

RESEARCH PROPOSAL

Written in line with PRISMA-P 2015 statement

Title

Thoracic dysfunction in whiplash associated disorders: a systematic review and meta-synthesis

Registration

To be registered in PROSPERO. A protocol following method guidelines Cochrane handbook (Higgins and Green, 2011) informed the conduct of this systematic review, which will be reported in line with the PRISMA statement (Moher et al, 2009).

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Contributions

NH is CI leading protocol development, analyses and dissemination. RS and NH are first and second reviewers. AR is third reviewer. All authors will contribute to data interpretation and article drafts.

Amendments

Important protocol amendments post registration will be recorded and included in dissemination.

Support

No sources of support or funding were provided for this review. Authors are academic staff at University of Birmingham.

INTRODUCTION

Rationale

The cumulative incidence of patients seeking healthcare post-whiplash from a road traffic accident has increased during the last 30 years to between 3 and 6/1000 inhabitants in North America and Western Europe (Holm et al., 2008). Following injury, individuals experience a range of clinical manifestations, described as Whiplash Associated Disorder (WAD), including neck pain, fatigue, nausea, low self-reported physical and mental health, cognitive problems and pain in multiple sites (Johansson et al., 2015). 40–60% patients progress to experience chronic whiplash associated disorder (CWAD) with estimated costs of \$3.9 billion (USA) and €10 billion (Europe) associated with management and time off work (Eck et al., 2001; Galasko et al., 2002). Whilst research has identified risk factors for poor prognosis (Williamson et al., 2014; Walton et al., 2015), and enhanced understanding of changes (Chien & Sterling, 2010), we do not know why disability and pain persist beyond the normal tissue healing times in CWAD. Physiotherapy interventions, widely considered the cornerstone of conservative management in WAD (Moore et al., 2005) are largely ineffective (Rushton et al., 2011), with simple advice being found to be as effective as physiotherapy interventions (Michaeleff et al., (2014).

CWAD research has focused on the primary complaint of neck pain (Bortsov et al. 2014) although symptoms may also include stiffness (Sterling et al., 2004; Woodhouse & Vasseljen, 2008) and pain in other regions including the jaw, head, upper and lower limbs, chest, abdomen and groin (Hincapie et al., 2010). Data from a large cohort study (n= 6481) found 0.43% participants presented with isolated neck pain 30 days post injury, compared to the 86.2% presenting with neck and widespread pain, including pain in the thoracic spine (Hincapie et al., 2010), not surprising consider the mechanism of injury involving forceful stretch/eccentric loading to posterior muscles such as trapezius, which span both the neck and thoracic spine (Vasavada et al., 2007). Evidence of trapezius muscle abnormalities are well documented in CWAD (Nederhand et al., 2002; Gerdle et al., 2007), with recent evidence of pathology in the mid/lower portion of the muscle where it inserts onto bone (myofascial-entheseal dysfunction) (Bismil & Bismil, 2012). This may partly account for the prevalence of 65.5% (95% CI 64.4–66.7) thoracic pain in WAD (Hincapie et al., (2010).

Whilst the thoracic spine (mid-spine) contributes up to 33% and 21% of the movement occurring during neck flexion and rotation respectively (Tsang et al 2013a) little is known about the impact of WAD on this spinal region (Heneghan & Rushton, 2015). With up to 66% of individuals complaining of mid-spine pain and 23% still experiencing symptoms one year on (Hincapie et al., 2010) it is reasonable to assert that spinal kinematics may be affected, something that has been observed in chronic neck pain during active movement (Tsang et al., 2013b). Whether this is a consequence of pain or trauma such as WAD has yet to be elucidated. Despite a paucity of evidence investigating the involvement of the thoracic spine in contributing to persistent pain and disability it is reasonable to assert that neck stiffness post WAD (Woodhouse & Vasseljen, 2008) could be a result of dysfunction (pain and/or stiffness) in the mid spine.

With the thoracic spine contributing up to a third of the movement occurring in the neck and evidence of musculoskeletal dysfunction in the thoracic region in patients with CWAD, further research is needed to examine to role of the thoracic spine in WAD. Knowledge of such dysfunction may be used to inform future clinical trials of novel interventions targeting thoracic impairments in WAD. In the first instances a systematic review of the current evidence is needed to examine the scope and nature of dysfunction/impairment in the thoracic spine region following WAD.

Objective

To synthesise the existing evidence of thoracic region dysfunction in patients with WAD.

METHODS

Design and methods used for this systematic review comply with Centre of Research and Dissemination Guidelines, Meta-analyses of Observational Studies in Epidemiology (Moose) and is reported in line with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [21]. Eligibility criteria were informed using the SPIDER and MOOSE guidelines.

Eligibility criteria

(S) Sample: Adults patients who have experienced a whiplash associated disorder with no complications, aged >16 years.

