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Review Article

Comparative clinical effectiveness of management strategies for sciatica: systematic review and network meta-analyses

Ruth A. Lewis, BSc (hons), MSc[a,*], Nefyn H. Williams, PhD, FRCGP, FLCOM[a,b], Alex J. Sutton, PhD[c], Kim Burton, PhD, DO, EurEng[d], Nafees Ud Din, MSc, MFDS, RCS[a], Hosam E. Matar, BSc, MBBS[e], Maggie Hendry, BA (hons)[a], Ceri J. Phillips, PhD[f], Sadia Nafees, MSc[a], Deborah Fitzsimmons, PhD[d], Ian Rickard[g], Clare Wilkinson, MD, FRCGP[a]

[a]*North Wales Centre for Primary Care Research, College of Health & Behavioural Sciences, Bangor University, Gwenfro Unit 4-8, Wrexham Technology Park Wrexham, UK LL13 7YP*

[b]*North Wales Organisation for Randomised Trials in Health (NWORTH), Bangor University, The Normal Site, Holyhead Road, Gwynedd, UK LL57 2PZ*

[c]*Department of Health Sciences, University of Leicester, 22-28 Princess Road West, Leicester, UK LE1 6TP*

[d]*Spinal Research Institute, University of Huddersfield, Queensgate, Huddersfield, UK HD1 3DH*

[e]*Sheffield Teaching Hospitals NHS Foundation Trust, Northern General Hospital, Herries Road, Sheffield, UK S5 7AU*

[f]*School of Human and Health Sciences, Swansea University, Singleton Park, Swansea, UK SA2 8PP*

[g]*Green Oak, Dolydd Terrace, Betws-Y-Coed, UK LL24 0BU*

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Abstract

BACKGROUND: There are numerous treatment approaches for sciatica. Previous systematic reviews have not compared all these strategies together.

PURPOSE: To compare the clinical effectiveness of different treatment strategies for sciatica simultaneously.

STUDY DESIGN: Systematic review and network meta-analysis.

METHODS: We searched 28 electronic databases and online trial registries, along with bibliographies of previous reviews for comparative studies evaluating any intervention to treat sciatica in adults, with outcome data on global effect or pain intensity. Network meta-analysis methods were used to simultaneously compare all treatment strategies and allow indirect comparisons of treatments between studies. The study was funded by the UK National Institute for Health Research Health Technology Assessment program; there are no potential conflict of interests.

RESULTS: We identified 122 relevant studies; 90 were randomized controlled trials (RCTs) or quasi-RCTs. Interventions were grouped into 21 treatment strategies. Internal and external validity of included studies was very low. For overall recovery as the outcome, compared with inactive control or conventional care, there was a statistically significant improvement following disc surgery, epidural injections, nonopioid analgesia, manipulation, and acupuncture. Traction, percutaneous discectomy, and exercise therapy were significantly inferior to epidural injections or surgery. For pain as the outcome, epidural injections and biological agents were significantly better than inactive control, but similar findings for disc surgery were not statistically significant. Biological agents were significantly better for pain reduction than bed rest, nonopioids, and opioids. Opioids, education/advice alone, bed rest, and percutaneous discectomy were inferior to most other treatment strategies; although these findings represented large effects, they were statistically equivocal.

CONCLUSIONS: For the first time, many different treatment strategies for sciatica have been compared in the same systematic review and meta-analysis. This approach has provided new data

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* Corresponding author. North Wales Centre for Primary Care Research, North Wales Clinical School, College of Health & Behavioural Sciences, Bangor University, Gwenfro Units 6-7, Wrexham Technology Park, Wrexham LL13 7YP, UK. Tel.: (44) (0) 1978-727340; fax: (44) (0) 1978-311419.

