An arresting injury

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SUMMARY

Three cases of brachial plexus injury due to handcuffing with the hands behind the back are presented.

INTRODUCTION

Injuries to the brachial plexus usually follow severe trauma and result in significant disability; however, seemingly minor trauma may cause temporary brachial plexus dysfunction. Three patients have presented with brachial plexus injury after being handcuffed behind their back by police officers. This mechanism of injury has not been previously reported.

CASE REPORTS

Case 1

A 30-year-old man presented 18 h after his arrest. He complained of paraesthesia and decreased power in the left arm. During his arrest the left arm had been forcibly extended and adducted as handcuffs were applied.

Examination showed 4/5 power in biceps and paraesthesia in the C6 dermatome. Biceps and supinator tendon reflexes were absent.

He had made a full recovery in 2 weeks.

Case 2

A 25-year-old man presented 12 h after arrest during which his hands were secured behind his back. He complained of inability to flex or extend the right elbow and decreased sensation over the radial three fingers of the right hand.

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On examination there was bruising on the inner aspect of his left upper arm and a circumferential bruise at the left wrist. The left arm was neurologically normal. On the right the power was 0/5 biceps, 2/5 triceps, 3/5 wrist flexion and 4/5 wrist extension. All reflexes were absent in the right arm. There was no objective sensory loss, although he described paraesthesia in the C6 dermatome.

EMG studies confirmed neurogenic changes in the right deltoid, biceps and, to a slight degree, extensor digitorum communis in keeping with a neuropraxia of the upper part of the brachial plexus.

An improvement in power was apparent at 2 weeks. The patient failed to attend for further follow-up.

Case 3

A 32-year-old man was restrained by having his arms extended and adducted to bring his hands together behind his back. He presented 12 h later with weakness and paraesthesia of the left arm and paraesthesia of the right arm.

Examination of the left arm showed power 2/5 deltoid, 3/5 biceps, 3/5 wrist flexion and 3/5 wrist extension. The biceps tendon reflex was absent. Power in the right arm was normal. There were subjective sensory changes in the C4,5,6 and 7 dermatomes on the right and C5,6,7 and 8 on the left.

EMG studies showed neurogenic changes in the left deltoid and biceps.

By 3 weeks power had increased to 4 + /5 deltoid, 3/5 biceps and 5/5 wrist extensors. The conclusion was that this represented a patchy neuropraxia which was recovering. The patient failed to attend for further follow-up.

DISCUSSION

None of the patients gave a history of preceding neurological problems. All patients had evidence of upper brachial plexus injury affecting the C6 level with decreased power in biceps, loss of the biceps tendon reflex and paraesthesia in the C6 dermatome (Table 1). The distribution of injuries at other levels probably represents differences in the forces applied and the exact position of the patient at the time of injury. The similarity of the mechanism of injury and injury sustained suggests that forced extension and adduction of the arms to bring the hands together behind the back may cause injury to the upper part of the brachial plexus.

One patient made a full recovery at 2 weeks. The other two showed significant improvement at 2–3 weeks, but failed to attend for further follow-up so no assessment of time to full recovery, or residual deficit, was possible. In all cases management was conservative after clinical evidence of recovery and/or EMG evidence of neuropraxia. Observation is recommended for traction injuries of the brachial plexus which have a chance of spontaneous recovery (Millesi, 1977; Millesi, 1984).

The brachial plexus is protected against traction injury by the plexiform pattern,

Table 1

	Patient		
	1	2	3
MOTOR			
Deltoid	5	5	2
Biceps	3	0	3
Triceps	5	2	5
Wrist extension	5	4	3
Wrist flexion	5	3	3
SENSORY DISTURBANCE			
C5	—	—	+
C6	+	+	+
C7	—	—	+
C8	—	—	+
TENDON REFLEXES			
Biceps	—	—	—
Supinator	—	—	+
Triceps	+	—	+

+ = present, — = absent.

which dissipates any applied force, and the encasement of the nerve fibres in connective tissue. However, these factors are of little value in cases of sudden violent stretching (Wynn-Parry, 1984). The patients had resisted arrest and struggled with police officers as the handcuffs were applied making a sudden stretching injury more likely.

Although the upper trunks of the brachial plexus are more prone to injury in adduction of the arm (Ferenz, 1988) adduction to the midline seems unlikely to produce a significant traction injury. It seems likely that it is the added extension of the arms which produces the injury. This is supported by the 'rucksack palsy' seen in army recruits who carry heavy packs with anterior shoulder straps pulling the shoulders backwards. They develop an upper brachial plexus neuropraxia similar to that seen in our patients (Bessen *et al.*, 1987; Wilson, 1987). Adduction is not a feature of this injury. Therefore, if a prisoner was to bend or twist during the application of handcuffs an injury to the brachial plexus is more likely.

Police officers are advised to apply handcuffs with the hands behind back to immobilize the arms and to reduce more effectively the ability to resist. If the arms can be kept close to the back to avoid extension of the arms during this manoeuvre perhaps this injury would not occur.

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