CHAPTER 5

DISCUSSION

The aim of this study was to investigate the presence of sensory disturbances as well as psychological distresses in elders with chronic idiopathic neck pain compared to healthy elders. Discussion in this chapter will begin with an overview of the results according to the study hypotheses. It will then focus on implication of study in term of changes in pain thresholds and psychological features in the elderly with neck pain. Limitations and directions for future research will be also discussed.

5.1 Overview of study results

The first and major hypothesis of this study was that sensory hypersensitivity (decreased pain thresholds) as measured by QST would present in elders with chronic idiopathic neck pain compared to those without neck pain. This hypothesis was partially supported. We found decreased PPTs and CPTs over cervical spine and CPTs at a remote site (tibialis anterior muscle) but no changes in HPTs and supra-thresholds in elders with neck pain. Changes in pain thresholds might depend on painful stimuli and confounded by age-related changes in the sensory nervous system. The second hypothesis was that psychological distresses (depression and anxiety symptoms) would be greater in elders with chronic idiopathic neck pain as compared to those without neck pain. This hypothesis was rejected. The TGDS and STAI-state and trait scores were not found to be different between elders with and without neck pain.

5.2 Quantitative sensory testing

5.2.1 Pain thresholds

5.2.1.1 Pressure pain thresholds

The results of this study demonstrated a decrease in PPTs over the cervical spine but not over the tibiablis anterior in elders with neck pain. The results are in accordance with findings of previous studies investigating in younger populations with chronic idiopathic neck pain (10, 11). The decrease in PPTs at the cervical spine (a local site) may be a sign of peripheral nociceptor sensitization, which is as a consequence of arthopathy of the cervical spine (85). Impairments to the cervical spine structures may cause peripheral inflammation leading to an increase in pain substances (e.g. substance P, bradykinin, prostaglandins) (86). However, the results of this study do not support findings of some previous studies which have found lower PPTs at the remote site in younger persons with chronic idiopathic neck pain, suggesting the presence of central sensitization (12, 13). It has been documented that psychological distress can influence pain thresholds (87, 88). One reason for the discrepancy results may therefore be due to psychological factors. Effects of psychological factors on pain thresholds were not determined in Javanshir's study (12). In our study, we found no influence of psychological distresses (depression and anxiety) on the QST results. On the other hand, discrepancies between the results may be associated with experience and expression of pain as well as changes in brain morphology and function with increasing age (19-22, 89). It has been suggested that older adults with persistent pain are not simply a chronologically older version of younger individuals with persist pain (90).

Pressure pain thresholds measured in this study appear to be confounded by age-related changes in the sensory system. It is well known that there are aged-related changes in the peripheral and central nervous systems (15), such as a reduction in the number and density of myelinated and unmyelinated fibers (55-58), loss of myelin in the medial lemnesical pathways (91), altered spinal neurochemistry (91), small primary somatosensory cortex (62) and impaired endogenous pain inhibitory system (92). Numerous studies have also demonstrated that older persons have increased PPTs compared to younger persons (16, 69). It was noted that the methodological aspect and characteristics of neck pain (i.e. duration of neck pain history and neck disability) of this study were consistent with those reported in the previous studies of younger populations with neck pain (10, 11, 13). However, the mean values of PPTs revealed in elders in this study were relatively higher than those obtained in younger persons. For example, in a study of Javanshir et al (12) conducted in younger subjects with neck pain, the mean PPT values were 115.3 ± 26.1 kPa at the cervical spine and 225.0 ± 78.7 kPa at the tibialis anterior muscle. In contrast, the mean PPT values in our elders with neck pain were 287.0 ± 58.0 kPa at the cervical spine and 482.2 ± 129.0 kPa at the tibialis anterior muscle.

5.2.1.2 Thermal pain thresholds

The present study revealed decreased CPTs over cervical spine and tibialis anterior muscle in elders with neck pain, supporting findings of Javanshir et al's (12) study investigating CPTs in younger persons with neck pain. A decrease in CPTs at the cervical spine suggests the presence of peripheral sensitization, whereas over tiblialis anterior suggests the presence of central sensitization. However, our results

do not support results of Johnston et al's (13, 75) studies demonstrating decreased CPTs at the local posterior neck only. Widespread hypersensitivity to cold stimuli may be more related to impairments of the central nervous system functions in particular impaired descending inhibitory systems (93).

