Seminal papers in spinal surgery

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Abstract

Evidence based medicine should underpin the practice of all orthopaedic surgeons. Spinal pathology should be considered in the differential diagnosis for pain in every upper and lower limbs region and an understanding of spinal anatomy and physiology is vital in the management of the trauma patient.

We present ten key articles, which have been selected for their impact within the field. They encompass trauma, degenerative, inflammatory, deformity and emergency spinal disorders. The articles range from level I randomized control trials to level V expert opinion. An understanding of their methodology and key findings should be part of the core knowledge encompassing spinal surgery and will, in particular, be of benefit for those preparing for final professional examinations.

Keywords articles; classic; orthopaedics; papers; spine

Introduction

Evidence based medicine should underpin the practice of all orthopaedic surgeons. Broad knowledge across all of the orthopaedic subspecialities is required both for success in final professional examinations, but more importantly for safe and insightful clinical practice. Spinal pathology should be included in the differential diagnosis for pain in every upper and lower limbs region and an understanding of spinal anatomy and physiology is vital in the management of the trauma patient. Therefore spinal surgery is a core topic within orthopaedics and an understanding of the evidence base in key spinal topics is therefore essential.

We present ten key articles, (Table 1) which have been selected for their impact within the field. They encompass trauma, degenerative spine disease, rheumatoid cervical spine disease, cauda equina syndrome, spinal cord compression and adolescent idiopathic scoliosis. The articles range from level I randomized control trials to level V expert opinion. An understanding of their methodology and key findings should be part of the core knowledge of spinal surgery. This article follows previous articles by our group highlighting seminal papers in the field of orthopaedics and trauma.[1,2]

Lumbar disc herniation. A controlled, prospective study with 10 years of observation

(Publisher to action, the layout of the titles to papers in this article should follow the pattern established in this groups previous two articles in our journal – citations 1 and 2)

Weber H. Spine (Phila Pa 1976). 1983 Mar;8(2):131–40.[3]

Level of evidence: II (Prospective randomized controlled trial without blinding)

Aims

This paper is a subgroup analysis within a larger study. The aim was to evaluate the difference in surgical and non-surgical treatment of patients with clinically symptomatic lumbar disc herniation (sciatica) and to see if any difference persisted at 10 years follow-up.

Methods

Over a period of one year at a single centre in Oslo, Norway, 280 consecutive patients with sciatica correlating with radiculography findings were recruited into three arms of a large study as in-patients. This paper deals with the first group of patients who had continued clinical symptoms of radicular pain provoked by the sitting position, moderate exercise or coughing/sneezing at 14 days, with no definitive indications for surgical intervention. These 126 patients were randomized to non-operative management, which consisted of an intensive course of physiotherapy lasting six weeks, surgical management with discectomy and discharge home between seven and nine days without further intervention. All patients were followed up with regular written questionnaires and a full neurological examination at one, four and 10 years by the investigating author. Patients were grouped broadly into good, fair, poor and bad depending on subjective statements from the patients themselves.

Results

At one year there was a trend towards better clinical results with surgery that was significant, whether using intention to treat or as-treated analysis ($p = 0.0015$ for both). A trend towards better outcome with surgery remained at four years follow-up, but statistical significance was lost. By 10 years, there was little difference between the two groups. There was no statistical

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Summery of articles

Author	Year of publication	Theme	Journal	Level of evidence
Weber et al.	1983	Lumbar disc herniation	Spine	II
Waddell et al.	1980	Low back pain	Spine	III
Fairbank et al.	2005	Low back pain	BMJ	II
Ahn et al.	1976	Cauda equina syndrome	Spine	II
Weinstein et al.	2009	Degenerative spondylolisthesis	JBJS(Am)	II
Patchell et al.	2005	Spinal cord compression	Lancet	I
Ranawat et al.	1979	Rheumatoid cervical spine	JBJS(Am)	IV
Boden et al.	1993	Rheumatoid cervical spine	JBJS(Am)	IV
Magerl et al.	1994	Classification of thoracolumbar trauma	Eur Spine Journal	IV
Lenke et al.	2001	Adolescent idiopathic scoliosis	JBJS(Am)	V

Table 1

difference between number of relapses or those classified as permanently incapacitated between the two groups at four or 10 years. Only increasing age persisted from four to 10 years as a predictor of unsatisfactory outcome.

Paper discussion and conclusion

The authors argue that, potentially, 60% of patients would undergo unnecessary surgical intervention if all were considered for surgical intervention acutely. They also calculated that an observation period of three months is required before the majority of those managed without surgery rate themselves as good or fair. This does mean, however, that those who fail conservative management have been subjected to a potentially avoidable period of pain and disability.

Critique

As with all studies of this nature there was a sizeable cross-over from the non-operative group into the surgical group (17 of 66 patients), though both intention to treat and as-treated analyses were carried out. Clinical evaluation was performed by the author alone, hence without blinding, leaving the study open to observer bias. In the surgery group the initial management was bed rest for one week followed by partial bed rest for a further week, all as in-patients. The non-operative treatment arm underwent a six week in-patient course of physiotherapy compared to no post-operative physiotherapy in the surgical arm once discharged. Therefore the two patient arms are not accurately comparable, as the rehabilitation should have been the same in both groups in order to measure the clinical effect of surgery. Prolonged in-patient rehabilitation is not in keeping with modern management of this condition, which makes the results less applicable to the modern world.

Key points

In acute sciatica without a clear indication for surgery, there is an early benefit of surgical intervention that does not persist at four or 10 years.

Relevance to current practice

This landmark paper is one of the early examples of a truly randomized controlled clinical trial in orthopaedic surgery. However, now that both the surgical and non-surgical treatment of sciatica has evolved, its findings are no longer directly relevant to the modern management of this condition.

Nonorganic physical signs in low-back pain

Waddell G, McCulloch JA, Kummel E, Venner RM.
Spine (Phila Pa 1976) 1980;5:117–25.[4]
Level of evidence: III (Case controlled study)
(Title formatted as in previous articles by this group)

Aims

The paper aims to identify and evaluate predominantly non-organic clinic signs associated with low back pain in a wide group of patients with back pain.

Methods

Five separate groups of patients in Toronto, Canada and Glasgow, Scotland were assessed with a full medical history and physical examination for organic and non-organic signs. The first two groups were from the Ontario workman's compensation board (WCB), with group 1 having failed surgical management and group 2 were problem admissions with disability claims. In the Glasgow cohort, group 3 were primary referrals for orthopaedic opinions and group 4 were patients referred for secondary opinions from elsewhere, having failed treatment locally (often surgical treatment). Group 5 consisted of controls, selected from patients presenting to a hand clinic, with no history of back pain, time lost from work or any psychiatric history or neurotic symptoms. As part of the assessment, all patients completed pain diagrams and the observer estimated physical (organic) and non-organic disability. Patients in group 1 also filled in a Minnesota Multiphasic Personality Inventory (MMPI). Initially (in groups 1 and 2) a larger number of non-organic signs were identified but distilled down to five signs (eight actual tests) seen in Table 2. Tests were excluded either because they were too complex, were not reproducible or were covered in part by another test. Reliability and stability of the nonorganic signs were studied as part of study 2 where two observers examined 50 consecutive patients as part of the same admission in random order, blinded to the other observers' results. One observer then repeated their examination at discharge.

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