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CASE REPORT

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# Simultaneous Proximal Median and Ulnar Neuropathy: A Rare Complication of 24-hour Ambulatory Blood Pressure Monitoring with Unexpected Neurophysiological Findings

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*ABSTRACT*

***Introduction:*** *Ambulatory blood pressure monitoring (ABPM) is a non-invasive method of obtaining brachial artery pressure assessment over 24 hours while patients undergo normal daily activities. Side effects, such as peripheral petechiae, limb edema, and sleep disturbance, are usually mild and reversible.*

***Case report:*** *A 67-year-old male presented with excruciating left hand pain and weakness on waking up from night sleep, having worn a cuff on his left arm for a whole day in the context of 24-hour ABPM. Clinical*

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*examination confirmed hypoesthesia in the left median and ulnar nerve distribution and weakness solely affecting ulnar and sparing median innervated hand muscles. Neurophysiological testing was performed. Interestingly, although median and ulnar motor responses were abnormal the respective sensory responses were unremarkable.*

***Conclusion:*** *To our knowledge, this is the first reported case of simultaneous proximal median and ulnar neuropathy complicating 24-hour ABPM. From a neurophysiological standpoint, it is also intriguing as this is a rare case of peripheral neuropathy with prominent motor fibre involvement, but normal sensory responses.*

**Keywords**: ambulatory blood pressure monitoring, median neuropathy, ulnar neuropathy.

## INTRODUCTION

Ambulatory blood pressure monitoring (ABPM) is a non-invasive method of obtaining brachial artery pressure assessment over 24 hours while patients undergo normal daily activities (1, 2). It is also a safe method. Side effects, such as peripheral petechiae, limb edema, and sleep disturbance, are usually mild and reversible (3, 4). However, there are anecdotal reports of severe side effects related to type II complex regional pain syndrome, vein thrombosis (deep or superficial), and peripheral neuropathies (5-7). ❑

## CASE REPORT

A 67-year-old male with a past medical history of hypertension and a normal arm circumference was referred to our Neurophysiology Department due to excruciating left hand pain and weakness. His symptoms were commenced abruptly, on waking up from night sleep, having worn a cuff on his left arm for a whole day in the context of 24-hour ABPM with a validated device that took blood pressure measurements every 30 minutes during the daytime and 60 minutes at sleep.

Precise clinical examination confirmed hypoesthesia in left median and ulnar nerve distribution and weakness solely affecting ulnar and sparing median innervated hand muscles. Neurophysiological studies were conducted. Left Abductor Digiti Minimi (ADM) and 1st Dorsal Interosseous (FDI) Compound Motor Action Potential (CMAP) amplitudes were moderately reduced and EMGraphically exhibited active neurogenic changes. Ulnar motor Conduction Velocities (CV) were mildly reduced. In contrast, left Abductor Pollicis Brevis (APB) CMAP amplitude, median motor CV and median innervated muscles' EMG sampling were unremarkable. Furthermore, left median and ulnar F-wave latencies were both abnormal. Interestingly, left median and ulnar sensory responses were normal (Table 1). This case was reported as "an unusual presentation of median and ulnar neuropathy at the level of the left arm related to 24-hour ABPM with normal sensory responses". The patient was reviewed five months afterwards. Clinical and neurophysiological improvement was evident, as both median and ulnar F-wave latencies decreased, F-wave persistence normalized and ADM and FDI CMAP amplitudes increased (Table 2). ❑

## DISCUSSION

Few cases of upper limb neuropathies related to automated non-invasive blood pressure monitoring in anesthetized patients are mentioned in the literature (8). Due to its superficial course near the elbow, the radial nerve seems more susceptible to such compression injury. Consequently, to avoid nerve compression injury, the cuff is recommended to be placed higher on the arm and away from the elbow joint (9-11). A couple of cases affecting the ulnar or the median nerve, most probably close to the elbow where these nerves become superficial, are also reported (12, 13).

