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Success of Occipital Neurostimulation Therapy for Persistent Occipital Neuralgia after Anterior Cervical Discectomy and Fusion: A Case Study

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Abstract

This case report details diagnostic and therapeutic processes in managing a 52-year-old female with chronic cervical pain and myeloradiculopathy resulting from a C6-C7 herniated nucleus pulposus and cervical spinal canal stenosis. Initially misdiagnosed with a shoulder strain, further assessment revealed significant spinal pathologies, necessitating an Anterior Cervical Discectomy and Fusion (ACDF). Despite initial surgical success, the patient encountered complications including pharyngoesophageal dysphagia and continued neuropathic pain resulting from occipital nerve maladaptation. Initial and subsequent interventions included pharmacological treatments, nerve blocks, and Occipital Nerve Stimulation (ONS), which ultimately provided substantial relief and improved quality of life. This case underscores the complexity of diagnosing and treating cervical spine disorders, highlighting the need for comprehensive evaluation and personalized treatment strategies to manage such challenging conditions effectively.

Introduction

Chronic cervical pain is a pervasive condition that can significantly impact quality of life, often requiring comprehensive diagnostic approaches and multifaceted treatment strategies [1]. In the realm of spinal pathologies, cervical radiculopathy and myeloradiculopathy stand out due to their complex etiologies and the intricate nature of the cervical anatomy, which demands a thorough understanding of both biomechanical and neurophysiological aspects for effective management [2].

The cervical spine is uniquely vulnerable to a spectrum of degenerative and traumatic conditions due to its high mobility and the significant biomechanical stresses it endures [3]. Cervical radiculopathy, characterized by pain and neurological symptoms that radiate along a nerve root, often results from mechanical compression and inflammation caused by disc herniation or spondylosis [4]. Similarly, myeloradiculopathy involves not only the nerve roots but also the spinal cord, leading to a more complex clinical presentation that may include motor deficits, sensory disturbances, and autonomic dysfunction [5].

Management of these conditions is challenged by the variability in clinical presentations and the underlying pathophysiological mechanisms. Initial conservative treatment often includes pharmacologic pain management, physical therapy, and activity modification. However, persistent or severe cases may require more invasive approaches, such as epidural steroid injections, which aim to reduce inflammation and pain by delivering steroids directly to the affected area [6].

When conservative measures fail, surgical interventions such as Anterior Cervical Discectomy and Fusion (ACDF) become necessary. ACDF aims to relieve nerve root or spinal cord compression by removing the offending disc material and restoring vertebral stability with the fusion of adjacent vertebrae [7]. While ACDF is generally effective in alleviating symptoms and preventing further neurological damage, it is not devoid of risks and complications such as dysphagia [8], recurrent laryngeal nerve palsy [9], or adjacent segment disease [10], which must be considered.

The complexity of managing cervical spine disorders is further compounded by the need for tailored treatments based on individual patient characteristics, including age, comorbidities, and specific anatomical and pathological considerations. For instance, patients with fewer comorbidities may have better surgical outcomes and a more robust response to physical rehabilitation compared to older patients with significant systemic health issues [11].

This case report illustrates the intricate decision-making process in managing a patient with cervical radiculopathy and myeloradiculopathy, reflecting on both the successes and challenges of current therapeutic strategies. Through this discussion, we aim to enrich the understanding of cervical spine pathologies and foster a deeper appreciation of the complex interdependencies required to effectively manage these challenging conditions.

Case

A 52-year-old female with a history of Calcium Pyrophosphate Deposition Disease (CPPD), hyperparathyroidism, gastric bypass surgery, and inflammatory arthritis treated with hydroxychloroquine since 2017, presented to the emergency department with pain in her arm, shoulder, and scapula. The onset of pain occurred when she was using a crimping tool, during which she felt a pop in her neck. Upon examination, she demonstrated significant neuropathy in both upper extremities, accompanied by weakness. Initially diagnosed with a shoulder strain, she was discharged from the emergency department. However, her pain persisted, leading to a referral for neurosurgical evaluation two months later.

Further evaluation revealed significant myeloradiculopathy stemming from a C6-C7 herniated nucleus pulposus, along with moderate to severe cervical spinal canal stenosis, as confirmed by MRI. This prompted the decision to proceed with an anterior cervical discectomy and fusion at C6-C7. Meanwhile, the patient continued her medications: meloxicam 15 mg daily, ergocalciferol 50,000 units daily, oxycodone 5 mg every six hours as needed, hydroxychloroquine 300 mg daily, and acetaminophen 500 mg as needed.

Four months post-onset of her symptoms, the patient underwent the planned C6-C7 anterior cervical discectomy and fusion, which included hardware fixation and plating across two segments. Postoperatively, she developed pharyngoesophageal dysphagia, requiring multiple ENT consultations and speech therapy sessions. Despite these complications, there was a noted improvement in the use of her bilateral upper extremities, with gradual improvement in residual paresthesia and dexterity in her hands.

