

Case Study

Radiographic changes induced after cervical facet radiofrequency denervation

Michelle Smith, PA-C^a, Gene Ferretti, DO^b, Steven Mortazavi, MD^{a,*}

^aPain Management Center, St. Luke's Hospital, 801 Ostrum Street, Bethlehem, PA 18015, USA

^bDepartment of Radiology, St. Luke's Hospital, 801 Ostrum Street, Bethlehem, PA 18015, USA

Received 1 October 2004; accepted 30 April 2005

Abstract

BACKGROUND CONTEXT: Paraspinal infections after zygapophyseal (facet) radiofrequency denervation (RFD) are a serious but rare complication of this procedure. We are aware of only one case report of an epidural abscess after facet joint injection.

PURPOSE: To report post-procedure inflammatory changes after cervical facet RFD.

STUDY DESIGN: Case report.

PATIENT SAMPLE: A 35-year-old Caucasian female.

METHODS: Retrospective case review.

RESULTS: The patient underwent cervical RFD and was admitted to the hospital 7 days after her procedure with severe neck pain. Magnetic resonance imaging (MRI) with contrast revealed what appeared to be evidence of a paraspinal muscle abscess although blood tests were negative. She was treated with antibiotic therapy, yet she never developed systemic signs of infection. A follow-up MRI without contrast revealed no evidence of infection, and she was discharged home on hospital day 6. At her first follow-up visit, she was still experiencing scalp pain and paraspinal muscle spasm. During subsequent follow-up visits, she has continued to improve clinically without experiencing signs of infection. Another follow-up MRI 6 weeks after her discharge home revealed persistent minimal left paraspinal enhancement at C2–3, possibly representing post-procedure granulation tissue with no evidence of abscess.

CONCLUSIONS: Post-procedural MRI findings after radiofrequency lesioning can resemble radiographic findings associated with a paraspinal abscess. Patients with radiographic findings consistent with abscess should only be treated if clinical signs or symptoms of systemic infection are present.

© 2005 Elsevier Inc. All rights reserved.

Keywords:

Abscess; Epidural; Rhizotomy

Introduction

Radiofrequency denervation (RFD) is a technique in which insulated needles are percutaneously placed to defined targets and radiofrequency waves are emitted from an exposed needle tip. A small, controlled thermal lesion is created circumferentially in tissues approximately 3 mm adjacent to the needle tip [1]. RFD of the zygapophyseal (facet) joints can effectively reduce musculoskeletal pain stemming from

facet joint arthropathies (spondylosis). Each facet joint is supplied by the medial branch of the dorsal ramus of the nerve root above and below as they exit their respective neural foramen [2]. In order to obtain successful RFD, therefore, the medial branches both cephalad and caudal to each joint must be lesioned. The symptoms of facet pain are often nonspecific and can include weather-related dull aching neck, thoracic or low back pain which is often worse with hyperextension. Patients may also have tenderness to palpation over the corresponding facet joints. Imaging studies (X-ray, computed tomography scan, magnetic resonance imaging [MRI]) may be negative or often show only degenerated, hypertrophic joints whereas bone scanning can often reveal increased radiopharmaceutical uptake in degenerative joints. In patients whose spinal pain is thought to be mediated

FDA device/drug status: not applicable.

Nothing of value received from a commercial entity related to this manuscript.

* Corresponding author. Valley Pain Specialists, PC, 260 East Broad Street, Bethlehem, PA 18018. Tel.: (610) 954-9040; fax: (610) 954-9093.