Ambulatory blood pressure monitoring appears even safer. Although vascular side effects, such as petechiae and limb edema, are not uncommon, peripheral nerve injuries are extreme-

**TABLE 1.** Initial neurophysiological study

| **Sensory nerve conduction studies** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Nerve and Site** | **Onset Latency** | **Peak Latency** | **Amplitude** | **Segment** | **Latency Difference** | **Distance** | **Conduction Velocity** |
| **Median.L** | | | | | | | |
| Digit II (Index fing | 2.3 ms | 2.9 ms | 14 µV | Digit II (Index finger)-Wrist | 2.3 ms | 135 mm | 60 m/s |
| Digit III (long fing | 2.3 ms | 3.0 ms | 12 µV | Digit III (long finger)-Wrist | 2.3 ms | 135 mm | 58 m/s |
| **Ulnar.L** | | | | | | | |
| Dig V | 1.9 ms | 2.5 ms | 8 µV | Dig V-Wrist | 1.9 ms | 118 mm | 63 m/s |
| **Median.R** | | | | | | | |
| Digit II (Index fing | 2.3 ms | 2.9 ms | 12 µV | Digit II (Index finger)-Wrist | 2.3 ms | 130 mm | 57 m/s |
| Digit III (long fing | 2.4 ms | 2.9 ms | 11 µV | Digit III (long finger)-Wrist | 2.4 ms | 126 mm | 53 m/s |
| **Ulnar.R** | | | | | | | |
| Dig V | 2.0 ms | 2.7 ms | 7 µV | Dig V-Wrist | 2.0 ms | 120 mm | 59 m/s |
| **Radial.R** | | | | | | | |
| Thumb | 1.4 ms | 2.0 ms | 30 µV | Anatomical snuff box- Thumb | 1.4 ms | 80 mm | 57 m/s |
| **Radial.L** | | | | | | | |
| Thumb | 1.5 ms | 2.1 ms | 26 µV | Anatomical snuff box-Thumb | 1.5 ms | 90 mm | 60 m/s |
| **Motor nerve conduction studies** | | | | | | | |
| **Nerve and Site** | **Latency** | **Amplitude** | **Segment** | | **Latency Difference** | **Distance** | **Conduction Velocity** |
| **Median.L** | | | | | | | |
| Wrist | 3.3 ms | 9.4 mV | Abductor pollicis brevis-Wrist | | 3.3 ms | mm | m/s |
| Elbow | 7.9 ms | 9.3 mV | Wrist-Elbow | | 4.6 ms | 230 mm | 50 m/s |
| Axilla | 10.8 ms | 9.0 mV | Elbow-Axilla | | 2.9 ms | 160 mm | 55 m/s |
| **Median.R** | | | | | | | |
| Wrist | 3.2 ms | 8.8 mV | Abductor pollicis brevis-Wrist | | 3.2 ms | mm | m/s |
| Elbow | 7.6 ms | 8.7 mV | Wrist-Elbow | | 4.4 ms | 230 mm | 52 m/s |
| **Ulnar.L** | | | | | | | |
| Wrist | 3.1 ms | **7.5 mV** | Abductor digiti minimi (manus)-Wrist | | 3.1 ms | mm | m/s |
| Below elbow | 7.5 ms | **5.6 mV** | Wrist-Below elbow | | 4.4 ms | 200 mm | **45 m/s** |
| Above elbow | 9.5 ms | **5.2 mV** | Below elbow-Above elbow | | 2.0 ms | 100 mm | **41 m/s** |
| **Ulnar.R** | | | | | | | |
| Wrist | 2.6 ms | 16.8 mV | Abductor digiti minimi (manus)-Wrist | | 2.6 ms | mm | m/s |
| Below elbow | 6.4 ms | 14.4 mV | Wrist-Below elbow | | 3.8 ms | 200 mm | 53 m/s |
| Above elbow | 8.5 ms | 14.3 mV | Below elbow-Above elbow | | 2.1 ms | 100 mm | 48 m/s |
| **Ulnar.L** | | | | | | | |
| Wrist | 4.6 ms | **3.1 mV** | First dorsal interosseous-Wrist | | 4.6 ms | mm | m/s |
| Below elbow | 9.0 ms | **1.6 mV** | Wrist-Below elbow | | 4.4 ms | 200 mm | **45 m/s** |
| Above elbow | 11.4 ms | **1.2 mV** | Below elbow-Above elbow | | 2.4 ms | 100 mm | **42 m/s** |
| **Ulnar.R** | | | | | | | |
| Wrist | 3.9 ms | 8.9 mV | First dorsal interosseous-Wrist | | 3.9 ms | mm | m/s |

ly rare (4). Only a single case of radial compressive neuropathy related to ABPM could be found in the literature to the best of our knowledge (7).

Our case is unique as it is the first reported case of blood pressure cuff injury simultaneously affecting median and ulnar nerves. During ABPM, a cuff is placed around the upper arm over the brachial artery. In the upper arm the brachial artery descends along with the median and ulnar nerves within the medial neurovascular bundle (14). Thus, both nerves could have been injured at this level as the patient might have laid on the cuff or the cuff tube might have been blocked while he was asleep. Alternatively, simultaneous median and ulnar nerve injury might have resulted from improper low cuff placement near the elbow where both nerves become superficial (14).

