Side-to-side range of movement variability in variants of the median and radial neurodynamic test sequences in asymptomatic people


Objective
To provide a better understanding of the normal asymmetries between left and right elbow range of motion (ROM) during variants of the median and radial upper limb neurodynamic tests (ULNT) in an asymptomatic population.

Methods
Within-subject comparisons of left and right elbow flexion ROM were conducted on 51 asymptomatic participants (26 females, 25 males; mean age 29.7, SD 5.9 years). Range of motion was measured using an elbow mounted electrogoniometer during median and radial ULNTs. The participants were positioned supine with the neck in contralateral lateral flexion and the scapular stabilised in neutral. The arm was then passively positioned in 90° shoulder abduction and external rotation and 90° elbow flexion. The median nerve biased position involved full forearm supination and full wrist/finger extension, while the radial biased position involved full pronation with wrist/finger flexion. The elbow was then passively extended to onset of resistance (R1) and onset of discomfort (P1) in separate tests.

Results
There were no significant differences in mean ROM between sides, with the ROM of one side significantly correlated with the opposite side (median $R^2 = 0.62$, radial $R^2 = 0.85$) for both P1 and R1. Lower bound scores accounting for measurement error and within-subject variability indicate that flexion ROM differences between sides of greater than 15° for the median ULNT and 11° for the radial ULNT could indicate asymmetry beyond normal variation in a similar age-matched population.

Conclusion
The normal variability in ROM observed between sides highlights the need to combine ROM findings with those of symptom provocation and structural differentiation in determining the clinical significance of a median or radial neurodynamic test.

Commentary
Upper limb neurodynamic tests have become a commonly used clinical tool in the assessment and diagnosis of peripheral neuropathic pain. In the absence of central pain mechanisms as the primary cause of symptoms, ULNTs are generally accepted as tests biased towards the mechanosensitivity of nerve roots, brachial plexus and peripheral nerve trunks (Nee et al 2012). A positive test is indicated by (i) reproduction of the patient’s symptoms and (ii) structural differentiation via movement of more distal or proximal joints along the path of the nerve, that either aggravate or ease symptoms. A third plausible indicator is a reduction in ROM on the symptomatic side compared to the asymptomatic side (Butler 2000). While ROM asymmetries are commonly accepted as partial indicators of a positive test, only recently has evidence emerged to guide clinicians in the normal asymmetries that may exist between sides (Nee et al 2012). This is pertinent considering asymptomatic subjects can also report symptoms of aching, pain, burning and tingling in response to ULNTs (Nee et al 2012). Therefore, this recent study is worthy of review and may aid clinicians in their interpretation of ULNT ROM findings, helping to avoid false positives and prioritise management.

The clinical relevance of this study is strengthened by its use of therapist-administered variants of ULNTs, without mechanical stabilisers utilised in other similar studies (Van Hoff et al 2012). There are multiple variations for biasing the median, radial and ulnar nerves in ULNTs; however, all require skilled manual handling to ensure the intended neural structure is progressively loaded, thereby achieving an accurate test of the nerves’ mechanosensitivity (Butler 2000). In the absence of precise movement and sound patient communication, false tests can easily occur.

If the findings of this study are to be used clinically as a cut-off for potentially normal asymmetry in ULNTs, then the pre-placement of the neck in contralateral lateral flexion and the use of R1 and P1 as end points are important aspects to consider. It is common clinical practice to elicit symptoms with the neck in neutral, then to utilise neck lateral flexion as a sensitising manoeuvre to aid in structural differentiation, especially when suspecting more distal pathology such as carpal tunnel syndrome or radial nerve entrapment (Butler 2000). Contralateral lateral flexion of the neck reduces the ROM available in an ULNT, effectively pre-loading the peripheral neural structures (Coppieters et al 2001). A previous study of similar design found higher ROM variability when the neck remained in neutral and the end point was marked by ‘firm resistance’ – 27° and 20° of elbow flexion for the median and radial ULNTs, respectively (Covill and Petersen 2012), compared to 15° and 11°, respectively, in the present study. These findings are not representative of a symptomatic population, however they may suggest that pre-loading the neural structures and stopping at R1 or P1, rather than ‘firm resistance’ (Covill and Petersen 2012), provides a more accurate representation of ROM differences between sides.

An objective cut-off value indicating when differences in ROM between sides are likely to be a result of pathology would be an ideal clinical measure for interpreting the significance of an ULNT. In addition, this would provide a clear measure of outcome, guiding treatment and aiding in communication with other involved parties, such as employers and insurance providers. In this regard, the values reported in this study should be used cautiously. The use of an electrogoniometer and a relatively young population are the obvious limitations in the clinical value of these findings. In fact, the actual mean differences between sides were not found to be significant. However, consideration of measurement error and within-subject variability revealed potential differences of 15° and 11°. The clinical value of this study should instead be interpreted through the increased understanding that normal asymmetry can exist in upper limb neurodynamics. As a result, ROM findings need to be coupled with symptom provocation and structural differentiation for a ULNT to be interpreted as a positive sign of peripheral neuropathic dysfunction.

REFERENCE


