Current Practice

JOINTS AND THEIR DISEASES

Cervical Spine

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A wide variety of diseases can present as pain in the neck, owing to the complex anatomy of the region. Table I outlines a scheme for the discussion of the diagnosis and treatment of the commoner conditions affecting this area.

TABLE I.—*Sites of Origin of Neck Pain*

- (1) Synovial joints—apophysial
—atlanto-axial
- (2) Intervertebral discs
- (3) Nerve roots ; spinal cord
- (4) Vertebral bodies
- (5) Muscles ; ligaments
- (6) Arteries—vertebral
—cranial
—polymyalgia
- (7) Deep lymphatic glands ; retropharyngeal space.
- (8) Thoracic viscera

Examination

The main movement patterns of the cervical spine are formed by synchronous motion at different levels, but most of the movements occur at the upper five intervertebral joints. Nodding of the head occurs largely at the atlanto-occipital joint, and about half the range of lateral rotation occurs at the atlanto-axial joint. Accurate localization of cervical spinal lesions by the examination of cervical movements is thus usually not possible, but certain patterns can be recognized. In inflammatory spondylitis and degenerative spondylosis there is usually an overall restriction of movement, particularly of lateral flexion. Patients with acute "mechanical" torticollis typically show an asymmetrical pattern, with marked pain and limitation of one or two movements and with other movements relatively unimpaired. In most instances when cervical pain is due to vertebral disease, such as malignant deposits or infection, the neck is held virtually rigid. Though severe acute mechanical torticollis may show similar gross restriction at the outset, after rest and support in a collar for a day or so the typical pattern emerges. A brief neurological examination of the limbs, including the plantar responses, must be performed in all patients, since the development of spinal cord compression can be most insidious and asymptomatic. Root pain due to a cervical disc lesion is typically aggravated by neck movement, but this valuable localizing sign may be negative on quick testing. Each cervical spinal movement may need to be held passively at full range for about ten seconds for the root pain and paraesthesiae to develop.

Root pain is usually due to a disc protrusion. If neurological signs are found they are almost invariably confined to the territory of one root (uniradicular), and the weakness is moderate. The finding of severe weakness and reflex changes in the territory of more than one root (multiradicular) strongly suggests another pathological cause. Individual muscles of the arm derive their innervation from several segments, though usually one predominates, and there is considerable individual variation (Table II). Reflex changes provide valuable objective confirmation of the root involved, but the sensory changes which may be found in the relevant dermatome are more vari-

able and unreliable. The commonest root to be affected is the 7th cervical. This produces moderate weakness of triceps, sometimes weakness of the extensors and flexors of the wrist and fingers, depression of the triceps reflex, and sensory impairment mainly over the index finger.

TABLE II.—*Summary of Segmental Supply of Arm Muscles (After Gray)¹*

Deltoid	C 5, (6)
Biceps	C (5), 6
Triceps	C (6), 7, (8)
Wrist and fingers extensors and flexors	C 7, 8
Thumb abductor and extensor	C (7), 8
Intrinsic hand muscles	C 8, T.1

The signs that may be elicited in less common syndromes will be outlined as they are discussed. Standard antero-posterior and lateral x-ray films of the neck and a sedimentation rate (E.S.R.) are useful screening tests for the exclusion of serious underlying disease.

Synovial Joints

Several forms of inflammatory arthritis show a predilection for involvement of the facet joints of the cervical spine. These include, in order of frequency: rheumatoid disease, psoriatic arthritis, ankylosing spondylitis, Reiter's disease, and colitic arthritis. Usually evidence of the disease will be manifest elsewhere by the time symptoms in the neck arise, but rarely rheumatoid disease can first present as pain and stiffness in the neck. Examination reveals symmetrical restriction of head movement, particularly of lateral flexion.

The drug treatment of inflammatory spondylitis should follow the regimen for the underlying disease. Partial rest and support of the neck can be provided by a felt or plastic collar, but prolonged immobilization should be avoided, particularly in ankylosing spondylitis, since permanent restriction of movement may result.