Although in this study of elders with chronic neck pain demonstrated widespread sensitivity to cold pain stimuli but we found no changes to heat stimuli. The results are in accordance with previous studies conducted in younger persons with neck pain (11, 12). The results may suggest that heat pain thresholds are not a feature of patients with chronic idiopathic neck pain. There may be different mechanisms involved in the processing of painful stimuli. Although heat and cold pain stimuli are mediated by both Aδ fibers (myelinated fibers) and C-fibers (unmyelinated fibers) (94), heat pain stimuli are predominantly mediated by C-fibers, which have slow conduction velocity and sensitivity (32, 94). Alternatively, it may also be confounded by alterations in peripheral nerve fibers and central pain processing as well as a reduction in skin innervation, which occur with increasing age (15, 70, 95). Stevens and Choo (96) investigated warm and cold thresholds in 13 regions of the body surface over the life span and found that older people were less sensitive to warm stimuli than cold stimuli in all body regions. Additionally, they found that central parts of body (e.g. face and back) were more sensitive to warm and cold stimuli than peripheral parts of the body (e.g. upper and lower extremities).

Again, pain thresholds to thermal (heat and cold) stimuli are likely to be influenced by a factor of age. The mean values of CPTs and HPTs measured in our elders with neck pain were much higher than those measured in younger subjects with neck pain. For example, in Javanshir et al's (12) study of younger neck pain, the

mean CPT and HPT values over the cervical spine were 21.1 ± 10.8°C and 37.0 ± 10.6°C, respectively and were 23.3 ± 12.6°C and 40.5 ± 8.7°C, respectively, over the tibialis anterior muscle. In our study, the mean CPT and HPT values over the cervical spine were 3.0 ± 3.5°C and 47.3 ± 2.7°C, respectively and were 1.5 ± 3.2°C and 47.9 ± 1.4°C, respectively, over the tibialis anterior muscle. Given that there is evidence of age-related changes in peripheral and central nervous systems functions (15), increase in thermal (heat and cold) pain thresholds in older persons may also be due to such changes. A review by Gibson et al (16) reported that older persons had increased HPTs when compared with younger persons, suggesting a decline in pain sensitivity. A higher cold detection on the forearm and hand was also observed in older persons (17, 70).

Notably, there may be differences in pain processing mechanisms between various painful syndromes in the elderly population. In this study we found localized hypersensitivity to mechanical stimuli and generalized hypersensitivity to cold stimuli in elders with chronic idiopathic neck pain. These results are not comparable to findings of previous studies investigating in elders with other pain. For example, Lee et al (23) assessed pain sensitivity and the inflammatory response to pain in patients with knee osteoarthritis and found decreased PPTs over the quadriceps (a local site) as well as trapezius muscles and the first metacarpophalangeal joint (remote sites). Uthaikhup et al (24) investigated pain sensitivity and revealed no changes in PPTs and CPTs in any sites in elders with headache. Instead, they found increased sensitivity to heat stimuli over the local cervical spine. From the previous and our results, it is difficult to conclude definitive sensory features of chronic pain in older persons. Pain sensitivity in older persons with chronic pain may as well be associated

with pathogenesis, regardless of other factors. There is a need for a better understanding of pain sensitivity and underlying pain processing mechanisms in elders with chronic pain.

5.2.2 Supra-threshold heat pain ratings

Supra-thresholds stimulation has been suggested to be associated with the presence of central sensitization (37, 38). There has been little research investigating supra-thresholds response to heat stimuli in elders with and without pain. To our knowledge, this study was the first study investigating supra-threshold heat pain ratings in elders with neck pain. The results demonstrated no differences in supra-threshold heat pain scores between elders with and without chronic idiopathic neck pain. These results taken together with the HPT results may suggest that central sensitization to heat noxious stimuli is not a feature of chronic idiopathic neck pain in the elderly. However, as this was the first study investigating supra-threshold response, the results need to be confirmed in future research. Furthermore, it has been documented that the nature of the applied stimulus as well as factor such as stimulus duration, site of application and areas of stimulation may influence the ability to detect age-related changes in pain (15). Additionally, Yarnitsky et al (45) also suggested that the magnitude of pain was increased with increasing rates of temperature changes. Thus, further investigation of the influence of these factors on supra-threshold response is also required.

5.2.3 Influence of psychological factors on pain thresholds

Alteration of pain perception can be influenced by psychological factors (19). However, in this study psychological factors (depression and anxiety) did not influence pain sensitivity measured in elders with chronic idiopathic neck pain, which is consistent with the previous studies of neck pain conducted in younger populations (11, 14). Touche et al (14) and Scott et al (11) found no influence of anxiety on mechanical and thermal pain thresholds and no correlations between pain thresholds and anxiety scores. Nevertheless, it should be noted that other factors such as maladaptive coping strategies and compensation are yet to be investigated in the previous and our studies. Such factors may affect on pain sensitivity in patients with chronic neck pain.

