NECK SENSORYMOTOR DISTURBANCE IN THE EARLY STAGE AND 6 MONTH AFTER A WHIPLASH TRAUMA

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SUMMARY
The processes that may underlie whiplash-associated disorders (WAD), the heterogeneous of pain and also the maintenance of symptoms in those who do not recover are not well understood. This study aimed to improve head-neck kinematics and postural outcomes by coupling muscle strategies assessment in patients at two stages of whiplash trauma compared to healthy controls. As reported previously by other authors, kinematic results showed reduced range of motion in sagittal and axial plane and larger coupled rotation associated with side bending in WAD compared to controls. This was combined with altered neck flexor and extensor muscle recruitment patterns. Furthermore, at 6 month no recovery was observed related to the severity of pain in early stage in WAD. Beside, no significant differences were found in proprioception error or postural parameters between WAD and controls. It seems that neuromuscular evaluation combined with classical mechanical tests could be relevant prognostic indicators for WAD and transition to chronicity.

INTRODUCTION
Whiplash injury and subsequent disorders have been extensively investigated in the literature. Even if most individuals recover within a few weeks of injury, a significant proportion will develop persistent ongoing pain up to two years post injury [1]. Alterations in the sensorimotor function that may underlie whiplash-associated disorders (WAD), the heterogeneous of pain and also the maintenance of symptoms in those who do not recover are not well understood and conflicting [2]. Chronic WAD displayed mostly reduced ranges of motion (ROM) and larger head repositioning error [3], as well as altered cervical motion patterns during active movement compared to asymptomatic subjects [3,4]. Recent data has also demonstrated structural and neuromechanical muscle changes in patients with chronic WAD, which could be associated, in some way, with the development of chronic pain following whiplash injury. This study was designed to improve kinematic, proprioceptive, postural response outcomes and associated muscle efficiency of the head neck segment in WAD at two stages of recovery compared to healthy control.

METHODS
Thirty patients (age 20-50 years) with acute WAD were followed and assessed from within 8-to-15 days of injury and 6 months post injury. They were recruited via local hospital emergency departments as they all complaining about neck pain in the first 48 hours after the collision, and classified as grade I or II according to the Quebec Task Force (Sterling 2006). Twenty healthy subjects, physically active, with no concern of specific neck training or history of whiplash injury or neck/back pain, were also recruited. Head and trunk kinematics was recorded with an active 3D motion analysis system (Coda-motion). Surface EMG (Delsys) of sternocleidomastoid (SCM) and paraspinal (ES) muscles was assessed bilaterally. Cervical principal and coupled movements as well as muscle EMG patterns were measured in flexion/extension, axial rotation and side bending, as well as repositioning in neutral position after axial rotation and extension. Furthermore, frequency analyses of the head and trunk during simple trajectory tasks were quantified. Finally, postural parameters were assessed using force plates.

RESULTS AND DISCUSSION
Main results showed a reduced range of motion (ROM) in sagittal (81° ± 18 vs. 95° ± 10 ; $p<0.05$) and axial (124° ± 23 vs. 139° ± 16; $p<0.05$) planes in WAD compared to controls. Furthermore, WAD displayed larger coupled movements in axial rotation coupled within side bending (37 ± 20 vs. 23 ± 13 ; $p<0.05$) compared to controls. Results showed also no significant difference in WAD between early and 6 month stages. In some subjects, muscle activities recorded during ROM were associated with erratic muscle pattern (Figure 1). These results still remain to be quantified. Beside, no significant differences were found in proprioception error or postural parameters between WAD and controls.

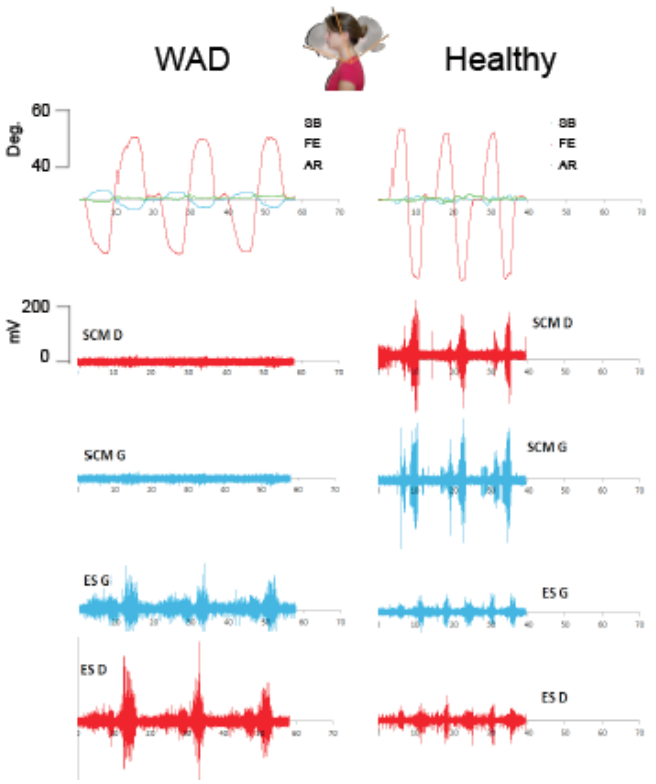

Figure 1: Example of muscle activity pattern during flexion/extension movement in painful WAD subject compared to healthy subject.

CONCLUSIONS

This qualitative and integrative approach was designed to help in establishing an early pathological profile of WAD disorder and to specify how much the delay after the trauma influence symptoms severity and origins. It seems that neuromuscular evaluation combined with classical mechanical tests could be relevant prognostic indicators for WAD and transition to chronicity. Further investigation remains to be conducted. We are currently trying to address the issue of a pathological state.

REFERENCES

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