SOME OBSERVATIONS CONCERNING PAIN IN THE NECK, UPPER CHEST, AND ARMS

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The diagnosis of the specific neurologic lesion that produces pain in the neck and arm may present a difficult problem. Obviously these pain impulses that arise centrally or peripherally mediate through the cervical or brachial plexuses. Since the type of cases we have under consideration involves the brachial plexus, and since the lesion is peripheral to the spinal cord, careful attention to this portion of the nervous system should be our first endeavor.

The brachial plexus is a somewhat intricate interlacement of the primary divisions of the lower four cervical nerves, the first thoracic nerve, and occasionally an added branch from the fourth cervical and second thoracic segments. These nerve radicles pass through the foramina of the spine and form fasciculi, which in turn pass downward between the scalenus anticus and medius muscles, then under the clavicle and into the apex of the axilla for distribution to the arm.

In peripheral lesions of this group of nerves we must differentiate first between the effects of pressure on the nerve radicles producing sensory changes such as pain and paresthesia of a segmental type and second, injury to the main nerve trunks. The principal causes of the former are lesions such as tumors, protruded disks, or osteophytes which involve or compress the nerve radicles in the spinal canal or within the spinal foramina. In the latter or peripheral brachial plexus lesions there are pathologic conditions producing pressure or irritation in the neck, axilla, or arm. Therefore, if one plots out the sensory changes in these areas of the skin, referring if necessary to neurologic charts, and if, in addition, examination is made for reflex changes, muscular atrophy, and vasomotor disturbances in the upper extremities, the site of the pathologic lesion can be determined with reasonable accuracy.

During our investigation it must be kept in mind that in segmental lesions there is an overlapping of the sensory fields so that a clear demarcation is not always possible. As a rule, two adjoining root segments must be involved to affect the entire sensory perception in any particular zone of sensation. Likewise, muscular atrophy or weakness may be indeterminate, since the motor innervation of a muscle is derived from more than one segment.

To repeat, segmental neuritis affects the roots within the spinal canal or within the foramina. Lesions in the first area may be due to pressure

of tumors or inflammatory processes such as herpes or arachnoiditis. In the second area (spinal foramina) the pressure is caused most commonly by herniated intervertebral disks or by osteo-arthritic changes. Proper interpretation is important since pressure within these foramina is amenable to surgical procedures.

For practical purposes the following symptoms and physical signs are indicative of radicular nerve pressure:

(1) Acute stabbing or shooting pain and paresthesia in the neck, shoulder, arm, and anterior or posterior area of the chest.

(2) Increase of pain by slight displacement of the cervical cord as the result of coughing, sneezing, or straining.

(3) Some relief of pain by a forward position of the head.

(4) Increase of pain by lateral bending of the head toward the side of the lesion, accompanied by pressure on the vertex of the skull.

(5) Temporary relief by bending the head to the opposite side.

(6) Increase of radicular pain by jugular vein compression.

(7) Sensory changes of a segmental distribution in the neck, chest, or arm.

(8) Reflex changes, muscular atrophy, fibrillation, all of which may result from pressure of long standing.

(9) X-ray findings of a narrowed intervertebral space usually associated with obliteration of the normal lordotic curve of the cervical region of the spine.

(10) Oblique films of the neck showing encroachment or narrowing of one or more foramina.

(11) Spinal fluid, cervical block, and increase in total protein above 40 mg. per cent.

(12) Myelogram showing a shadow defect at the site of the lesion.

Case Reports

Case 1. Herniated cervical disk. A man, aged 44, complained of attacks of pain in the left arm of one year's duration. There was no history of trauma. The discomfort was increased by coughing or straining and occurred in episodes thirty to forty times a day. It increased after the patient arose from bed and radiated over the left manubrium and anterior region of the chest but not into the left arm. However, he was conscious of paresthesia in the first three fingers of the left hand. There was no tenderness over either scalenus anticus muscle.

Bending of the head toward the side of pain did not increase the discomfort, but jugular compression produced sharp exacerbation of pain in the left arm and hand. Mild hypesthesia to touch and pin prick occurred in the upper posterior aspect of the

left shoulder, along the radial aspect of the left forearm and involving the first three fingers. These sensory changes varied from time to time. There was no muscular atrophy, fibrillation, or changes in the tendon reflexes of the arm.

X-ray films showed a straightening of the cervical region of the spine and a narrowing of the intervertebral space between the sixth and seventh cervical vertebrae. Oblique films showed encroachment of the foramen between the sixth and seventh cervical vertebrae by a bony spur.

Spinal puncture revealed clear, colorless fluid, normal dynamics, 4 cells, 41 mg. per cent total protein, and negative globulin, colloidal gold curve, Wassermann and Kahn tests.

Cervical laminectomy* revealed a protruded cervical disk between the sixth and seventh cervical vertebrae. This was removed.

Postoperatively the patient noted an increase in the paresthesia along the distribution of the seventh cervical segment. A few days following the application of a cervical plaster cast to support the head, the paresthesia disappeared. The cast was removed on the nineteenth postoperative day. Recovery was complete.

