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Editorial: Whiplash-associated disorder—advances in pathophysiology, patient assessment and clinical management

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Editorial on the Research Topic

Whiplash-associated disorder—advances in pathophysiology, patient assessment and clinical management

“Whiplash injury” refers to an acceleration-deceleration mechanism of injury to the cervical spine. Neck pain arising from such an injury—termed whiplash-associated disorder (WAD)—is the most common injury sustained in a motor vehicle crash (MVC) (1) and a substantial component of MVC compensation claims (2). In the Western world, around 300/100,000 people sustain a whiplash injury each year (3).

After a whiplash injury, approximately 50% of patients develop chronic WAD, with around 16% reporting ongoing severe pain-related disability (4). Despite decades of research, current guideline-based treatments such as education, advice and exercise, typically demonstrate modest effects (5–9). This may reflect our incomplete understanding of WAD’s complex and heterogenous mechanisms, which span contributions from musculoskeletal (10, 11), neurological (12–19), inflammatory (20, 21) and psychological (22) factors, often within a “compensable injury” social context (4). In this special Research Topic *Whiplash-associated disorder—Advances in pathophysiology, patient assessment and clinical*

management, we sought to bring together a series of papers that provide new insight into mechanisms underpinning WAD, considerations in clinical assessment, as well as approaches to patient management.

Post-traumatic stress symptoms (PTSS) and sensory hypersensitivity are established predictors of poor outcome after whiplash injury (23, 24) and likely contribute to mechanisms underlying patient symptoms. Andersen et al. build on this prior data with a large cohort study ($N = 740$) exploring PTSS, pain and quantitative sensory testing (pressure algometry) across a 12-month period following a whiplash injury. Those patients with clinical PTSS had sensory hypersensitivity across all time points as well as greater pain intensity and more widespread pain—demonstrating a clear link between PTSS, sensory hypersensitivity and clinical outcomes. These data elegantly reflect the biopsychosocial dimensions of WAD and clinical importance of PTSS, especially in the context of a recent clinical trial targeting PTSS after whiplash injury, with clinically meaningful effects on neck pain-related disability at 6 weeks, 6 months and 12 months (25).

Kasch et al. revisit results from a previously published cohort study that investigated motor and sensory dysfunction after whiplash injury—employing a unique study design using patients with ankle injuries as a control group. These authors performed a comprehensive assessment of pain, disability, nociceptive sensory processing and motor function across a 12-month period post-injury. Those patients that had reduced work capacity one year after injury had early reports of higher pain and demonstrated early sensory (cold pressor test, pressure pain) and motor (maximal voluntary contraction) dysfunction compared with whiplash patients that recovered and ankle-injured controls. These data suggest an interplay between patient symptoms, nociceptive sensitisation and motor control, that is associated with long term clinical outcome, which reflects the complexity of mechanisms underlying poor outcome after a whiplash injury.

Cervical sensorimotor control, and its association with patient clinical presentation, has been explored in relation to various types of neck pain. Sensorimotor deficits are arguably most relevant for WAD, considering its associated symptoms such as dizziness and unsteadiness. One of the most commonly used cervical sensorimotor control tests is the cervical movement sense test, in which a participant or patient with a laser pointer attached to the head, follows a target line as accurately as possible with controlled head movements. The study by Røijezon et al. investigates the discriminative validity and reliability of the cervical movement sense test, assessing the level of proprioceptive disturbance in people with WAD,

idiopathic neck pain (INP), and healthy controls. Movement acuity was found to be a valuable outcome measure to assess disturbed cervical movement sense in both WAD and INP, with few differences in outcomes between the two neck pain groups. Yet, it was concluded that altered movement control strategies may exist between types of neck pain. Future investigation of such differential strategies can be used to inform management approaches tailored to WAD.

Alongside investigations of pain mechanisms, assessments, and the effectiveness of various treatments, there has been an increased emphasis on the clinical translation and implementation of evidence-based and high-value care approaches. As the clinical management of WAD remains to be challenging and development of physiotherapeutic care continues, a focus on quality improvement is warranted. Quality indicators can be used to standardise the assessment of such improvements, however, evidence lacks concerning their assessment, management, and patient-related outcome measures. Oostendorp et al. provide a synthesis of recent literature on quantitative measures of quality improvement in physiotherapy care. Included were more than 800 patients with WAD and a set of quality indicators used over a 16-year period. The authors conclude that physiotherapeutic care of WAD has substantially improved, and provide detailed suggestions for continued quality assurance.

The combined articles in this Research Topic illustrate the variety of work being undertaken to improve the understanding and clinical management of WAD. Building on the themes presented across these articles, further investigation is required to better understand the association between biopsychosocial mechanisms and the clinical presentation of patients with WAD and the symptoms they experience. Recent investigations into the (causal) relationship between genetic factors, biological mechanisms, and chronic pain presentations (26, 27) are a promising avenue to further explore the importance of these factors for the clinical management of WAD. Management approaches with demonstrable effects should be explored in large scale clinical trials. Preventing the transition from acute pain to a chronic condition, or the management of chronic pain itself, requires interventions with proven, clinically meaningful effects. Current evidence suggests that physical exercise, education, and psychological approaches should be considered as mainstay management for chronic WAD (9), however a more personalized approach for the prescription of these treatments may be needed. The implementation of evidence-based practice and utilization of clinical guidelines (28) can, and arguably should, be supported by reliable measures of quality improvement. A potential mechanism as posed by Oostendorp and colleagues is pursuing international

consensus on quality monitoring and improvement, an initiative to be considered for improving targeted care for WAD.

Author contributions

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