ORTHOPEDIC PHYSICAL ASSESSMENT

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Philadelphia London Toronto Montreal Sydney Tokyo

CHAPTER

2 Cervical Spine

Examination of the cervical spine involves determining whether the injury or pathology occurs in the cervical spine or in a portion of the upper limb. Cyriax called this assessment the *scanning examination*.[1] In the initial assessment of a patient who complains of pain in the neck and/or upper limb, this procedure is always carried out unless the examiner is absolutely sure of where the lesion is localized. If the injury is in the neck, the scanning examination is definitely called for. Once the lesion site has been determined, a more detailed assessment of the affected area is performed if it is outside the cervical spine.

The cervical spine is a complicated area to assess properly, and adequate time must be allowed to ensure that as many causes or problems are examined as possible. Many conditions affecting the cervical spine can manifest in other parts of the body, and the examiner must be aware of this.

APPLIED ANATOMY

The cervical spine consists of several joints. It is an area in which stability has been sacrificed for mobility, making the cervical spine particularly vulnerable to injury. The *atlanto-occipital joints* (C0–C1) are the two uppermost joints. The principal motion at these two joints is flexion-extension (15 to 20°), or nodding of the head. In addition, side flexion is approximately 10° whereas rotation is negligible. The *atlas* (C1) has no vertebral body as such. During development, the vertebral body of C1 has evolved into the *odontoid process*, which is part of C2. The atlanto-occipital joints are ellipsoid and act in unison. Along with the atlantoaxial joints, these joints are the most complex articulation of the axial skeleton.

The *atlantoaxial joints* (C1–C2) constitute the most mobile articulation of the spine. Flexion-extension is approximately 10°, and side flexion is approximately 5°. Rotation, which is approximately 50°, is the primary movement of these joints. With rotation, there is a decrease in height of the cervical spine at this level as the vertebrae approximate because of the shape of the facet joints. The odontoid process of C2 acts as a pivot point for the rotation. This middle, or median, joint is classified as a *pivot* (*trochoidal*) type of joint. The lateral atlantoaxial, or facet, joints are classified as *plane* joints. Generally, if a person can talk and chew, there is probably some motion occurring at C1–C2.

It must be remembered that rotation past 50° in the cervical spine may lead to kinking of the contralateral vertebral artery; the ipsilateral vertebral artery may kink at 45° of rotation. This kinking may lead to vertigo, nausea, tinnitus, "drop attacks," visual disturbances, stroke, or death.

There are 14 *facet*, or *apophyseal*, joints in the cervical spine. The upper four facet joints in the two upper thoracic vertebrae are often included in the examination of the cervical spine. The superior facets of the cervical spine face upward, backward, and medially; the inferior facets face downward, forward, and laterally. This plane facilitates flexion and extension, but it prevents rotation and/or side flexion without both occurring to some degree together. These joints move primarily by gliding and are classified as a *synovial*, or *diarthrodial*, type of joints. The capsules are lax to allow for sufficient movement. At the same time, they provide support and a check-rein type of restriction. The greatest flexion-extension of the facet joints occurs between C5 and C6; however, there is almost as much movement between C4–C5 and C6–C7. The neutral or resting position of the cervical spine is slightly extended. The close packed position of the facet joints is complete extension. The facet joints are highly innervated by the recurrent *meningeal* or *sinuvertebral nerve*.

Some anatomists[2–5] refer to the *costal* or *uncovertebral processes* as *uncunate joints* or *joints of von Lushka*. These structures were described by von Lushka in 1858. The uncus gives a "saddle" form to the upper aspect of the cervical vertebra, which is more pronounced posterolaterally. It has the effect

PHYSICAL EXAMINATION OF THE SPINE AND EXTREMITIES

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Medical illustrations by
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APPLETON-CENTURY-CROFTS / New York
A Publishing Division of Prentice-Hall, Inc.

