Cervical radiculopathy: pain, muscle weakness and sensory loss in patients with cervical radiculopathy treated with surgery, physiotherapy or cervical collar

A prospective, controlled study

Abstract This prospective, randomised study compares the efficacy of surgery, physiotherapy and cervical collar with respect to pain, motor weakness and sensory loss in 81 patients with long-lasting cervical radiculopathy corresponding to a nerve root that was significantly compressed by spondylotic encroachment, with or without an additional bulging disk, as verified by MRI or CT-myelography. Pain intensity was registered on a visual analogue scale (VAS), muscle strength was measured by a hand-held dynamometer, Vigorometer and pinchometer. Sensory loss and paraesthesia were recorded. The measurements were performed before treatment (control 1), 4 months after the start of treatment (control 2) and after a further 12 months (control 3). A healthy control group was used for comparison and to test the reliability of the muscle-strength measurements. The study found that before start of treatment the groups were uniform with respect to pain, motor weakness and sensory loss. At control 2 the surgery group reported less pain, less sensory loss and had better muscle strength, measured as the ratio of the affected side to the non-affected side, compared to the two conservative treatment groups. After a further year (control 3), there were no differences in pain intensity, sensory loss or paraesthesia between the groups. An improvement in muscle strengths, measured as the ratio of the affected to the non-affected side, was seen in the surgery group compared to the physiotherapy group in wrist extension, elbow extension, shoulder abduction and internal rotation, but there were no differences in the ratios between the collar group and the other treatment groups. With respect to absolute muscle strength of the affected sides, there were no differences at control 1. At control 2, the surgery group performed somewhat better than the two other groups but at control 3 there were no differences between the groups. We conclude that pain intensity, muscle weakness and sensory loss can be expected to improve within a few months after surgery, while slow improvement with conservative treatments and recurrent symptoms in the surgery group make the 1-year results about equal.

Key words Anterior cervical fusion · Cervical collar · Cervical radicular pain · Muscle strength · Physiotherapy
Neck pain and cervical radiculopathy is a common spinal disease after the age of 40, but there are many controversies as to the choice of treatment: whether, for instance, methods of surgical decompression and stabilization are preferable to various conservative regimens [41]. Many causes of radiculopathy may be found such as impingement from disk herniations, osteophytes and loss of disk height. Pain, muscular weakness, numbness or paraesthesias in the arms and fingers are common symptoms [17, 54]. Radiculopathy caused by a significant nerve root compression should be expected to produce weakness in the muscle innervated by the involved nerve root [25]. The clinical signs and symptoms are used to settle the diagnosis and to localize the level of cervical pathology. However, radiating pain from the neck is not exclusively an expression of nerve root compression. Muscular pain and connective tissue pathology may induce referred pain, obscuring the clinical picture [23, 54, 58]. The natural course of the cervico-brachial pain is not always predictable. In many patients pain and other radicular symptoms are spontaneously of a transient nature [20]. Furthermore, new or recurrent symptoms can arise after surgery [36, 49].

Motor or sensory loss may not always indicate the true level of pathology because of overlap or intersegmental connection of cervical roots or due to anastomoses between peripheral nerves [6, 16, 19, 22, 39, 53]. Sometimes, the patients are not aware of any motor weakness [22].

Different modalities of physiotherapy are often applied in the acute as well as the chronic phase [17, 19, 25, 56]. Many authors advocate a soft or semi-rigid collar [5, 44], while some suggest early mobilization as being most important for the relief of neck pain [35]. There are several studies demonstrating good surgical results in patients with cervical nerve root compression [14, 26, 30]. However, most studies are either personal series or uncontrolled in other respects.

In a previous study we evaluated pain intensity visual analogue scale, function (measured by the Sickness Impact Profile) and mood (measured by the Mood Adjective Check List) in patients with cervical radiculopathy [47]. To our knowledge, there is so far no prospective, controlled study in which surgery is compared with conservative treatments regarding motor weakness and sensory loss in patients with cervical radiculopathy. The aim of this study was therefore to evaluate pain, muscular weakness and sensory loss in patients with long-lasting cervico-brachial pain considered to be caused by nerve root compression according to the clinical picture and MRI and to compare the effects of three randomized treatments: surgical decompression, physiotherapy and immobilization in a cervical collar in a 1-year follow-up.

Patients

The study included 81 consecutive patients of both sexes, with cervico-brachial pain of more than 3 months' duration. Thirty-seven (46%) were women and 44 (54%) were men. The mean age was 47.5 years (SD 7.9) and ranged from 28 to 64 years. The patients had been referred to the out-patient clinic at the Department of Neurosurgery, University Hospital of Lund, because of neck/shoulder/arm pain, for consideration of surgical treatment. Plain radiographs and MR tomography of the cervical spine or cervical CT-myelography had been performed. The patients underwent a full neurological examination by a senior neurosurgeon (C-A.C.). Reflex disturbances, motor and sensory deficits, together with the distribution of pain were evaluated to determine the clinical level of radiculopathy.

Inclusion criteria

Patients were included if they showed clinical and radiological signs that indicated nerve root compression corresponding to the distribution of pain but without spinal cord compression.

Exclusion criteria

Patients with spinal cord compression, whiplash, other traumatic injuries and serious associated somatic or psychiatric diseases were excluded.

Social and demographic data of the groups were recorded by comprehensive history and by a questionnaire (Table 1). The patients were given written information about the study, which had been accepted by the Ethics Committee of Lund University. They were randomized by the use of sealed envelopes into three treatment groups: surgery, physiotherapy and cervical collar.

Control group

Thirty healthy subjects were recruited from the hospital staff as a sex- and age-matched control group. None of these subjects had any history of neck pain or major injury affecting the upper limbs. The healthy subjects were tested on two occasions with 7-14 days in between. There was a significant correlation ($r = 0.66-0.97$) in muscular strength between the two test occasions, which indicates the intra-reliability of the test method. In the control group the dominant side was about 5% stronger than the non-dominant side (Table 2).

Study design

The clinical evaluation was made before treatment (control 1), and repeated at the same time of the day 14–16 weeks after surgery or after the start of the conservative treatments (control 2), and after a further 12 months (control 3). Control 3 always took place at the predetermined time, even if the patients were reoperated between control 2 and 3. The clinical evaluation was done by a physiotherapist (L.P.) according to a fixed protocol with emphasis on the neurological and musculoskeletal examination. The same physiotherapist performed all three examinations, but did not take part in the physiotherapy treatment.

The clinical trials were carried out according to the "intention to treat" principle [2]. Three patients, randomized to the surgical group, rejected surgery because of spontaneous improvement at the time of operation, but the allocation to the surgical group was