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Stabilisation Surgery in Cervical Spine Degeneration

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Stabilisation surgery in cervical spine degenerative disease is important, but is not fully understood, and in several respects it is still a controversial subject.

Degenerative disorders of the cervical spine can make the spine unstable, although this is not usually a serious condition from the clinical point-of-view, it requires recognition by radiological studies, and in particular lateral radiographs of the patient's cervical spine in neutral, in full flexion, and full extension. On the other hand, instability of the cervical spine which has undergone degenerative changes may, for the first time, present subsequent to some form of cervical spine surgery.

The first cervical intervertebral disc excision operation without bone grafting was reported by Hirsch in 1960 [1]. A decision to "fuse or not to fuse" now poses a real practical problem for the surgeon [2].

Pathology

There is no doubt that there is a difference between a cervical protruding intervertebral disc, and cervical spondylosis concerning the integrity and stabilisation of the cervical spine. Instability is quite rare where there is a disc protrusion, but a degree of it is not too uncommon in cervical spondylosis. To complicate matters, however, there may be both a cervical disc protrusion and cervical spondylosis in the same patient. In addition, if one level of the cervical spine has been fused, instability at a second level usually the level above the fused level, may eventually occur because of the extra stress placed on the spine at this site. This is much rarer than may be expected. Another important factor is the pre-existing fusion of cervical vertebral bodies in a person with cervical spondylosis.

If the integrity of a cervical spine is disrupted by injury or by disease, abnormal motion may occur and this can cause neck pain and there may be implications of nerve roots, or/and of the spinal cord. It is well-known that traumatic hyperextension of the cervical spine in a person with cervical spondylosis may cause serious neurological disability usually in the form of a central cord syndrome. In some of these patients there is actual disruption of the anterior common ligament of the spine.

Biomechanical Studies

Several important biomechanical studies have been reported in the literature concerning stability and instability of the cervical spine. Johnson [3] and White [4] have shown that under normal

circumstances, the ligaments retain the vertebrae securely and the horizontal movement of one vertebral body on another does not exceed 3.5 mm.

Laminectomy will remove only about 18% of the stability of the cervical spine, when rested in flexion. If, in addition, the facet joints are removed, there is a 60% loss of stability.

Because of concern that the cervical spine may be unstable anterior interbody bony fusion has been done, before bony union has occurred. Johnson [5] et al, has carried out most interesting cadaveric studies. They removed intervertebral discs and the anterior common ligament from fresh cadaveric spines, and interposed a block of iliac bone. These spines were than subjected to mechanical force and it was found that, unexpectedly, in flexion the strength was increased over normal, but was seriously lost in extension. Thus it would appear to be important to limit extension after an anterior cervical operation has been carried out, until there is good bony fusion. However, would this be the case in anterior spinal operations without bony fusion?

Results of Operative Treatment

In patients with cervical spine degenerative disease, a "standard" decompressive laminectomy will not give rise to any spinal instability, but this is not always so, even if the facet joints have not been disturbed to any degree during the operation [6], [7]. It is unwise to carry out a decompressive laminectomy in these patients along with an extensive foraminotomy, or to carry out extensive dissection about the facet joints. However, if such a procedure is necessary for a particular patient, it is best in addition, to fuse the decompressed portion of the cervical spine by bone grafts, possibly along with a wiring technique.

Patients in older age group would appear to be less likely than younger patients to develop cervical spine instability after a decompressive laminectomy procedure for cervical spondylosis [8]. In several patients with severe cervical spinal stenosis causing a significant degree of myelopathy, it is preferable to carry out an anterior cervical decompression - interbody bony fusion procedure, and then after a period of weeks or months, to perform an extensive decompressive laminectomy with additional foraminotomies (if so indicated) [2], [9].

A degree of pseudarthrosis may occur after an anterior cervical spine operation, certain techniques, including the Smith-Robinson type of operation is reputed to result in a stable spine, but that is not always the case and in addition the clinical results of this type of procedure may not always be satisfactory.

Mayfield [6] carried out a posterior, laminectomy operation for cervical spondylotic myelopathy in 27 patients, 21 improved, 6 were failures. He was concerned about post-operative subluxation, and therefore took up the anterior cervical spine operation. Indeed the fusion rate in anterior cervical spine surgery is very variable, as is shown in different series, thus it was 88% in Robinson's series in 1962 [10], and Aaronson [11] reported a rate of only 4%. Pseudarthrosis is quite common, and it would appear, although this is not absolutely certain, that this is more likely to develop if more than one level of the cervical spine has been bony fusion. However, even if there is a degree of pseudarthrosis, the clinical result has usually been satisfactory, as if fusion had occurred, except in the report by Reilly [12] et al. Their patients had clinical improvement following subsequent posterior bony fusion.

Cervical Disc Degenerative Disease Treated by an Anterior Operation without Anterior Bone Grafting

There are now several reports in the published literature of patients who have had an anterior cervical spine decompressive procedure carried out for an intervertebral disc protrusion syndrome or for a syndrome resulting from cervical spondylosis, where bone grafting has not been performed as part of the operation [13], [14], [15], [16], [17]. Most of these authors report that there is no obvious difference in the clinical result in patients who did not have an interbody fusion compared to those who did have this carried out following anterior discectomy. It is also stressed that the morbidity is lower. In the report by O'laoire and Thomas [18], 26 patients with a cervical protruded intervertebral disc which was causing a spinal cord compression syndrome, were operated on, the disc being removed, the spine was not grafted and the patients did not require to wear a collar following the operation. They found that there was good alignment in all of their patients, and they studied 18 of their patients at 3 months and found that bony fusion had occurred in 15 and fibrous union in 3 of these patients. The long term results of such patients are awaited with interest, concerning the stability of the cervical spine.

Operations to Fuse the Unstable Cervical Spine

An operation to fuse the cervical spine in a patient with cervical spondylosis if there is significant instability, is best carried out as part of the primary operation for such a patient, and preferably an interbody bony fusion using the patients own bone. Usually a dowel removed from the iliac crest, is to be recommended. Alternatively cadaveric bone, or a keil graft may be used. Because of pseudarthrosis and instability, several variations of grafting have been reported included the keystone or of graft, and another is a fibular graft, which is locked into place [19].

If the cervical spine is unstable in a patient with cervical spondylosis, following a decompressive laminectomy procedure, this may be treated by interfaced wiring and bone grafting. However a better procedure is to carry out an anterior interbody bone graft.

Conclusion

The frequency and significance of unsuitability of the cervical spine which has degenerative changes is not fully known and understood.

Instability may be part of the degenerative process and may be then require to be treated by bony fusions. However it is more likely to be "Iatrogenic", occurring secondarily to operative treatment for clinical syndrome resulting from degenerative spinal disease and indeed is then important as neurological disturbances may well ensue.

With the increasing tendency by some surgeons to carry out anterior cervical operations on patient with either a cervical disc protrusion or, cervical spondylosis, an even greater interest is being taken in the possibility of post-operative spinal instability, although published papers do not report that this is a likely complication.

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