Atypical presentation of C-7 radiculopathy

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Object. The authors retrospectively reviewed the presenting symptomatology and 6-month outcome in 241 consecutive patients who underwent C6–7 anterior cervical discectomy (ACD) from an overall series of 1008 patients in whom the senior author performed one-level procedures.

Methods. In 28 (12%) of the 241 patients, the sole complaint was subscapular pain on the side ipsilateral to nerve root compression. In 11 patients (5%), the primary complaint was unilateral deep breast or chest pain. No patient experienced any of the traditional radicular signs involving C-7 such as numbness of the second or third digits, pain in the triceps, and/or atrophy or weakness of the triceps or pronator muscles. Of the 28 patients presenting with subscapular pain 238 (93%) of 241 experienced complete symptom relief within 6 months, and of the 11 who presented with chest pain complete relief or relief to the point of requiring nonnarcotic analgesic agents occurred in nine cases.

Conclusions. Approximately 15% of patients with a C-7 radiculopathy are likely to present with atypical symptoms that, if persisting after nonsurgical therapy, will often resolve after ACD and fusion.

Key Words • atypical symptom • radiculopathy • cervical spine • chest pain • subscapular pain • anterior cervical discectomy

Degenerative disease of the cervical spine presents in myriad ways. The predominant radicular complaints are primarily those of numbness, pain, and atrophy in a specific dermatomal distribution. Thus, for example, patients with C-6 nerve root compression often present with radicular pain in the distribution of the biceps muscle in conjunction with numbness or dysesthesias in the thumb. Patients with C-7 radiculopathy often complain of severe triceps muscle pain that they describe as penetrating and complain of numbness in the second and third digits of the relevant hand.

Less well described are more unusual presentations of cervical radiculopathy. In 1934, Nachlas described an entity that he called “pseudo-angina pectoris.” Nearly 70 years ago Hanflig described pain in the shoulder, arm, and the precordium due to cervical arthritis. In 1944, Michelsen and Mixter reported some cases of scapular pain attributed to herniated cervical discs diagnosed by lipiodol injections. In a more recent publication, Jacobs described what he called “cervical angina.” Yoss, et al. reported that 39% of patients with a herniated disc involving C-7 or C-8 presented with interscapular or scapular pain. Additionally, in 1943, Semmes and Murphey reported four cases in which a C-7 herniated disc presented with symptoms simulating coronary disease. Finally, Yeung and Hagen reported chest wall pain in a patient in whom C-7 nerve root compression was secondary to a herniated disc. Most of these patients had undergone evaluation for true angina pectoris, pleurisy, fractured rib, gastritis, and breast/chest wall tumors.

The senior author (L.F.M.) has treated several patients with C6–7 lesions who presented with either unilateral subscapular pain or chest pain and in whom the sole neuroimaging finding was lateral C6–7 nerve root compression. Most had undergone extensive evaluation for chest pain and in five cardiac catheterization had been performed. Initially these patients were treated with analgesic agents and/or steroid injections at the site of the discomfort, which in those with subscapular pain is almost always the inferior portion of the scapula. Because of the potential for misdiagnosis and because a number of our patients had been told that their disorder was psychogenic or untreatable, it appeared appropriate to review our experience.

Clinical Material and Methods

The database of cases treated by the senior author was reviewed for ACD in cases of one-level degenerative disease. Of 1008 consecutive single-level ACDs, 241 were performed in patients with C6–7 lesions. In the overwhelming majority of patients surgery was indicated based on conventional symptoms such as weakness in the muscles innervated by C-7 and/or sensory loss within the C-7 dermatome. Some patients who only suffered pain in the classic C-7 distribution, usually in the triceps, also underwent surgery. In 39 (16%) of the 241 patients presentation included somewhat more atypical complaints in which symptomatology was limited to either subscapular pain or deep breast/chest pain. In seven of these patients, left-sided nerve root compression was present, and all had
undergone extensive cardiac workups that yielded no useful result. All but one of these patients had been seen previously by at least one neurosurgeon, and many had consulted numerous neurosurgeons and orthopedic spine surgeons. They had been told that their symptomatology was not related to C6–7 lesion as demonstrated on MR imaging or CT myelography. Four of the 39 patients had suffered symptoms for more than 24 months and two for more than 5 years.

**Surgical Technique**

In all cases a standard ACD and fibular allograft fusion was performed with the assistance of the operating microscope. A single-level ACP (Synthes Spine, Paoli, PA) was placed in 11 patients, no plate was used in 28. Indications for placement of the plate were the patient’s desire not to wear a collar and for rapid return to work if possible within 10 to 14 days.