Zone II—Posterior Aspect

In preparation for palpation of the posterior aspect of the neck, stand behind the seated patient. When the patient is seated, the posterior soft tissues of the neck become more accessible. If sitting is painful for the patient, however, he may remain supine.

Trapezius Muscle. The broad origin of this muscle extends from the inion to T12. It then inserts laterally in a continuous arc into the clavicle, the acromion, and the spine of the scapula. Palpate the trapezius from origin to insertion, beginning with its prominent superior portions at the side of the neck and moving towards the acromion. The superior portion of the trapezius is frequently stretched in flexion injuries of the cervical spine, such as may occur in automobile accidents. When your fingertips reach the dorsal surface of the acromion, follow its course until you reach the spine of the scapula. Although the trapezius' insertion is not distinctly palpable, you may encounter unusual tenderness in the area, a symptom usually due to defects or to hematoma secondary to a flexion/extension injury of the neck. Then move your fingertips up the longitudinal bulges of the trapezius muscle, on both sides of the spinous processes, to the origin at the superior nuchal line. The trapezius muscle is best palpated bilaterally to provide instant comparison. Any discrepancy in the size or shape of either side and any tenderness, unilateral or bilateral, should be noted. Tenderness most often presents in the superior lateral portion (Fig. 19).

The trapezius and the sternocleidomastoid muscles share a continuous attachment along the base of the skull to the mastoid process where they split, with each muscle then having a different and noncontinuous attachment along the clavicle. Embryologically, the trapezius and sternocleidomastoid muscles form as one muscle, but split into two during later development. Because of their common origin, these muscles share the same nerve supply, the spinal accessory nerve or cranial nerve number IX.

Lymph Nodes. The lymph nodes on the anterolateral aspect of the trapezius muscle are not normally palpable, but pathologic conditions such as infection may cause them to become tender and enlarged. As your experience increases, palpation of the lymph node chains can be incorporated into palpation of the trapezius muscle (Fig. 20).

Greater Occipital Nerves. Move from the trapezius muscle to the base of the skull and probe both sides of the inion for the greater occipital nerves. If they are inflamed (usually as a result of trauma sustained in whiplash injury), the nerves are distinctly palpable. Inflammation of the greater occipital nerves commonly results in headache (Fig. 21).

Superior Nuchal Ligament. This ligament rises from the inion at the base of the skull, and extends to the C7 spinous process. It overlays and attaches itself by fibers to each spinous process of the cervical vertebrae and lies directly under your fingertips during palpation of the spinous processes. Although it is not a distinctly palpable structure, the area in which it lies should be palpated to elicit tenderness. Tenderness might indicate either a stretched ligament as a result of a neck flexion injury, or perhaps a defect within the ligament itself (Fig. 22).

RANGE OF MOTION

The normal range of neck motion provides the patient not only with a wide scope of vision but with an acute sense of balance as well. Range of motion in the neck region involves the following basic movements: (1) flexion, (2) extension, (3) lateral rotation to the left and right, and (4) lateral bending to the left and right. These specific motions are also used in combination, giving the head and neck a capacity for widely diversified motion. Although the entire cervical spine is involved in head and neck motion, the greatest amount of motion is concentrated: Approximately 50 percent of flexion and extension occurs between the occiput and C1, with the remaining 50 percent distributed relatively evenly among the other cervical vertebrae (with a slight increase between C5 and C6) (according to William Fielding). Approximately 50 percent of rotation takes place between C1 (atlas) and C2 (axis). These two cervical vertebrae have a specialized shape to allow for this greater range of rotary motion (Fig. 23). The remaining 50 percent of rotation is then relatively evenly distributed among the other five cervical vertebrae. Although lateral bending is a function of all the cervical vertebrae, it does not occur as a pure motion, but rather functions in conjunction with elements of rotation. A significant restriction in a specific motion may be caused by blockage in the articulation that provides the greatest amount of motion as, for example, in Klippel-Feil Deformity, where the bodies of two or more vertebrae are fused.