E-mail address: steven_mortazavi@hotmail.com (S. Mortazavi)

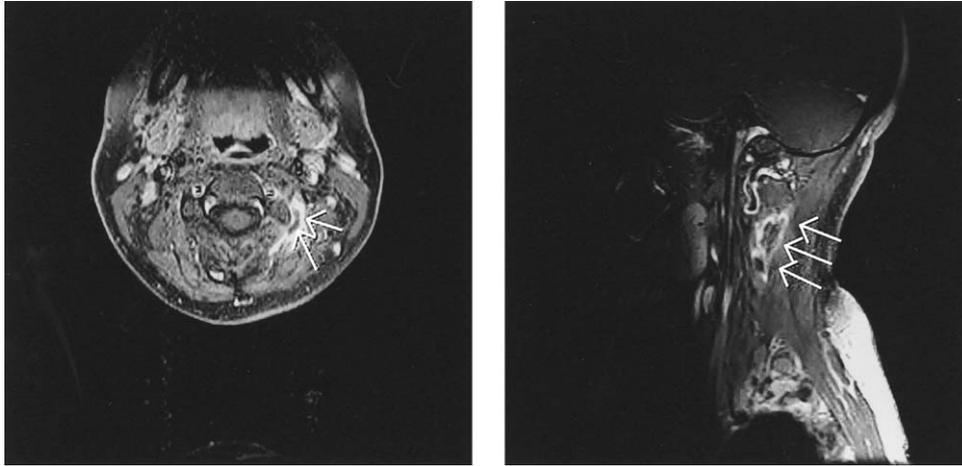


Fig. 1. Axial T1 (left) and sagittal T1 (right) post-contrast MRI images showing ring-enhancing fluid collection in the left paraspinal muscles on the day of admission, 7 days after her C2–4 radiofrequency lesioning.

from the facet joints, a diagnostic medial branch block with local anesthetic is performed to determine whether RFD will be likely to benefit the patient. If the patient responds positively to the medial branch block as demonstrated by reduced pain and improved range of motion, RFD is offered to the patient at a later date. Optimally, facet nerve RFD should only be offered to patients with substantial (greater than 75%) pain relief from the diagnostic medial branch block [3]. Risks of RFD are small but include bleeding, infection, and nerve damage to spinal nerve roots or the spinal cord. In the literature, only one case of epidural abscess after facet joint RFD has been reported [4]. We report a case of a patient undergoing cervical RFD who post-procedurally was initially diagnosed with a paraspinal abscess based on radiographic findings.

Case report

A 35-year-old otherwise healthy female underwent a left C2, C2-3 (third occipital nerve), C3, and C4 (four level) cervical medial branch RFD for treatment of her intractable neck pain with associated headaches. The procedure was performed in a hospital-based outpatient pain management center by an experienced practitioner. Neither sedation, nor preoperative antibiotics were used for either of her procedures. The patient was prepared using a povidone iodine solution and draped in a standard fashion. Four separate disposable RFK-C10-D-S radiofrequency needles were used for the procedure with a single-needle, single-glove technique. Previously the patient had responded well to a diagnostic medial branch block of the same nerves. She experienced only moderate discomfort during both procedures, which were performed 2 weeks apart. Several days after her RFD, she began to experience more sensitivity of her scalp and posterior cervical region. She also began complaining of increased neck pain and non-migraine type

headaches. In addition, she began noticing a tender swollen area on her scalp superior to the injection site.

Seven days after her RFD she presented to her local neurologist whom she had been seeing for her chronic migraine headaches. Based on her new complaints, an MRI of the cervical spine was obtained with and without contrast. The MRI report stated: “There is edema and enhancement within the left paraspinal soft tissues adjacent to the C2-3 and C3-4 facet joints. There is also a peripherally enhancing fluid collection as described above consistent with small abscess” (Fig. 1). The patient was started on broad-spectrum antibiotics (cefepime and vancomycin) in the emergency department, and orthopedic, infectious disease, and pain management consultation was obtained. The patient was subsequently admitted for observation. Blood cultures were obtained and were reported as negative for infectious process



Fig. 2. Axial T2-weighted image obtained on post-procedure day 12 demonstrating persistent left paraspinal lesion at approximately C2–3.

at 48 hours. Interventional radiology was consulted to aspirate this collection under computed tomographic guidance on her first hospital day, however, they elected to follow the patient conservatively. At no point during or before her 5-day hospitalization did she experience fevers or other systemic signs of illness, nor did she develop leukocytosis or elevation of the erythrocyte sedimentation rate.

