

REVIEW

Surgical treatment of cervicogenic headache

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In the present work, the late results of operative treatment on 60 patients, suffering from long lasting severe unilateral ($n = 32$) or bilateral ($n = 28$) cervicogenic headache, non-responsive to other treatment options, will be summarized. Cervicogenic headache (CEH) was diagnosed according to 'The Cervicogenic Headache International Study Group' guidelines. The cervical levels of affection were determined by neurological examination, magnetic resonance imaging (MRI), computed tomography (CT), anaesthetic blockades and X-ray diagnostics. The levels mainly operated on were at the C4/5, C5/6 and C6/7; one or two discs were removed. Immediately postoperatively there was pain freedom. Sixty-three per cent of the unilateral and 64% of the bilateral cases enjoyed long lasting pain freedom or improvement (>50%). The mean observation time was 19.8 and 25.5 months, respectively. After secondary deterioration (in 37% of patients with unilateral and in 36% with bilateral CEH) and further treatments, the final mean improvement was 73% and 66%, respectively. Well-selected CEH patients may benefit from surgical intervention. □ *Cervicogenic headache, headache, headache therapy, cervical spine, Smith/Robinson operation*

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Introduction

Until recent years, the pathological process underlying headache of cervical origin has been more or less unidentified. Vascular diseases, particularly pertaining to the vertebral artery, and even tumour, at one time were thought to be responsible for provoking headache of cervical origin. However, as both these putative factors are relatively rare, they cannot explain all the cases of an apparently not infrequent headache like CEH. Since Hunter and Mayfield's days (1), the C2 root has been the focus, and later the facet joints (2); the role of degenerative diseases of the cervical spine, such as disc protrusion and retropseudarthrosis, has been grossly underestimated until recently.

In the Neurosurgical Department in Göttingen, Cloward (3) and Smith and Robinson (4) procedures were standard neck operations for myelopathy or radicular shoulder–arm syndrome with sensation

and/or motor disturbances. Many patients successfully operated on because of their shoulder–arm pain, surprisingly reported improvement of their non-mentioned, preoperative headache.

Previously (5, 6) and also in recent prospective and controlled studies (7, 8) long-term follow-up results in CEH using a decompression and stabilization operation (Cloward, Smith/Robinson) in the middle/low cervical spine were reported. More recently, a German group around Diener reported the surgical treatment of lower cervical disc prolapse causing CEH (9).

A preliminary investigation was performed concerning frequency and localization of the headache of patients operated on for shoulder–arm pain. A total of 364 operations were conducted between 1973 and 1991. Of these, 124 (34%) patients also suffered from headache. After surgical decompression and fusion, 51% of these patients reported pain freedom (49%) or improvement (2%), during a mean

follow-up time of 2.6 years (range 2 months to 11 years). Improvement means a pain reduction of more than 50%. After a pain-free interval, recurrence of headache or a new headache was found in 46%. The segmental level of operation usually was C5/6 or C6/7. Connection between headache and degenerative disease of the cervical spine was assumed.

Methods

EDA/PDA

The spinal dura is furnished with a dense network of nociceptive nerve fibres.

To identify the underlying pathology, we developed a technique for anaesthetizing these dural, nociceptive nerve fibres. A gynaecologist had described cervical epidural anaesthesia in the past. During the epi- or peridural anaesthesia procedure, the patient is in the prone position. The midline of the neck and the cervical level are identified by anterior/posterior and lateral, radiological examination, using an imaging intensifier. The epidural space has correctly been called a sliding layer between the spinal dura and the posterior longitudinal ligament. In the epidural space, the pressure is subatmospheric. Identification of the epidural space is important.

For determination of the correct position of the needle, in addition to the radiological control, it is mandatory to follow the following guidelines:

The Touhy needle is inserted cautiously. Perforation of the dorsal ligament is followed by an immediate and characteristic loss of resistance. The epidural space negative pressure will cause an aspiration of physiologic saline at the hub of the needle immediately when the tip of the needle is positioned in the epidural space. The subsequent liquor-aspiration test must be negative. A small volume of injected contrast-medium (0.4–0.6 ml Solustrast® M 250) demonstrates typical dorsal and sometimes also ventral, peridural distribution (epidural anaesthesia: 0.8–1.0 ml Carbothesin®, 0.5%).

The injection level is selected on the basis of neurological investigation and above all the imaging procedures, especially the MRI. A positive response to epidural anaesthesia is pain freedom from about 10 min after injection. If pain freedom lasted longer than the anaesthesia, this procedure was used therapeutically. Primarily, it was used as a diagnostic test and an indication for an invasive approach. Dorsal calcification sometimes hindered the anaesthetic injection. No patients on whom such fake punctures were performed, reported

any improvement of pain. Epidural anaesthesia improvement is therefore hardly due to a placebo effect.

Selection for surgical treatment

A main factor in the selection process for surgical treatment was the resistance to nearly all other treatment options. Nearly all patients who were treated surgically, had a long-lasting headache history. All suffered from truly distressing uni- or bilateral cervicogenic headache, occasionally leading to suicidal thoughts (10%). Functional X-ray, CT and MRI and last, but not least, the diagnostic application of local anaesthetics give useful information for identifying the localization of the pathological process.