The respective neurophysiological findings are also exceptional, as in the case of peripheral neuropathies presenting with significant motor nerve fibre involvement, as evidenced by reduced CMAP amplitudes and neurogenic EMG changes, sensory responses are also abnormal (15). A single case of proximal median neuropathy related to glomangioma presenting with ab-

**TABLE 2.** Follow-up neurophysiological study (five months afterwards)

| **Sensory nerve conduction studies** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Nerve and site** | **Onset latency** | **Peak latency** | **Amplitude** | **Segment** | **Latency difference** | **Distance** | **Conduction velocity** |
| **Median.L** | | | | | | | |
| Digit II (Index fing | 2.3 ms | 2.8 ms | 12 μV | Wrist-Digit II (Index finger) | 2.3 ms | 135 mm | 59 m/s |
| Digit III (long fing | 2.3 ms | 2.9 ms | 14 μV | Wrist-Digit III (long finger) | 2.3 ms | 140 mm | 61 m/s |
| **Ulnar.L** | | | | | | | |
| Dig V | 2.0 ms | 2.5 ms | 7 μV | Dig V-Wrist | 2.0 ms | 125 mm | 63 m/s |
| **Ulnar .R** | | | | | | | |
| Wrist | 2.0 ms | 2.4 ms | 7 μV | Dig V-Wrist | ms | mm | m/s |
| **Dorsal ulnar cutaneous .R** | | | | | | | |
| Forearm | 1.7 ms | 2.1 ms | 10 μV | Dorsum of hand-Forearm | 1.7 ms | 95 mm | 57 m/s |
| **Dorsal ulnar cutaneous .L** | | | | | | | |
| Forearm | 1.8 ms | 2.3 ms | 13 μV | Dorsum of hand-Forearm | 1.8 ms | 95 mm | 53 m/s |

| **Motor nerve conduction studies** | | | | | | |
|---|---|---|---|---|---|---|
| **Nerve and Site** | **Latency** | **Amplitude** | **Segment** | **Latency Difference** | **Distance** | **Conduction Velocity** |
| **Median.L** | | | | | | |
| Wrist | 3.6 ms | 10.1 mV | Abductor pollicis brevis-Wrist | 3.6 ms | mm | m/s |
| Elbow | 8.2 ms | 9.0 mV | Wrist-Elbow | 4.6 ms | 230 mm | 50 m/s |
| **Ulnar.L** | | | | | | |
| Wrist | 3.2 ms | **10.1 mV** | Abductor digiti minimi (manus)-Wrist | 3.2 ms | mm | m/s |
| Below elbow | 7.1 ms | **8.6 mV** | Wrist-Below elbow | 3.9 ms | 210 mm | 54 m/s |
| Above elbow | 9.0 ms | **8.1 mV** | Below elbow-Above elbow | 1.9 ms | 100 mm | 52 m/s |
| **Ulnar.L** | | | | | | |
| Wrist | 4.6 ms | **5.1 mV** | First Dorsal Interosseous-Wrist | 4.6 ms | mm | m/s |
| Below elbow | 9.1 ms | **4.1 mV** | Wrist-Below elbow | 4.5 ms | 215 mm | 48 m/s |
| Above elbow | 11.0 ms | **4.1 mV** | Below elbow-Above elbow | 1.9 ms | 100 mm | 53 m/s |

| **F-wave studies** | | |
|---|---|---|
| **Nerve** | **F-Latency** | **F-wave persistence** |
| Ulnar.L | 30.3 | 8/10 |
| Ulnar.R | 29.8 | 8/10 |
| Median.R | 27.8 | 9/10 |
| Median.L | 29.4 | 9/10 |

normal motor and normal sensory responses could be found (16). However, this appears to be the exception and not the rule.

Regarding the mechanism of nerve injury, median nerve lesion was purely demyelinating, as evidenced by the combination of normal APB CMAP amplitudes, normal EMG findings from proximal and distal median innervated muscles, and abnormal F-wave studies (prolonged minimum F-wave latencies and decreased F-wave persistence) that normalized five-month afterwards. In contrast, ulnar nerve injury was primarily axonal as ADM, and FDI CMAP amplitudes were significantly reduced, and both muscles EMGraphically exhibited active neurogenic changes. ❑

## CONCLUSION

To the best of our knowledge, this is the first reported case of simultaneous proximal median and ulnar neuropathy complicating 24-hour ABPM. It is also intriguing and challenging from a clinical and neurophysiological standpoint as, despite the prominent motor fibre involvement, sensory responses were unremarkable. ❑

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