She subsequently had a repeat cervical spine MRI without contrast performed during her fourth hospital day, which was reported as “no evidence for paraspinous abscess or mass” (Fig. 2). Her neurological examination remained normal at all times during her hospitalization, yet she remained quite dysesthetic over her left posterior scalp area. Because of her improving and stable clinical condition, antibiotics were discontinued and she was discharged home.

Based upon the lack of clinical findings for infection and a history of undergoing a RFD procedure (not a steroid or nerve block procedure as originally thought), the attending radiologist later revised the interpretation of the original MRI. It was believed that such contrast-enhancing ring lesions in the paraspinous muscles could be secondary to necrosis of the soft tissues. The patient’s repeat MRI on her fourth hospital day did not use contrast and revealed only edema in the region of the procedure. Necrotic areas were not noted at that time; however, upon further review of the second MRI, small high signal areas were identified on axial images at C2-3 in the left paraspinous tissues (Fig. 2). At her first follow-up visit with our pain management service 2 weeks after discharge from the hospital, she was still experiencing pain and limited mobility although it was somewhat improved. She was seen 1 month after discharge and continues to improve slowly with less dysesthesia and no signs of systemic infection or neurological deficit. A repeat MRI with contrast administration obtained 7 weeks post-procedure continued to reveal small persistent left-sided paraspinous enhancement at C2-3 with only mild edema and no evidence of abscess (Fig. 3). At her visit 3 months post-procedure,

she has continued to experience mild posterior scalp dysesthesia and cervical pain similar to her baseline discomfort. In addition, the tender swollen area on her scalp has subsequently resolved. Following her last visit 7 months post-procedure, she continues to improve slowly with less baseline discomfort and migraine-type headaches.

Discussion

This represents the first case, to our knowledge, in which a ring-enhancing lesion was demonstrated in the paraspinous muscles after cervical RFD. Although paraspinous abscess cannot be completely excluded, it appears that these radiographic findings represent normal post-procedural necrotic changes after cervical RFD. It is known that inflammatory changes after radiofrequency lesioning are seen on computed tomography or MRI. Limanond et al. state that “a T2 hyperintense rim around the ablation area is a possible finding, likely related to edema from thermal injury” [5]. If an abscess is clinically suspected, gadolinium should be administered with MRI to enhance the accuracy of diagnosis. In this case repeat MRI on hospital day 4 did not use gadolinium and was likely therefore falsely negative and unable to identify any paraspinous abnormalities.

Radiographically, post-procedure inflammatory or necrotic changes from RFD and small paraspinous musculature abscess can be difficult to differentiate. This case represents a patient with “normal” post-procedure dysesthesia of the C2 medial branch and the third occipital nerve who was evaluated with MRI 7 days post-procedure. The exact nature of the procedure was not communicated to the interpreting radiologist, and an original diagnosis of abscess was made. It is known that complications of lumbar facet RFD are extremely low. Results have shown a “1.0% incidence of minor complications per lesion site” [6] with the complications including pain at the radiofrequency site