Some patients with progressive spondylitis may develop excessive mobility at the joint between the odontoid peg of the axis and the anterior arch of the atlas. When the neck is flexed the odontoid peg subluxes backwards towards the spinal cord. In a survey of outpatients with rheumatoid arthritis significant atlanto-axial subluxation was found in 25% of 76 patients,² but only five showed evidence of minor spinal cord lesions. Treatment by cervical brace or spinal fusion is unnecessary unless there are symptoms or signs of progressive cord damage. Particular care must be exercised when these patients are anaesthetized, since sudden stress when the neck is unsupported can cause complete interruption of the spinal cord. Vertebral subluxation can occur at lower levels and contribute to spinal cord lesions.

Cervical Spondylosis

The cervical spinal joints, particularly the lower ones, are a common site for degenerative spondylosis. Along with changes in the facet joints degenerative changes in the disc give rise to

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narrowing and osteophytic outgrowths. In the majority of the elderly no symptoms other than restriction of range are noticed. Some patients experience persistent aching in the neck and shoulders, though the signs and radiographs are not qualitatively different from those of symptomless patients. Sensitivity to pain and nervous tension seem to be factors producing symptoms. Forcible treatments are best avoided, but many patients achieve great relief from gentle stretching and mobilization by a physiotherapist aimed at restoring movement.

Intervertebral Discs

Opinion is still divided on the basic cause of acute cervical torticollis. There is circumstantial evidence that in adults a fragment of the annulus impinges against the sensitive dura mater or the nerve root sheath, producing asymmetrical restriction of cervical movements, deformity, and secondary muscle spasm.³ Gentle traction or rotation-mobilization of the neck may produce dramatic relief of pain and restoration of free movement. Recent epidural myelographic studies⁴ of patients with lumbago (where the signs suggest an analogous mechanical block of lumbar spinal movements) have demonstrated that small disc protrusions can be reduced in size by manipulation. However, these neck lesions are usually self-limiting, and if there is any clinical doubt that complications may exist it is preferable to await spontaneous resolution.

Nerve Roots and Spinal Cord

Some cases of cervical torticollis are accompanied by pain radiating down the limb, either from the outset or after a phase of pain confined to the neck. This pain may become very severe and be continuous at rest. Often in such cases nerve root interruption occurs, shown by the appearance of uniradicular neurological signs and the spontaneous resolution of pain. A firm collar and strong analgesics will afford some relief when the pain is at its height. Occasionally cervical traction, performed either reclining or sitting, may help intractable pain. A multicentre trial⁵ showed that the majority of patients lost their symptoms within three months whatever treatment was given. The minor weakness recovers spontaneously in three to six months, but sensory symptoms may persist, analogous to cases with root lesions in the leg.⁶ It follows that prolonged administration of placebo treatments, such as electrotherapy, on such patients is a waste of time and resources.

Compression of the first thoracic root at the thoracic outlet and of the median nerve in the carpal tunnel may produce aching in the arm associated with paraesthesiae in the hand. Typically the paraesthesiae are worse at night and are not exacerbated by neck movements. However, either of these conditions may occur in association with cervical spondylosis, and it may be impossible to determine clinically which is the predominant factor. Electrodiagnosis can be of great help, particularly in detecting carpal tunnel compression.

A syndrome of aching across the neck and shoulders is not uncommon, sometimes with root pain shortly followed by rapid onset of weakness and wasting. When a typical vesicular rash follows it can be recognized as herpes zoster. When not, the term neuralgic amyotrophy is used to cover a variety of neurological deficits presumed to be due to a viral radiculitis.⁷ Usually there is patchy severe weakness of periscapular muscles, sometimes bilateral. Sometimes individual muscles in the arm are affected, and there may be small sensory deficits. Among recognized predisposing causes are inoculations and surgical operations, the latter often raising difficult medico-legal implications. Electrodiagnosis can be of great help to determining the degree of muscle denervation. Usually it is incomplete and slow spontaneous recovery occurs.

If the weakness in the arm is severe or progressive and extends beyond the territory of one nerve root it is unlikely to be due to a simple disc protrusion. Multiradicular involvement can

be confirmed by electrodiagnosis, and causes such as malignant infiltration of the brachial plexus or spinal tumour should be sought. Significant spinal cord compression may present with spastic weakness of the legs and paraesthesiae in the limbs. The important signs are sustained knee or ankle clonus and extensor plantar responses, and these preclude any attempt at mechanical treatment. A neurological opinion and myelography should be arranged urgently.