Comment

This case represents a milder form of cervical disk compression. Aside from the pain and paresthesia in the distribution of the seventh cervical nerve segment, the positive findings were an increase in symptoms accompanying jugular compression and x-ray signs of a narrowing of the intervertebral foramen. Prompt removal of the herniated disk spared the patient a long period of suffering.

Case 2. Cervical osteo-arthritis. A laborer, aged 59, developed pain in his right shoulder ten days before coming to the Clinic. The pain was constant and had developed gradually without any history of trauma. Motion of the head in all directions except forward caused exacerbation of pain, which manifested itself over the right interscapular area and into the right arm, chiefly in the radial area of the forearm and thumb. The pain decreased when the patient was lying down and was relieved somewhat when he supported his right elbow. Increase in painful symptoms followed pressure over the right brachial plexus and axilla. Jugular vein compression increased the pain. There was no Horner's syndrome, but increased sweating in the right hand was noted.

X-ray of the chest was normal; there was no evidence of cervical rib or superior sulcus tumor.

Cervical x-ray films revealed straightening of the cervical region of the spine. Oblique x-ray films showed cervical osteo-arthritis with narrowing of the joint space and foramina between the fifth and sixth cervical vertebrae.

Although the signs and symptoms suggested involvement of the foramina between the fifth cervical and thoracic vertebrae as well, a diagnosis of herniated disk between the fifth and sixth cervical vertebrae was made.

Laminectomy revealed a severe nerve root compression between the fifth and sixth cervical vertebrae by a herniated disk and an osteophyte. Surgical relief of pressure at

*Operation in referred cases by Dr. W. J. Gardner.

this point did not relieve the pain. Within three weeks considerable atrophy developed in the right triceps muscle (fifth and sixth cervical vertebrae).

At the second operation bony spurs were removed from the foramina between the fifth and sixth cervical vertebrae and the seventh cervical and thoracic vertebrae.

Crutchfield calipers were applied to the calvarium, and postoperative head traction relieved the pain and paresthesia. The patient was discharged wearing a leather cervical collar to support the head.

Comment

This case illustrates the contrast between herniated cervical disk, which rarely involves more than one intervertebral space, and osteoarthritis, which may produce pressure involving several metameres. Due to technical difficulties the simpler operation was performed at the foramen between the fifth and sixth cervical vertebrae but was not sufficient to give relief. It was necessary to reopen the incision and relieve nerve root pressure from the seventh and eighth metameres.

Lesions peripheral to the spinal column produce symptoms and physical signs quite different from those noted in the preceding case reports. Conditions such as injuries about the neck and shoulder, tumors above the clavicle or in the apex of the lung, cervical ribs, crutch paralysis, pressure on the brachial plexus by hypertrophied scalenus anticus muscles, aneurism of the subclavian artery, and even heart lesions must be considered in the differential diagnosis. Likewise, diseases of the lungs other than tumors and lesions in or below the diaphragm may cause pain in the neck.

Many cases in which there is obvious irritation of the brachial plexus require careful neurologic study. The following symptoms and signs comprise some of the important features of brachial nerve irritation.

(1) Radiation of pain and objective sensory disturbances along the cervical, radial, median, and ulnar nerves.

(2) Muscular atrophy or fibrillation of peripheral nerve distribution.

(3) Tendon reflex changes.

(4) Sympathetic nerve irritation or paralysis causing vasomotor trophic changes or Horner's syndrome.

Again by consulting various tables and charts in neurologic treatises the internist can readily determine which nerves are involved. The clinical findings in any particular case depend on the severity and duration of the pathologic changes in the nerves. It must be borne in mind that in experimental pressure on a nerve trunk the motor functions and various forms of sensitivity disappear in the following order: Proprioceptive impulses are blocked first; the impulses conveying pressure,

touch, pain, heat, cold, and vasoconstriction then disappear in this order. Reflex changes and muscular paralysis appear later.[1]

Case 3. Scalenus anticus syndrome. A male laborer, aged 29, began to notice pain associated with numbness and tingling in the third, fourth, and fifth fingers of the right hand three and one-half years before admission to the Clinic. The pain, while worse at night, was increased by use of the arm. When severe it spread to the shoulder and the right anterior upper area of the chest.

The physical findings consisted of hypalgesia of the right fourth and fifth fingers. Movement of the neck was not painful and did not affect the radial pulsations. Pressure over the right scalenus anticus elicited tenderness and increase of pain in the right hand. Pressure over both the right and left scalenus anticus muscles obliterated the radial pulses.

X-ray of the cervical region of the spine including oblique views showed no abnormality.

Right anterior scalenotomy was performed. The muscle was found to be thick and fibrous, especially over the brachial plexus.

Following operation the patient was relieved of all pain and noted only a transient numbness of the fingers.

