Abstracts

Effect of various head and neck positions on vertebral artery blood flow

Summary – The purpose of this study was to assess blood flow velocity in the vertebral arteries with duplex Doppler ultrasound during various positions of the head and neck. Vertebral artery morphology and blood flow velocity were assessed in a control group and in a group of subjects who displayed clinical signs and symptoms of vertebrobasilar insufficiency. The two groups did not differ in vertebral artery gross morphology as assessed by ultrasound. The arteries were examined for vascular impedance by calculating the ratio of peak systolic velocity to end diastolic velocity (systolic/diastolic ratio). In the context of this study, a lower velocity ratio implied less resistance to vascular flow. These velocity ratios were established during several positions of the head and neck, including a widely used provocative test manoeuvre for vertebrobasilar insufficiency. No meaningful significant differences in mean velocity ratios were found between the two groups. None of the subjects had abnormal spectral flow patterns during the different testing positions.

Relevance – Manual therapists utilize certain provocative testing manoeuvres prior to spinal manipulation to assess the integrity of vertebral artery blood flow. One of the most commonly used manoeuvres is the Wallenberg test, during which the head and neck are placed in a position of extension with rotation. The results of this study suggest that vertebral artery flow is not impeded during this test in normal controls and in subjects with clinical signs and symptoms of suspected vertebrobasilar insufficiency.

Postmortem angiographic study of degenerative vascular changes in arteries supplying the cervicobrachial region

Objectives – To study the prevalence of degenerative changes in the arteries supplying the cervicobrachial region, and their relation to cervical disc degeneration.

Methods – Fifty postmortem aortic arch angiographies were evaluated for occlusions and variations in the diameter of the vertebral arteries and thyro- and costo-cervical trunks, as well as for tortuosity, average diameter and the highest cervical level to which the ascending cervical artery, an upward continuation of the thyrocervical trunk, and the deep cervical artery, an upward continuation of the costocervical trunk, ascended.

Results – Localized segmental narrowings, usually situated close to the ostia of the arteries, were common, whereas total occlusions were rare. Thirty (60%) of the subjects showed a segmental narrowing at least in one of the six arteries analysed, while only two (4%) showed an occluded artery, which in both the cases was the thyrocervical trunk. Narrowings were most common in vertebral arteries, followed by costocervical and thyrocervical trunks. Segmental narrowings, as well as general tortuosity of the arteries, increased with age. It was also found that ascending and deep cervical arteries did not run as high up in the posterior neck muscles in older people as in younger ones. Twenty-three subjects with marked cervical disc degeneration showed on average 2.3 arteries with segmental narrowings, while the corresponding figure for twenty-seven subjects without disc degeneration was 0.6. Both the segmental narrowings and the disc degeneration, however, were strongly associated with age, and thus the causality between the two remained unclear.

Conclusion – The study showed that degenerative changes are common in the arteries supplying the cervicobrachial area, indicating that impaired blood flow might play a part in some cervicobrachial disorders.

Clinical use of the simple 3D-calculation in scoliosis

In this paper we show the clinical application of a simple method of calculating three-dimensional shape in scoliosis by the use of two tables based on normal standard x-rays in the anteroposterior and lateral projections. The three-dimensional alignment should be considered in both conservative and operative correction. In 57 patients with 87 scoliotic curves we measured the well-known Cobb angle (a) and determined the vertebral rotation according to the method of Nash and Moe. We compared this information with the results of the calculated three-dimensional angles of scoliosis (angle B between the curvature plane and the sagittal plane, angle c as the true angle of scoliosis in this curvature plane). In 76 curves (87%) our method was practicable. The true angle c is always higher than the projected angle c, especially in the clinically relevant range of 20–40°. Poor correlation is shown between the projected angle a and the true angle c (r = 0.41 for thoracic curves and r = 0.57 for lumbar curves) and almost no correlation between vertebral rotation and the true angle c (r = 0.10 for thoracic curves and r = 0.44 for lumbar curves) and the curvature plane (B) (r = 0). The three-dimensional shape of scoliosis cannot be estimated by the well-established projected angles and indices and we recommend the use of our simple method for the radiological investigation of scoliotic patients.

