Microneurography and Somatosensory Research

In the late 1960’s Hagbarth and Vallbo presented a number of papers describing a method of recording neural activity in single sensory afferents in man. This method came to be known as microneurography (1). I have wanted to see and learn more about this technique ever since I undertook my PhD studies, where I recorded from nociceptive afferents in the rat (2, 3). My final year medical elective, and the funds generously provided by the AAGBI, gave me the opportunity to fulfil this aim.

I was able to visit the laboratory of Professors Wessberg and Olausson in the University of Gothenberg, Sweden. I worked under the direct supervision of Dr Ackerley, Assistant Professor in the Physiology department.

My Elective was everything that I hoped it would be and more. I was able to participate in microneurography experiments: being a subject twice and even undertaking some manipulations of the needle electrodes under supervision. I also had the opportunity to present some of my PhD work to the Physiology Department in the University and to the Neurophysiology Department at the Sahlgrenska Hospital.

When discussing microneurography it is useful to recall that peripheral nerves contain multiple axons. These axons convey either afferent (sensory) or efferent (motor) activity. Within the afferent population there are multiple subtypes. These subtypes are classified in various ways including: By their conduction velocity i.e. fast A fibres and slow C fibres and by the least adequate stimuli which evokes activity; mechanoreceptors, thermoreceptors, chemoreceptors etc. In some units, the least adequate stimuli required to evoke activity, causes damage or has the potential to cause damage. These units are the nociceptors and, in general terms, activity in these units gives rise to the discriminative and affective components of pain. These units are generally slower conducting and have A delta or C fibres, though there are important exceptions to this simplification (4).
Thus, with my background in nociceptor physiology, I found the microneurography experiments focusing on the C fibre afferents fascinating. Profs Olausson and Wessberg have pioneered research on the C tactile afferents; those which respond to very light touch and are thought to have a role in the emotional response to touch (5, 6). It was remarkable to see and hear these C units whilst watching the receptive field on the arm being stroked. This was particularly special as I had recorded from these very same afferents during my previous research. Excitingly, we also came across other C fibre classes included thermoreceptors and even putative nociceptors.

The experience gained on my elective has enabled me to have the fortunate opportunity to continue this research with colleagues in the Physiology Department in Bristol University. Working with Dr Donaldson, Prof. Matthews and others, we have undertaken some preliminary experiments to reproduce recent work evaluating the potential for using microneurography in rats (7). I hope that such work will enhance the translational capacity of this technique in that novel manipulations or experimental paradigms can be trialled in pre-clinical models prior to use in either volunteers or even patient populations.

This ability to discriminate single C afferents in humans is truly remarkable and offers great potential to better understand the role of these afferents in both normal physiology and pathology. This technique is now being applied to the field of chronic pain (8, 9) and may offer the possibility to not only advance understanding but to also individualise management regimes and, hopefully, develop novel analgesics.

I wish to thank the Association of Anaesthetists of Great Britain and Ireland for the funding which enabled me to pursue this marvellous opportunity.

References