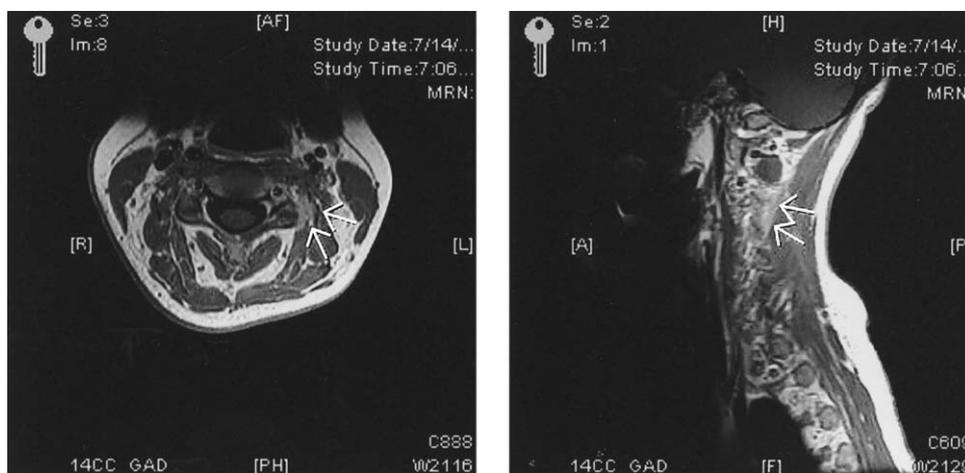


Fig. 3. Axial T1 (left) and sagittal T1 (right) post-contrast images obtained 7 weeks post-procedure continue to reveal persistent minimal paraspinous enhancement at C2-3.

that lasted more than 2 weeks (3 of 616 subjects, 0.49%) and three cases of neuritic pain. Another report stated that “no cases of infection, new motor deficit, or new sensory deficit were identified.” [7].

Given the extremely low incidence of complications from RFD, we suggest when faced with a patient with worsening spinal pain after RFD, MRI with contrast be obtained only if systemic signs of infection are present or the patient experiences a change in their neurologic condition.

References

- [1] Kline M. Radiofrequency techniques in clinical practice. *Interventional pain management*. Philadelphia: WB Saunders, 1996:185–217.
- [2] Whitworth LA, Feler CA. Application of spinal ablative techniques for the treatment of benign painful conditions. *Spine* 2002;27:2607–12.
- [3] Schellhes K. Facet nerve blockade and radiofrequency neurotomy. *Neuroimag Clinics North Am* 2000;10:493–501.
- [4] Alcock E, Regaard A, Browne J. Facet joint injection: a rare form of epidural abscess formation. *Pain* 2003;103:209–10.
- [5] Limanond P, Zimmerman P, Ramon S, Kadell B, Lu D. Interpretation of CT and MRI after radiofrequency ablation of hepatic malignancies. *Am J Roentgenol* 2003;181:1635–40.
- [6] Jerosch J, Castro W, Liljenquist V. Percutaneous facet coagulation: indication, technique, results and complications. *Neurosurg Clinics North Am* 1996;7:119–34.
- [7] Kornick C, Kramarich S, Laer T, Sitzman T. Complications of lumbar facet radiofrequency denervation. *Spine* 2004;29:1352–4.



One Hundred Ten Years Ago in Spine

In 1895, Wilhelm His [1] published a work on anatomic nomenclature. This work served as the basis for the Basle *Nomina Anatomica*, which is said to have reduced the number of terms used in anatomy by 80%. His was professor of anatomy at Basel from 1857 until 1872, and thereafter he held the same position at Leipzig until 1904. He published on numerous topics, with an emphasis on embryology. Similar to William Fielding, a pioneer in spine care in the next century, His

was known for his preoccupation with presentation, using such cutting-edge techniques as microphotography, lantern-slides, models and his own drawings. *Nomina Anatomica*, along with the Bertillon classification of diseases, were the 19th century precursors to further efforts along the spectrum of definition, classification and codification that led to current systems in use in spine care [2].

References

- [1] His W. *Die anatomische Nomenclatur*. Leipzig: Veit & Co, 1895.
- [2] Fardon DF, Milette PC, Combined Task Forces of the North American Spine Society, American Society of Spine Radiology, and American Society of Neuroradiology. Nomenclature and classification of lumbar disc pathology. Recommendations of the Combined Task Forces of the North American Spine Society, American Society of Spine Radiology, and American Society of Neuroradiology. *Spine* 2001;26:E93–113.