E-mail address: lewisr17@cardiff.ac.UK (R.A. Lewis)

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to assist shared decision-making. The findings support the effectiveness of nonopioid medication, epidural injections, and disc surgery. They also suggest that spinal manipulation, acupuncture, and experimental treatments, such as anti-inflammatory biological agents, may be considered. The findings do not provide support for the effectiveness of opioid analgesia, bed rest, exercise therapy, education/advice (when used alone), percutaneous discectomy, or traction. The issue of how best to estimate the effectiveness of treatment approaches according to their order within a sequential treatment pathway remains an important challenge.

Keywords: Systematic review; Sciatica; Intervertebral disc herniation; Mixed treatment comparisons; Clinical effectiveness; Treatment strategies

Introduction

Sciatica is the term used for the syndrome characterized by radicular leg pain, with or without sensory deficits, radiating along the distribution of the sciatic nerve [1–3]. In about 90% of cases, it is caused by an intervertebral disc herniation resulting in nerve root irritation [4–6]. It is a common reason for seeking medical advice [7,8], and has considerable economic consequence in terms of health care resources and lost productivity [7]. The diagnosis and management of sciatica varies considerably within and between countries [4], which may reflect treatment availability, clinician preference, and socioeconomic variables rather than evidence-based practice.

Previous systematic reviews (including meta-analyses) have evaluated the effectiveness of various individual treatment approaches for sciatica, including conservative treatments [9–12], epidural steroid injections [9,11,13,14], and surgical procedures [15]. However, numerous treatments have not been directly compared. Furthermore, to choose the optimal treatment(s), it would be more helpful if all candidate treatments could be compared in the same analysis, as opposed to using a series of simple but inefficient standard pairwise meta-analyses comparing only two treatments at a time. It has been acknowledged that there is difficulty in interpreting the findings of multiple comparisons with low power, due to the small number of participants or events, which are inclined to result in statistically insignificant findings [16,17].

A network meta-analysis [18], by contrast, enables the simultaneous comparison of more than two treatment approaches, while combining data derived from both direct within-study comparisons between two treatment strategies (eg, A vs. B) and comparisons constructed from two studies that have one treatment in common (eg, A vs. B, B vs. C) [17]. This type of analysis can be applied only to connected networks of randomized controlled trials (RCTs) [19], but preserves the within-trial randomized comparison of each study [19] and allows information on treatment strategies to be "borrowed" from other studies within the network, thereby increasing the total sample size [20,21]. Network meta-analysis conducted using Bayesian methods [22–24] also allows the treatment strategies to be ranked in terms of clinical effectiveness with an estimate of the probability that each strategy is "best" [25].

Our primary aims were to simultaneously compare the clinical effectiveness of different treatment strategies for sciatica using network meta-analyses, so as to identify the best treatment and to provide estimates for all possible pairwise comparisons, based on both direct and indirect evidence. Our secondary aims were to demonstrate the feasibility of using network meta-analyses as a rational basis for clinical decision making when a number of treatment options are available and where a series of conventional systematic reviews have failed to help with real-world treatment decisions. The analyses presented in this article represent a refinement of initial network meta-analyses conducted as part of a broader Health Technology Assessment (HTA) evaluating the clinical and cost-effectiveness of treatments for sciatica. A full account of the study methods and literature search are presented in the HTA monograph (which also includes the protocol) [16].

Methods

Search strategy

Included studies were identified via an extensive literature search described in full, including the search strategy, in the HTA monograph [16]. The search incorporated 28 electronic databases and trial registries, including MEDLINE, EMBASE, and AMED. Databases were searched from inception until December 2009 without language restriction. The reference lists of previous systematic reviews and included studies were also scanned for further references.

Study selection and data extraction

This review included any comparative study (experimental or observational) with adults who had sciatica diagnosed clinically, or where clinical imaging confirmed lumbar disc prolapse consistent with the clinical findings. The essential clinical criterion was radicular leg pain worse than back pain [16]. Studies of sciatica caused by conditions other than a prolapsed intervertebral disc were included if it was documented that radicular leg pain was worse than back