Additional evidence that C8-T1 roots were blocked by ultrasound-guided interscalene brachial plexus blockade

We would like to thank Pereira et al. for their interest in our work and for raising their concerns about the methodology of our recently published study.2 The first critical concern raised by Pereira et al. was the possibility that nerve roots C8 and T1 may have been spared by the interscalene blockade of the brachial plexus. Firstly, the muscles at LI4 are innervated mostly by the C8 and T1 spinal nerve roots. We performed the interscalene blockade under ultrasound guidance, which significantly improves its success rate. Roots C8 and T1 can be clearly visualised by ultrasound and it has been reported that successful sensory and motor blockade can be achieved in 99% of patients following ultrasound-guided interscalene brachial plexus blockade.3 Secondly, we assessed sensation and motor function after brachial plexus blockade and demonstrated these to be completely absent in 11 of 12 participants after brachial plexus blockade (table 1). Moreover, participants had no acupuncture sensation during electroacupuncture (EA) after brachial plexus blockade (in the EA+NB session).2 This suggests that roots C8 and T1 were blocked in most, if not all, participants in our study. In fact, brain activation should have been observed if roots C8 and T1 were not blocked in the EA+NB session, which was not the case judging by our results.

The second critical concern raised by Pereira et al. related to test-retest reliability, given that nerve stimulation by EA at the site of needle insertion cannot be proven, especially under brachial plexus blockade. Pereira et al. argue that the “intensity of stimulation depends on how close the needle tip is to the sensory or motor nerves stimulated by EA, and it is unreasonable to expect that the needle tip will lay at the same exact point during each needleling session”. They suggest adjusting the intensity of EA according to muscle contraction; however, we do not agree that the movement of the finger is a sufficiently sensitive variable on which to adjust the intensity of EA. By contrast, we believe that EA intensity per se is a more objective standard.

To test intra-individual variability in the intensity of EA between different treatment sessions, we performed the following additional experiment. Twenty-six patients were enrolled and received EA three times at LI4 (Hegu) and LI11 (Quchi) by the same professional acupuncturist of 13 years’ experience, who was blinded to EA intensity. Instead the intensity of EA was independently adjusted by a nurse who was not told the objective of the experiment. During the first session of EA, the intensity was adjusted until the patient felt a moderate de qi sensation. During the second and third sessions, the intensity of EA was increased until the patients experienced the same level of sensation as reported the first time. The intensity of EA in each of the three sessions was recorded and compared using one-way analysis of variance (ANOVA). The results showed that there was no difference in EA intensity between the three sessions (4.92±0.10, 4.94±0.09 and 4.96±0.09 mA, respectively; p<0.05), which suggests that there was unlikely to have been any major difference in the degree of EA stimulation between the three different sessions in our study when EA was performed by our acupuncturist.3

It is also noteworthy that the acupuncture sensation was similar between the EA session (21.1±2.3) and the EA+LA session following injection of local anaesthetic into the deltoid muscle (23.3±2.8) in our study.2 Thus, test-retest reliability appeared good between the EA sessions, despite unavoidable small differences in needling position or depth. Moreover, visible muscle contraction did occur in all three sessions, and was mentioned in the paper as follows: “One week before the experiment, the intensity of EA was tested for each participant and adjusted in order to generate a moderate de qi sensation, which was generally accompanied by mild muscle contraction in the index finger (5–12 mA).”

The third concern raised by Pereira et al. was regarding the intensity of EA used in the study.

Table 1  Assessment of the brachial plexus block

| Subject | Motor function | Pain sensation | | | | | |
|---------|----------------|----------------|----------------|----------------|----------------|----------------|
|         | Motor function | Ulnar | Median | Radial | Medial cutaneous of forearm | Lateral cutaneous of forearm | Temperature sensation |
| Subject 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 3 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Subject 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subject 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

0=absent; 1=present.
(5–12 mA). It should be noted that 8–10 mA has been used in previous studies,\(^4\)\(^5\) and a relatively higher intensity was deliberately chosen to maximise the possibility of brain activation during EA. The intensity of 5–12 mA (using an apolar current) was well tolerated by all participants. The pulse width used was 0.5 ms and not 30 ms as stated in the paper; we are grateful to Pereira et al for recognising this mistake and an erratum will be issued shortly.

Finally, Pereira et al pointed out that intramuscular injection of local anaesthetics poses a risk of myotoxicity and suggested the use of interfascial plane infiltration as an alternative. We would like to thank Pereira et al for their helpful suggestion. Although there were no adverse events in our study, interfascial plane injection of local anaesthetic is a safer technique and should be considered in future studies.

We hope that our responses will help reassure Pereira et al and the readers of Acupuncture in Medicine that our original conclusion is likely to be valid; that is, EA-induced brain activation detectable by functional MRI is abolished by blockade of the brachial plexus.

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Contributors WG was responsible for study design, recruitment of participants, and statistical analysis, and helped to draft and finalise the manuscript. WJ was responsible for the recruitment of participants. JH was responsible for the acupuncture. ZW was responsible for study design and analysis. All authors read and approved the final manuscript.

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