out (Tables I and II).

TABLE I
Nerve Conduction Study — Upper Extremity

NAME: A. LaC		AGE: 40		DATE: 26.8.1976	
MOTOR		R. Median	R. Ulnar	R. Radial	Normal
B.	Latency-Motor				
	Wrist to muscle	3.3 msec.	2.6 msec.		< 4.5 msec.
	Latency-Sensory				
	Wrist to index finger	2.3 msec.	2.2 msec.	4.6 msec.	< 3.5 msec.

TABLE II
Timing as Related to EMG Needle Electrode Examination
in Peripheral Nerve Injury (F. J. Bonner)

PHASE		FIBRILLATION	VOLITIONAL MOTOR UNIT ACTION POTENTIAL
Acute	Within 7 days	None	Reduced numbers depending upon degree of completeness
Subacute	After 10-21 days	Increasing	High rate of fire if total numbers are few (density)
Chronic	Probably longer than 3 months	Many (variable)	Reduced numbers depending upon degree of completeness. High rate of fire if total numbers are few (density). Increased amplitude (hypertrophy). Increased polyphasicity (nerve branching/regeneration)

The electromyographic findings were consistent with a partial injury to the right brachial plexus, with the major injury to the medial and posterior cords. The motor and sensory conduction velocities, latencies and character of the evoked responses, were within normal limits in the right median and ulnar nerves. The right radial response was prolonged. (Johnson and Olsen, 1960).

The patient returned for further examination on September 21st, 1976 at which time there was frank evidence of denervation in the right posterior and medial cords of the brachial plexus, but no denervation in the lateral cord distribution. There were no motor units observed in the muscles innervated by the distal portion of the medial cord, while the muscles innervated by the posterior cord revealed single motor unit patterns except for the extensor carpi radialis longus. The lateral cord distribution appeared uninvolved, except for a mild reduction in muscle interference patterns. Prognosis for the recovery of the muscles innervated by the posterior and medial cord was poor, with the medial cord recovery being even less favourable (Table III).

TABLE III
Right Upper Extremity

Muscle	At Rest	26th AUGUST, 1976		At Rest	21st SEPTEMBER, 1976	
		Minimal Contr.	Maximum Contr.		Minimal Contr.	Maximum Contr.
Deltoid	Normal	Single Motor Unit (Normal Unit)		Moderate Fibrils	Single Motor Unit Pattern only Potentials	
Biceps	Normal	Normal Motor Unit Potentials	Complete	Normal	Normal Motor Unit Potentials	Complete
Triceps	Normal	Normal Motor Unit Potentials	60% Interf. Patrn.	Moderate Fibrils	Single Motor Unit Pattern Only	
Ext. Carpi Rad	Normal	Normal Motor Unit Potentials	40% Interf. Patrn.	Few Fibrils	Normal Motor Unit Potentials	Incomplete
Pronator Teres	Normal	Normal Motor Unit Potentials	80% Interf. Patrn.	Normal	Normal Motor Unit Potentials	Complete
Supra Spinatus	Normal	Normal Motor Unit Potentials	Complete	Normal	Normal Motor Unit Potentials	Complete
Serratus Anterior	Normal	Normal Motor Unit Potentials	Complete	Normal	Normal Motor Unit Potentials	Complete
Flex Carpi Uln.	Normal	Normal Motor Unit Potentials	50% Interf. Patrn.	Moderate Fibrils	No Motor Unit Potentials	
First Dorsal Inter- osseus	Normal	No Voluntary Motor Unit Potentials Seen		Moderate Fibrils	No Motor Unit Potentials	
Opponens Pollicis	Normal	Normal Motor Unit Potentials	60-70% Interf. Pattern	Moderate Fibrils	Normal Motor Unit Potentials	Incomplete

The patient was started on a comprehensive exercise programme to prevent shoulder atrophy and to optimize muscle function in the area of only minimal involvement. He was told to return in 3-4 months to ascertain the rate and degree of re-inervation.

In March 1977, he had full functional recovery, however the EMG examination revealed a marked increase in polyphasic motor unit potentials with a reduction in interference pattern.

When coupled with an accurate history and physical examination, the examination of the electrical activity of voluntary muscle aids the physician in the diagnosis and prognosis of trauma and disease involving the neuromuscular system. The procedure of clinical electromyography and nerve conduction studies is of particularly practical value to those involved in the diagnosis and treatment of sports injuries.

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