**Results**

Minimum follow-up duration was 6 months, and all but one patient were followed for a minimum of 2 years. In 26 of the 28 patients with subscapular pain, the pain was dramatically improved within 60 days and was sustained 6 months in all. At 2 years, pain had developed in one patient ipsilateral to the side of the original subscapular lesion. The pain was in its preoperative location and although less severe, it was clearly worrisome. Repeated neuroimaging in this patient failed to demonstrate any obvious lesion responsible for the recurrent symptom. Recovery was somewhat slower in the patients in whom symptom duration exceeded 2 years. All but two patients, however, reported dramatic relief at their 6-month follow-up visit. In all 11 patients who had undergone ACP-assisted stabilization successful fusion was demonstrated on follow-up plain radiographs. In 26 of the 28 patients in whom ACPs were not placed successful fusion was also documented. In two patients in whom plain radiography demonstrated evidence of pseudarthrosis, symptoms were absent; CT scanning was performed in both to assess the fusion site and evidence of pseudarthrosis was revealed on fine-cut CT scans.

This sample size is too small to allow us to draw any conclusion regarding fusion rate efficacy of single-level ACPs in this particular patient population. An extensive review was performed to determine whether these cases involving an atypical presentations differed with regard to a number of factors including age, sex, and neuroimaging/radiographic features. No unique features could be identified. Our database lacked sufficient detail to allow for specific examination of the mechanism associated with the initial complaint; we confirm, however, that there was no relationship with the financial sponsorship in terms of the initial complaint of patients with C-7 radiculopathy and the ultimate outcome.

**Illustrative Case**

This 55-year-old woman presented with progressively severe right-sided chest pain that had developed during a 6-week period. Eight months prior to her initial visit, she had experienced several days of triceps discomfort, which had resolved completely within a few days. Her chest pain became so severe that it affected almost all activities of daily living. After a variety of diagnostic studies including chest CT scanning, MR imaging of the cervical spine was performed (Fig. 1). After an uneventful course of traction and physical therapy, the patient underwent a standard ACD and fibular allograft fusion. Within 4 hours, the patient’s chest pain was completely relieved. Six months postoperatively she remains free of pain and has resumed all of her activities.

![Fig. 1. Sagittal (left) and axial (right) T2-weighted MR images revealing disc protrusion at C6–7 (left) and severe compression of the right C-7 nerve root (right) in a patient with severe right chest pain.](image-url)
Atypical C-7 radiculopathy symptoms

Discussion

Anterior cervical discectomy is routinely performed in thousands of patients each year in the US, predominantly for degenerative disease causing radicular complaints. There exists, however, a relatively small set of patients with unilateral subscapular and/or chest pain in whom there are no other findings referable to the C-7 nerve root. In the senior author’s initial experience, because this subset was not recognized, they were often treated with analgesic agents and steroid injections particularly in cases involving subscapular pain and were told that their symptoms could not be explained by their C6–7 lesion. After demonstration of a successful outcome in a young woman with a very large cervical disc protrusion, who presented with a 5-year history of unilateral subscapular pain, the senior author began to include this clinical picture in his assessment of patients with C6–7 disc disease.

The mechanism underlying subscapular and unilateral chest pain is unclear. The pattern of pain, which has also been called vertebrogenic, does not have a clear cause.1 In a series of experiments Frykholm,2 however, demonstrated that stimulation of the ventral spinal nerve root produces more diffuse pain than that seen when the dorsal root is stimulated. This empirical observation indicates the possibility that deep afferent fibers, which are also known to be associated with a more diffuse pattern of pain and with poor localization, may be activated by ventral nerve root stimulation. A similar explanation based on Frykholm’s observation would also apply to the midline intrascapular pain, which is often a characteristic symptom in patients with C5–6 disc disease.

In this series successful outcomes have been sustained for at least 2 years in the overwhelming majority of patients. This strongly suggests that in appropriately evaluated patients, ACD in cases involving these two complaints, which interestingly are almost always separate, will relieve these symptoms. It is possible that patients with classic C-7 radicular symptoms and lateral nerve root compression could also undergo surgery via a posterior approach, but the senior author has limited experience with the use of this approach in patients with such a unique symptomatology. Of course unilateral left-sided chest pain must be distinguished from pain of cardiac origin. In patients with disease at C6–7 causing left-sided C-7 nerve root compression, the patients’ complaints were more of a constant penetrating pain, somewhat independent of activity, not a crushing sensation or feeling of pressure, which much more frequently characterizes left-sided chest pain of cardiac origin.

Conclusions

Approximately 15% of patients with C6–7 degenerative disc disease involving unilateral C-7 nerve root compression presented with either subscapular pain or breast/chest pain. Approximately 90% of such patients experienced long-term relief following ACD and fusion, indicating that their symptoms were clearly referable to the C-7 nerve root.

References

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