Sagittal configuration of the spine and growth of the posterior elements in early scoliosis

The early stages of the sagittal alignment of the spine and the asymmetry between the posterior and anterior elements were determined on the basis of 134 lateral and 167 anteroposterior radiographs obtained from a control group and from patients with early scoliosis. The radiographs were allocated into four groups according to the degree of the Cobb
angle. In thoracic curves with a Cobb angle of more than 8°, the kyphosis and the vertebral sagittal wedge angle decreased in comparison with the control group. The sagittal-wedge angle of the disc did not change significantly with increasing Cobb angle. The pelvic height in relation to the vertebral height, considered to represent the growth of the posterior element in relation to the growth of the anterior element, was not significantly different in the scoliotic groups as compared with the control group. The results indicate that changes of the sagittal configuration of the spine occur early in idiopathic scoliosis and that they are associated with disturbed growth of the vertebral body but not of the posterior elements. These findings seem to reflect a simultaneous deformation in the coronal and sagittal planes rather than a single growth disturbance in any specific plane.

Fatigue failure at the disc-vertebra interface during cyclic axial compression of cadaveric specimens

Summary – Seven specimens of adjacent lumbar vertebrae, with the disc between them, were obtained from five cadavers (age 40–80 years). The vertebrae were bisected in the transverse plane, posterior elements were removed and the specimens subjected to cyclic compression, with a peak load of 1.9 kN at a frequency of 0.5 Hz. During loading, the bulging of the end-plate into the more caudal of the two vertebrae was monitored using a displacement transducer. Application of the load was continued for 7,000 cycles, or until the end-plate displacement reached 1.5 mm, whichever happened first. One specimen failed at 30 cycles; another failed within only five loading cycles, i.e. not by fatigue. The remaining five specimens showed signs of fatigue failure but the end-plate remained intact.

Relevance – Repetitive compression can damage cadaveric specimens, even when the peak load is with normal physiological range. The first signs of fatigue failure may not involve fracture of the end-plates.

Transfer strategies used to rise from a chair in normal and low back pain subjects

Summary – The mechanics of rising from a chair are analysed in two groups of male subjects including five normal subjects and five chronic non-specific, low back pain subjects. Chair height, foot placement and arm position were controlled while force plate, video and electromyographic data were collected. The task was broken into three phases: initiation, chair unloading, and ascending. Moment and power analyses of the ascending phase showed two different strategies were used among the normal subjects. A 'knee strategy', comprising higher knee muscle moments, propelled the body into the standing posture while keeping the trunk relatively vertical; a 'hip-trunk strategy' flexed the trunk farther forward, decreasing the knee moments, but at the same time increasing the moments at the hip and low back. The low back pain subjects used a modified strategy that distributed the moments and power more evenly throughout the lower limb and low back.

Ice hockey injuries: a 4-year prospective study of a Swedish elite ice hockey team

In this prospective study, we investigated the incidence of injuries of different severity, types of injury, and mechanisms of injury during ice hockey practice and games. One Swedish elite hockey team was closely observed during four seasons (1986–1990). There were 376 injuries, of which 148 resulted in absence from practice or games. The incidence of injury (injuries associated with later absence) during practice was 2.6 per 1,000 player-practice hours and 74.1 per 1,000 player-game hours. Nuisance injuries (without any later absence) and minor injuries (absence < 1 week) constituted the vast majority (95.2%) and only 4.8% (18 cases) were classified as moderate or major injuries (absence > 1 week). Of the injuries 85% were caused by trauma and 15% by overuse. Injuries were most often localized to the lower limb (37.8%) and head/face (31.4%). The commonest injuries were contusions, lacerations/wounds, strains and sprains. Most injuries resulted from stick or player contact (predominantly checking). The results are in close agreement with those of a previous investigation on another Swedish elite hockey team covering the years 1982–1985. It should be possible to reduce the number of injuries by stricter enforcement of the hockey rules, especially against stick violations, and a more widespread use of visors.

Elastic supports and body suits: effective energy-storing garments

The principles behind the use of lumbar supports have changed drastically in recent years. Once used for immobilisation, lumbar supports and body suits are now being used to encourage mobility and return to function in low back pain patients. Modern concepts regarding the stored/strain energy of elastic garments are introduced, followed by a discussion of how body suits and elastic support utilize these properties to assist the low back pain patient. A number of different types of elastic garments are illustrated.