(PI) Phenomenon of Interest: a whiplash associated disorder following motor vehicle or sporting injury

(E) Evaluation: Any patient reported or performance based measure of thoracic dysfunction will be evaluated

(D) Design: All types of observational study; cohort, case control, single case studies

(R) Research type: qualitative, quantitative and mixed-methods research could be searched for.

Information sources

The search will employ sensitive topic-based strategies designed for each database from inception to 25th November 2015. There will be no language or geographical restrictions.

Databases:

- CINAHL, EMBASE, MEDLINE, ZETOC, Index to Chiropractic Literature, ChiroAccess Databases
- Selected Internet sites and Indexes: Turning Research into Practice, PubMed
- National Research Register
- Cochrane Back Review Group
- Hand searches key journals e.g. Spine, European Spine Journal
- Science Citation Index and Social Science Citation Index
- Unpublished research: British National Bibliography for Report Literature, Dissertation Abstracts, Index to Scientific and Technical Proceedings, National Technical Information Service, System for Information on Grey Literature.

Search strategy

The search strategy will include the study population using terms and keywords derived from scoping search and expertise in the subject field. Study population terms: whiplash, whiplash associated disorder, WAD, thoracic spine, dorsal spine, trapezius, whiplash injury, motor vehicle accident, road traffic accident etc. Dysfunction location and terms: injuries, thoracic spine, symptoms. See example in figure 1.

Figure 1.
Details an example of searches that will be used: the Medline OvidSP advanced search 25th November 2015.

1	exp Accidents, Traffic/ or exp Whiplash Injuries/ or whiplash associated disorder\$.mp. or *Disability Evaluation/ or *Adult/	54869
2	*Pain Measurement/ or *Adult/ or *Whiplash Injuries/ or whiplash.mp.	13959
3	*Adult/ or exp Accidents, Traffic/ or exp Wounds, Nonpenetrating/ or motor vehicle accident.mp. or exp "Wounds and Injuries"/	773526
4	*Adult/ or Motor vehicle collision.mp. or *"Wounds and Injuries"/	49932
5	*Thoracic Outlet Syndrome/ or *Whiplash Injuries/ or cervical strain.mp. or *"Sprains and Strains"/ or *Adult/	7026
6	*"wounds and injuries"/ or *athletic injuries/ or *back injuries/ or *soft tissue injuries/ or *thoracic injuries/	76697
7	*Thoracic Vertebrae/ or mid-spine.mp.	9413
8	*Kyphosis/ or *"Bone and Bones"/ or dorsal spine.mp.	48873
9	*Musculoskeletal Pain/ or *Musculoskeletal System/ or musculoskeletal.mp.	36808
10	1 or 2 or 3 or 4 or 5 or 6	798153
11	7 or 8 or 9	93894
12	10 and 11	14607
13	limit 12 to (english language and humans and "adult (19 plus years)" and "diagnosis (best balance of sensitivity and specificity)")	714

Study records

Data management

Records will be managed through End Note; specific software for managing bibliographies.

Selection process

Two reviewers (NH/RS) will search information sources independently and assess identified studies for inclusion, facilitated by grading each eligibility criterion as eligible/not eligible/might be eligible (van Tulder et al, 2003). The full text of a study will be reviewed and the study considered potentially relevant when it cannot be clearly excluded on the basis of its Title and Abstract (CRD, 2009) following discussion between the two independent reviewers. Full text will be obtained for abstracts with insufficient information or in a situation of disagreement. A study will be included when both reviewers independently assess it as satisfying the inclusion criteria from the full text. A third reviewer (AR) will mediate in the event of disagreement following discussion (Furlan et al, 2009).

Data collection process

Using a standardised form, two reviewers (NH/RS) will extract the data independently (CRD, 2009). A third reviewer (AR) will independently check the data for consistency and clarity.

Data items

Data extracted will include the following summary data: sample characteristics, sample size, outcomes, and timescales to reflect disorder state, acute, subacute and chronic, outcomes.

Risk of bias in individual studies

Risk of bias for each included trial will be independently assessed by the same initial reviewers. The third reviewer will mediate in situations of disagreement. Cohen's κ will be used to assess agreement between reviewers. All tools and processes will be piloted prior to use. Risk of bias will be assessed using the Newcastle-Ottawa Scale (Deeks et al., 2003)

Data

Data will be presented in tabulated form to allow for semi qualitative comparison of; study sample, time point post WAD, measures of dysfunction or impairment. Grouped according to outcome to evaluate across studies

All authors will be contacted to request either raw data or additional data to those reported. All results will be reported in the context of overall study quality.

Synthesis

It is unlikely that a meta-analysis will be possible based on findings of scoping search although meta-synthesis will be performed to allow where possible grouping of results based on stage post injury, severity of the condition and/or outcome.

Confidence in cumulative evidence

The strength of the overall body of evidence will be assessed using Grading of Recommendations, Assessment, Development and Evaluation (GRADE).

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