Surgical procedure

The surgical procedure is performed through an anterior approach to the cervical spine. The contents of the disc space and the dorsal and dorso-lateral disc protrusions are removed. The thickened dorsal ligament as well as dorsal osteophytes should be completely removed. They cause spinal dura displacement. After decompression of the spinal dura as well as the nerve roots, a bone dowel from the anterior iliac crest is inserted into the intervertebral space to create stabilization and fusion. A stiff collar for 2–3 months was obligatory, to avoid intervertebral space reduction.

Patients

The insight from the preliminary study inspired a prospective study of 60 new patients.

Unilateral CEH

One series contained 32 patients (26 female, 6 male) with unilateral headache. The mean age at onset was 45 years (range 31–73). The mean headache duration at operation was 6 years (range 0.5–20). The headache was chronic in 23 patients. All had cervicobrachialgia. Invariably the pain started as occipital. A reduction of cervical range of motion was present in 31.

The anaesthetic procedures were invariably positive. Attacks or exacerbations could be provoked in all those with information. The situation of these patients was considered precarious.

All patients except one with traumatic luxation, proved to have osteochondrosis and spondylosis,

narrowing the spinal canal, shown by MRI and/or CT.

In 16 cases, there was evidence for a one-level and in 16 cases for two-level affection. Of a total of 48 levels, 26 operations were carried out at the level C5/6, 11 at C6/7 and 7 at C4/5. The remaining four cases concerned the levels C3/4 and C2/3.

Bilateral CEH

The bilateral series contained 28 patients (20 female, 8 male). The mean age at onset of the disease was 44 (range 18–62) years. The mean age at operation was 50 years (range 19–62) and the mean headache duration 6 years (range 0.5–30). The pain was chronic in 26 patients. CEH was invariably a main indication for operation, not the coexisting radiculopathy.

In bilateral headache cases, the operation was performed at 45 levels, 21 at the level C5/6, 14 at C6/7, 8 at C4/5 and 2 at C3/4.

There was no significant difference between the distribution of the levels of affection in unilateral and bilateral cases.

Pain started in the neck and spread to the front in all but one. In addition, the pain in 23 patients spread to the shoulder, in seven cases to the interscapular area, in six to the eye, and in four cases to the left side of the chest. Migraine symptoms, like nausea, were present in seven and a pulsating pain quality in two patients. The pain was dull and pressing in general.

The MRI consistently showed narrowing of the subarachnoid space in the cervical area. Contact between protruded disc and cord was shown by MRI ($n = 12$) or Myelo-CT ($n = 11$).

Anaesthetic procedures ($n = 24$) were carried out in 23 cases by epidural anaesthesia and one by root blockade, and showed a positive result as long as the anaesthetic worked.

Except for the bilaterality of the headache, Cervicogenic Headache International Study Group criteria (10) for all 60 cases were generally fulfilled.

Results

Unilateral CEH

Postoperative improvement

The patients were controlled, frequently not at the planned regular follow-up, but at somewhat irregular intervals. In both series, all patients immediately postoperatively were 100% free of headache without analgesics. Also facial, ocular, interscapular and arm pain disappeared.

In unilateral headache the mean follow-up time was 19.8 months (range 1–58). The patients ultimately were lost to follow-up. The mean duration of pain freedom or improvement was 14.8 months (range 1–58). During the observation time, 20 patients or 63% enjoyed continued pain freedom or an improvement between 50 and 80%.

Secondary deterioration

In 12 (37%) patients with unilateral CEH, a recurrence of pain or a new headache was observed. Recurrences, to a large extent, seemingly originated from neighbouring segment levels. Complete recurrence was observed in five and in seven a deterioration between 50 and 90%. Remarkably, 75% of recurrences, and all the severe ones, occurred within the first year.

Late postoperative treatment

After various other approaches, the final mean improvement was 73% in those with secondary deterioration at the end of the mean follow-up period of 23 months. In the five re-operated ones, the improvement rate was 75%.

Five patients refused further treatment, because of a 'good quality of life'.

Bilateral CEH

Postoperative improvement

In bilateral headache, immediately postoperative pain freedom was present in all cases. The mean postoperative observation time was 25.5 months (range 2–100). Eighteen patients (64%) enjoyed permanent pain freedom or improvement during a mean observation time of 22.7 months (range 2–100).

Secondary deterioration

In 10 patients (36%), a secondary deterioration of headache was observed. The deterioration appeared from 2 months onwards, in nine the deterioration was between 50 and 70%, and in one complete. These patients were treated by various approaches. The final improvement in this group was 66%.

Control series

By sheer luck, it was possible to construct a control series of 10 patients. All these patients were later included in our series of unilateral CEH. Each patient was his own control. Prior to the final operation, eight had been operated upon in the

cervical spine and two in the lumbar spine during the period of CEH and in six cases with the Smith-Robinson procedure, but generally not with CEH as the main indication. These operations had been carried out at the non-optimal level for CEH, as far as we are concerned. In two cases, the operations were for coexisting tumours. Invariably, there was no beneficial effect of the operation.

Complications

The complication rate was acceptably low. No one experienced permanent complications.

Conclusion

Well-selected patients in a precarious situation, suffering from long-lasting and severe CEH, non-responsive to other treatment options, may benefit from surgical intervention.

Acknowledgements

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Conflicts of interest

The author declared no conflicts of interest.

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