Her pain management journey continued with the treatment of cervicogenic headaches and occipital neuralgia, benefiting significantly from bilateral greater occipital nerve blocks-achieving an 80% improvement on the left side and 10% on the right, which improved to about 70% pain relief bilaterally after a second set of nerve blocks. She proceeded with bilateral C2/C3 facet blocks under fluoroscopy, reporting more than 50% relief, leading to a second set of blocks and plans for bilateral C2-C4 Radiofrequency Ablation (RFA). However, she experienced worsening numbness and tingling, which was only resolved with Cymbalta 60 mg after gabapentin failed to provide relief. Despite reported success with facet blocks, she did not find relief from RFAs.

Subsequently, the patient underwent Trigger Point Injections (TPIs) in the trapezius, cervical paraspinal, and rhomboid muscle groups, which, contrary to expectations, exacerbated her pain. Reevaluation by a surgical team found no indication for further surgical intervention, and her medications provided only mild relief.

After a detailed discussion with the patient, a decision was made to proceed with a trial of occipital nerve stimulation (SCS) under fluoroscopy. During this procedure, 14-gauge Touhy needles were advanced along the occipital ridge toward the left and right mastoid processes. Stimulator leads were then implanted through the needles. This intervention resulted in 90-100% pain relief on her left side and 50% on her right side initially. Reprogramming by Abbott representatives enhanced the relief on her right side to over 75%. Ultimately, the patient underwent placement of bilateral occipital nerve stimulators and a right subclavicular pulse generator. She continues to report 85% overall relief from her symptoms, underscoring a significant improvement in her quality of life post-interventions.

Discussion

The case of a 52-year-old female with a complex medical history presents a quintessential example of the challenges in diagnosing and managing cervical spine disorders, particularly when initial symptoms may mimic less severe conditions. Initially diagnosed with a shoulder strain, further evaluation revealed underlying severe cervical pathologies, illustrating the necessity for thorough diagnostic processes in cases of atypical pain presentations in the upper extremities. This case underscores the importance of considering a differential diagnosis that includes cervical spine pathology in patients presenting with arm and shoulder pain, especially when accompanied by neurological deficits.

The management of this patient involved a combination of pharmacologic treatments, surgical intervention, and various pain management techniques, reflecting the often-multifaceted approach required for such conditions. The eventual decision to perform an Anterior Cervical Discectomy and Fusion (ACDF) at C6-C7 was based on significant myeloradiculopathy and radiographic evidence of herniated nucleus pulposus and spinal stenosis. The surgery, while initially successful in alleviating some of the patient's symptoms, also led to complications such as pharyngoesophageal dysphagia, a known but less common postoperative outcome of ACDF.

Post-surgical management strategies, including greater occipital nerve blocks and radiofrequency ablation, were pivotal in addressing the patient's persistent pain and headache. The varied response to these interventions highlights the unpredictable nature of pain relief techniques and the necessity for personalized treatment plans. Moreover, the case illustrates the potential utility and effectiveness of occipital nerve stimulation

(ONS) in managing refractory cervicogenic headaches and occipital neuralgia, especially after other modalities fail or result in incomplete symptom relief.

This case contributes to the existing literature by emphasizing the complex interplay of spine pathology, surgical intervention, and advanced pain management techniques. It also raises awareness about the potential for misdiagnosis in patients with multifactorial pain presentations and the critical role of a detailed clinical evaluation to avoid delays in appropriate treatment. The long-term management strategies discussed herein provide valuable insights into the potential adjustments needed in treatment plans to address evolving symptoms and complications, showcasing the dynamic nature of managing chronic pain associated with cervical spine disorders.

Further, the evolution of biomedical technology and pharmacotherapy continues to broaden the therapeutic landscape. Innovations such as cervical disc arthroplasty offer an alternative to fusion with the potential to preserve motion and reduce the risk of adjacent segment degeneration [12]. In the realm of pharmacotherapy, advancements in molecular biology have facilitated the development of targeted therapies that could potentially modulate the underlying pathological processes of cervical spine disorders, such as inflammation and autoimmune reactions [13,14]. It is essential to consider not only the clinical aspects of these conditions but also the ongoing research and emerging treatments that could revolutionize the current standards of care. Research into the pathophysiology of nerve compression and its systemic effects, as well as the long-term outcomes of various treatment modalities, remains crucial for advancing clinical practice and improving patient outcomes.

Conclusion

This case exemplifies the complexities involved in diagnosing and managing cervical spine disorders, particularly when initial symptoms may be misleading. The multifaceted approach, including surgical intervention, advanced pain management techniques, and the innovative use of occipital nerve stimulation, eventually led to significant symptom relief and an enhanced quality of life for the patient. This report emphasizes the importance of a thorough diagnostic process and the need for individualized treatment plans in managing chronic cervical conditions. It also illustrates the potential of integrating emerging biomedical technologies and pharmacotherapies in treating spine-related pathologies, encouraging continued research and adaptation of treatment modalities to improve patient outcomes in similar clinical scenarios.

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