5.3 Psychological features

The present study revealed no differences in psychological distresses (TGDS and STAI-state and trait scores) between elders with and without neck pain. There was no indication of depression in elders with chronic idiopathic neck pain. The results of this study are consistent with previous studies conducted in elders with headache (22, 24) and younger populations with idiopathic neck pain (11). Albeit the mean TGDS score in elders with neck pain was likely to be higher than that in elders without neck pain, it was well below threshold values indicating having depression (TGDS score $\geq$ 13/30). The mean STAI-state and trait scores in this study indicated that elders with neck pain had mild anxiety, but the scores were not different from the control group. A possible explanation for no greater likelihood of psychological distress in elders with neck pain may be due to low-disability neck pain. In addition, older persons are

more likely to experience pain. There is evidence suggesting that older persons are more accepting of their pain and some may learn increased emotional control (97, 98). Thus, these could be another explanation for why psychological distresses were not greater in our elders with neck pain compared to those without neck pain.

5.4 Clinical implications and limitations

The study would help develop a better understanding of sensory and psychological features in elders with chronic idiopathic neck pain. The results of this study suggest that there are changes in pain sensitivity in elders with chronic neck pain and the changes are likely to be dependent on painful stimuli. There are localized hypersensitivity to pressure stimuli and widespread hypersensitivity to cold stimuli in elders with chronic idiopathic neck pain. In the meantime, although the definitive conclusion of pain sensitivity in elders with chronic neck pain is unclear, evaluation of pain sensitivity using tests of pressure and cold pain thresholds may somehow provide useful information to clinicians in their assessment and management of neck pain elders. The use of manual therapy (e.g. mobilization) and modalities (e.g. cold/ice) should be carefully considered and monitored. As elders with chronic neck pain did not appear to have a greater psychological distress than those without neck pain, assessment of psychological distress may not be necessary in this population. However, the psychological assessment should not be overlooked, in particular in elders who have emotional signs and symptoms of depression and anxiety.

Some limitations should be addressed in the study. It is well-known that musculoskeletal pain is common in older persons (2). Thus it is difficult to recruit

elderly subjects who have only a chronic idiopathic neck pain. The experience of pain in those elders may also influence the expectation and pain outcomes. However, the impact of co-morbid musculoskeletal pain (back pain, knee pain) was determined and did not appear to affect the study outcomes. It has been suggested that the magnitude of pain was increased with increasing rates of temperature changes (45). The rates of the thermal ramp in this study could be set at a maximum rate of 4°C/s. Thus this rate may not be sensitive to reveal differences in supra-threshold pain response between elders with and without neck pain. Additionally, the sample size of this study was small. The statistical power levels of the non significant results were less than 0.8, indicating inadequate power to detect statistical significance. Thus these results need to be interpreted with caution.

5.5 Future directions in research

The results of this study provide some information regarding pain sensitivity in elders with chronic idiopathic neck pain, which poses further challenges for influence of age on pain sensitivity in elders with pain. Further investigation of sensory hypersensitivity in elders with pain is necessary before any conclusion can be made. Further research is needed to investigate pain sensitivity in elders with diverse pain conditions. Pain sensitivity can be influenced by many factors such as stimulus, site, area and duration. Thus these factors should be considered in future research investigating pain sensitivity in elder with pain. In addition, the relationship between pain thresholds and pain characteristics should be assessed in future research. Furthermore, investigation of changes in pain sensitivity following management of

cervical pain may be an alternate strategy which helps to understand changes in pain sensitivity in elders with pain.

5.6 Conclusion

The results of this study demonstrated localized hypersensitivity to pressure stimuli and widespread hypersensitivity to cold stimuli in elders with chronic idiopathic neck pain. No heat hypersensitivity was observed. The presence of increased sensitivity appears to be dependent on painful stimuli but not psychological factors. The reason for this is unclear but it may be associated with age-related changes in the peripheral and central nervous system functions. No greater psychological factors (depression and anxiety) were found in elders with neck pain compared to those without neck pain. The results of this study may be useful information to clinicians in their assessment and management of neck pain elders. However, future research is still required to identify pain sensitivity and provide a better understanding of pain processing mechanisms in older person with pain.