Comment

There is considerable difference of opinion regarding the validity of a scalenus anticus syndrome. Anatomically the scalenus anticus muscle arises by four tendinous slips from the anterior tubercles of the transverse processes of the third to the sixth cervical vertebra. The four slips unite to form a flat muscle which extends downward and forward to be inserted into the scalene tubercle on the upper surface of the first rib. The nerve supply to the muscle is from branches of the fourth, fifth, and sixth cervical nerves. The scalenus anticus muscle lies in front of the roots of the brachial plexus, and near its insertion it passes over the second portion of the subclavian artery and under the subclavian vein. Therefore, in the event that there is increased backward pressure from spasm or hypertrophy of this muscle, especially in the presence of a cervical rib, we have the possibility of compression of the brachial plexus or subclavian artery.

Nachlas[2] doubts that this syndrome, which was first suggested by Adson and Coffey,[3] is a true pathologic entity. He believes that the scalene triangle formed by the cervical spine, the superior surface of the thorax, and the scalenus anticus muscle has two fixed sides and that this triangle is enlarged by spasm of the muscle. Thus any muscular pressure should relieve rather than exert pressure in the brachial plexus. Furthermore, he maintains that the benefit that may come from section of the scalenus anticus muscle is due to a better extension of the cervical area of the spine and an increase in the intervertebral foramina. In other

words, the symptoms attributed to this syndrome are due to radicular nerve pressure within the foramina.

On the other hand, our experience and many of the case reports in literature indicate that anterior scalenotomy gives relief not only of pain but also of vasomotor and anoxemic disturbances in the brachial nerve distribution. Regardless of anatomic considerations, anterior scalenotomy has practical value.

In our fourth and final case report we wish to discuss an uncommon but serious cause of pain in the neck and upper extremity. A tumor in the superior sulcus of the lung may produce pain of continuous and increasing degree without cough or respiratory symptoms. It is our experience that the cause of this pain is overlooked frequently, and the diagnosis is missed in the early stages of the disease unless one remembers to look for a Horner's syndrome and to take x-ray films of the lungs. A homogeneous shadow at the superior pulmonary sulcus on the side of the painful symptoms is usually diagnostic. An additional finding may be destruction of the first and second ribs. Since the tumor is malignant in type and usually resistant to x-ray therapy, the usual treatment is palliative, such as posterior rhizotomy or an attempt to cut the spinothalamic tracts on that side by cordotomy.

Case 4. Superior sulcus tumor (Pancoast). A man, aged 37, presented a long and disturbing history of pain in the right shoulder and arm. The symptoms began in August, 1944, after he had entered the Armed Services. It affected the right scapula and was increased by coughing, sneezing, and straining. The constant pain became more severe in November, 1944, and at that time a diagnosis of arthritis was entertained.

In the next six months the patient was studied at three Army hospitals and was discharged with the diagnosis of "hysteria" (patient's statement). Due to continued pain he was seen again at a veterans' hospital and granted 40 per cent disability.

The correct diagnosis was made by his home town physician, who remembered to take an x-ray of the lungs and discovered a right superior sulcus tumor. A course of radiation therapy given at this time failed to relieve the pain.

Operation performed in a Cleveland hospital consisted of biopsy and electrocoagulation of the tumor. The pathologic report was undifferentiated carcinoma.

Upon examination at the Clinic in February, 1946, the principal findings were: (1) pain and hyperesthesia in the distribution of the eighth cervical nerve and the first and second thoracic nerves, (2), increased pain by coughing and sneezing, (3) Horner's syndrome, right side, and (4) x-ray demonstration of a tumor of the right superior pulmonary sulcus. A rhizotomy, fifth cervical vertebra to the second thoracic vertebra, was performed on March 26, 1946, and on April 1, 1946, a cordotomy between the third and fourth cervical vertebrae was done. The pain was relieved somewhat but not completely.

Postoperative neurologic study showed that, while the right spino-thalamic tract was interrupted, the loss of pain, heat, and cold perception was not complete.

Comment

This case illustrates the long period of suffering (one and one-half years) that preceded discovery of the cause of pain. It is possible, of course, that a more careful neurologic study, especially with reference to Horner's syndrome, might have suggested the ultimate diagnosis. Cases of intractable pain present day and night should always suggest the possibility of a malignant tumor. While the surgical removal of a pulmonary superior sulcus tumor is seldom feasible, a cure by this means is possible if the diagnosis can be made in the very early stages of the disease.

Conclusions

We have presented clinical excerpts from 4 cases presenting a major symptom of pain in the neck, chest, and arm. Obviously there are many other pathologic lesions that produce cervical nerve root and brachial plexus irritation. However, careful anatomic and pathologic investigations will lead to the correct diagnosis in most instances.

References

1. Bing, R.: Textbook of Nervous Diseases, translated into English and enlarged by Haymaker, W. (St. Louis: C. V. Mosby Co., 1939).

2. Nachlas, I. W.: Scalenus anticus syndrome or cervical foraminal compression? South M. J. **35**:663-667 (July) 1942.

3. Adson, A. W., and Coffey, J. R.: Cervical rib; method of anterior approach for relief of symptoms by division of scalenus anticus. Ann. Surg. **85**:839-857 (June) 1927.