Vertebrae

Neoplastic deposits or sepsis in bone give rise to a constant pain, which often persists at rest. The neck is usually held completely rigid, and a period of rest and support for a day or so produces no amelioration, as is seen with mechanical torticollis. X-ray films may show localized osteolysis or collapse, the earliest detectable change sometimes being the asymmetrical disappearance of a pedicle. However, complete reliance should not be placed on a negative report, since radiographic changes may not be evident for several months after the onset of symptoms. The E.S.R. will usually be elevated, so that in practice either the E.S.R. or the radiograph will be abnormal, and these are essential screening investigations in such cases.

Muscles and Ligaments

Chronic neck pain without the localizing signs of organic disease already described is extremely common. Patients who are depressed or emotionally disturbed seem to complain disproportionately of neck pains. Poor "hang-dog" cervical posture, with secondary stretching of cervical muscles and ligaments, may be a factor. Strong reassurance after careful examination coupled with postural instruction may help. It is preferable to avoid the use of medicaments if possible, but the intermittent use of a mild sedative benefits some patients.

Persistent neck pain after injury, particularly traffic collisions producing a "whip-lash" effect, is common. Once again the symptoms are usually quite disproportionate to the signs, and it is hard to avoid the conclusion that emotional instability and compensation wrangles are major factors. X-ray films of the cervical spine with a lateral view in full flexion and extension should always be taken. Having thus excluded traumatic subluxation, it is possible that partial tears of the interspinous ligaments may be responsible. On this supposition the injection of hydrocortisone and local anaesthetic sometimes produces relief.

Arteries

The vertebral arteries run up the cervical spine in foramina just anterior to the facet joints, and then join to form the basilar artery, which is the main arterial supply to the hind-brain. In elderly patients one vertebral artery or both may be largely occluded by atheromatous changes. If an osteophyte from a degenerative facet joint further obstructs the flow, transient ischaemia of the hind-brain may occur on neck-movement. This may be manifested by drop-attacks, transient paraesthesiae, positional vertigo, or visual disturbances. Such symptoms are an absolute contraindication to any mobilizing treatment of the neck, and immobilization in a collar or brace should be advised.

The temporal and occipital arteries may be involved in temporal arteritis, causing severe head pains and occasionally an apparent torticollis. Usually the patient is elderly, and may notice severe malaise, fever, and night sweats. The temporal arteries may be thickened and the pulses obliterated. The E.S.R. is usually markedly raised (more than 50 mm. per hour Westergren), and arterial biopsy confirms the diagnosis. Since the central artery of the retina may be obstructed at any time, producing permanent blindness, there should be no delay in

starting corticosteroid therapy, which will completely suppress the disease.

The term polymyalgia rheumatica is regrettably gradually being accepted as a diagnostic entity and blanket therapy with steroids recommended. It must be stressed that it is no more than a symptom complex consisting of girdle pains arising usually from arthritis of central joints, including the spine, shoulders, and hips, associated with malaise and a raised sedimentation rate. Many diseases, including temporal arteritis, polyarteritis, dermatomyositis, reticulosis, myelomatosis, and carcinomatosis, can present in this way.⁸ Thorough investigations, often including arterial, muscle, and bone marrow biopsy, should be made before steroid therapy is commenced, so that a policy for long-term management can be determined. Some milder cases run a benign self-limiting course and can be relieved by non-steroid antirheumatic drugs such as phenylbutazone.

Cervical Glands

Infection in the deep cervical glands and retropharyngeal space may cause a painful torticollis, particularly in children.

Though an acute disc lesion can rarely produce dysphagia, in adults this symptom may indicate an inflammatory process.

Thoracic Viscera

Apical pneumonia in children can present with a painful torticollis. Cardiac or mediastinal pain can be referred into the jaw and neck, but a careful history and examination will show that the cervical spine is not the source.

REFERENCES

- ¹ Gray's Anatomy, 1967, ed. D. V. Davies, 34th ed. London, Longmans.
- ² Mathews, J. A., *Annals of the Rheumatic Diseases*, 1969, 28, 266.
- ³ Cyriax, J. H., *Textbook of Orthopaedic Medicine*, 1962, 4th ed. London, Cassell.
- ⁴ Mathews, J. A., and Yates, D. A. H., *British Medical Journal*, 1969, in press.
- ⁵ British Association of Physical Medicine, *British Medical Journal*, 1966, 1, 253.
- ⁶ Yates, D. A. H., *Annals of Physical Medicine*, 1964, 7, 169.
- ⁷ Brain, Lord, *Diseases of the Nervous System*, 1962, 6th ed. London, Oxford University Press.
- ⁸ Hart, F. D., *British Medical Journal*, 1969, 2, 99.

TODAY'S DRUGS

With the help of expert contributors we print in this section notes on drugs in current use.

Corticotrophin and its Synthetic Analogues

Corticotrophin, or A.C.T.H., is the adrenocorticotrophic hormone secreted by the anterior lobe of the pituitary gland. As its name implies, this hormone acts on the adrenal cortex, where it stimulates the production of steroid hormones and maintains the size and weight of the adrenal glands. The most important steroid produced by the human adrenal cortex in response to this stimulus is cortisol, a substance which is perhaps better known to the clinician as hydrocortisone. A.C.T.H. also stimulates production of adrenal androgens, though to a lesser degree. Production of aldosterone, on the other hand, is regulated by other mechanisms, and the output of this steroid actually falls during prolonged stimulation of the adrenal glands with exogenous A.C.T.H.

Chemistry and Pharmacology

A.C.T.H. is a straight-chain polypeptide consisting of 39 amino-acids, but its biological activity is associated with the first 24 amino-acids only, and this sequence is common to the hormone obtained from cattle, pigs, sheep, and man. The arrangement of the amino-acids in the latter part of the molecule differs from one species to another. Though these variations in structure do not affect the biological activity of the molecule, they are of some clinical importance, since they may result in antibody formation and allergic reactions when A.C.T.H. of animal origin is injected into patients. These preparations are extensively purified before use, but there is always a slight risk that they may still be contaminated by other pituitary proteins or peptides, which may themselves be antigenic. Nevertheless, the reported incidence of severe allergic reactions is extremely small when one considers the thousands of patients who have been given A.C.T.H. over the past 15 years. Animal preparations can be standardized only by bioassay, so that they cannot be administered on a weight basis.

In recent years a number of synthetic analogues of A.C.T.H. have been manufactured which contain the first 24 amino-acids only. These synthetic polypeptides possess full biological activity, but the absence of the antigenic part of the molecule should reduce the risk of sensitivity reactions. Other advantages of these pure compounds over the animal preparations are that dosage can be based accurately on weight, and risks due to contamination have been eliminated.

A number of extra-adrenal effects of A.C.T.H. have been described, but only one of these is likely to be of clinical importance. This is the melanophore-stimulating effect of the hormone, which is responsible for the increased pigmentation of the skin seen in Addison's disease and in some patients on prolonged A.C.T.H. therapy. This action is due to the amino-acid sequence between the fourth and eleventh amino-acids in the molecule, which is identical with that found in α -melanophore-stimulating hormone. As this sequence is present in the first part of the molecule, hyperpigmentation is just as likely to occur with the synthetic analogues as with the natural hormone.

Both A.C.T.H. and its synthetic analogues are destroyed in the gastro-intestinal tract, so that they have to be given by injection.

Preparations Available

Corticotrophin (ACTH-Crookes, Acthar, Cortrophin) is a highly purified A.C.T.H. obtained from the pituitary glands of animals. Current preparations are mainly of porcine origin. It consists of a freeze-dried sterile powder which must be dissolved in sterile water or saline before use. As this preparation has a relatively short duration of action it is now used only for diagnostic purposes.

Corticotrophin gelatin injection (Acthar Gel, Cortico-gel) is a highly purified preparation of corticotrophin in gelatin for subcutaneous or intramuscular injection. This repository A.C.T.H. has both rapid onset and prolonged action, the adrenal glands being stimulated for a period of about 12 to 16 hours after one injection. The earlier preparations required warming to body temperature before injection, and attempts to