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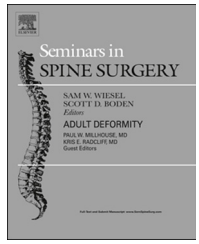

Cost-effectiveness of treatments for cervical disc herniation

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ABSTRACT

In this current area of value-based health care, it is important to consider both the effectiveness and the cost of an intervention. Anterior cervical discectomy and fusion (ACDF) has long been considered as an effective treatment option for patients with symptomatic cervical spondylosis and/or disc herniation that is refractory to conservative treatment. Other treatment options, such as posterior decompression and cervical disc replacement (CDR), are also effective for certain types of pathology. More recent studies have looked at the cost-effectiveness of these interventions.

1. Introduction

Symptomatic cervical disc disease, often presenting as cervical radiculopathy or myelopathy, commonly affects patients in their fourth and fifth decades and has a reported incidence of 5.5 per 100,000 individuals in the general population.[1] In a study, Ernst et al.[2] found that upwards of 73% of asymptomatic patients had signs of cervical disc degeneration on MRI. Fortunately, a number of treatment modalities exist, ranging from conservative to surgical. Conservative therapy, often first-line in treating cervical disc disease, includes activity modifications, NSAIDs, oral steroid therapy, physical therapy, and epidural steroid injections. When these options fail, cervical spine surgery is usually considered and often necessary.[3]

From 2002 to 2009, there was an increase from 52.2 to 60.8 cervical spine surgeries performed per 100,000 people in the United States.[4] These surgeries included posterior decompression with or without fusion, anterior cervical discectomy and fusion (ACDF) and, more recently, cervical disc replacement (CDR).

Regardless of treatment modality pursued, shifting healthcare paradigms in the United States mandate that interventions are evaluated on not just outcomes alone, but also cost-effectiveness.[5] As more patients require treatment for cervical disc disease, cost-effectiveness will be an important parameter to consider in treatment selection. The purpose of this review is to present the current literature comparing the cost-effectiveness of treatment options for the management of cervical disc herniation.

2. Cost-effectiveness

Cost-effectiveness is becoming an increasingly vital aspect of treatment selection. In the future, institutions analogous to the National Institute for Health and Care Excellence (NICE) in the United Kingdom may play a larger role in determining which services are available to patients for the management of certain disease processes.[6,7] For their purposes, cost-effectiveness analyses (CEAs) are often used as the basis of determining whether an intervention is an efficient use of

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resources. CEAs assess the net cost while accounting for the relative health benefit (commonly denoted as Quality Adjusted Life Years or QALYs) over a study period.[5] Although there is no definite cutoff with regard to what is considered cost-effective in the United States, interventions valued at less than $50,000–$100,000/QALY are generally considered cost-effective.[8,9] When comparing two different interventions, it is common to report cost-effectiveness in terms of the incremental cost-effectiveness ratio (ICER). This ratio is determined by finding the difference between the costs associated with each intervention divided by the difference in QALY for each intervention. An ICER is informative when comparing new treatment modalities to the current gold standard.

An important component of CEAs is the time horizon or length of study. When comparing surgical interventions to nonsurgical interventions, the surgical interventions typically have a large upfront cost associated with them. Assuming that the results are durable over time, longer-term follow-up will demonstrate increased value as the upfront cost will be spread out over time.[5] The time horizon must also be sufficient enough to capture factors that can contribute to added cost and/or decreased quality of life over time, such as reoperation in the setting of device failure, nonunion, and/or adjacent segment disease. In general, treatment that is needed to address treatment failures and/or symptom recurrence after the index procedure add significant cost and can affect the overall "value" of the index procedure.[5]

3. Conservative treatment

The vast majority of patients with acute cervical disc herniation and radiculopathy improve with time and conservative treatment. To date, evidence in the literature has supported the use conservative treatment options for this condition. Heckmann et al.[10] and Saal et al.[11] looked at outcome data comparing conservative and surgical treatment strategies for herniated cervical disc and found conservative therapy can be used to treat cervical disc herniation with good results and high patient satisfaction. Bush and Hillier[12] examined the effectiveness of epidural injections for relieving cervical radiculopathy and found that 76% of subjects no longer had symptoms 39 months after a series of 2–3 epidural injections on an average. A Cochrane review investigating the effects of acupuncture found that it can successfully relieve chronic neck pain but only for short-term endpoints.[13] A limitation of these studies is that they did not consider the cost associated with each treatment and no cost-effectiveness analysis was performed.

Unfortunately, only a handful of studies have examined the cost-effectiveness of conservative options for the management of acute and chronic neck pain. Many of these articles are limited in that the etiology of the patient's pain in the studies was not specifically the result of cervical disc herniation and consisted more of neck pain rather than radicular symptoms.[6,7]

Manca et al.[7] performed a CEA comparing different lengths of physiotherapy treatment. In this randomized control trail, patients with neck pain were assigned either brief physiotherapy (1–3 "hands-off" sessions, encouraging self-management) or the usual physiotherapy (electrotherapy, manual traction, and acupuncture). QALYs were determined from patients' responses to EuroQol-5 Dimensions (EQ-5D) and Northwick Park Questionnaire (NPQ) questionnaires which were administered at baseline, 3 and 12 months. The cost [in Euros (€)] of intervention for each group included physiotherapy sessions, days of work missed, lab tests, doctor visits, and prescriptions over the 12 months of the study. The authors found that usual physiotherapy, on average, not only cost more than brief physiotherapy but demonstrated only a marginal increase in QALYs. With an ICER of 68,000 Euros in favor of brief physiotherapy, brief physiotherapy which was found to be more cost-effective when health care providers are willing to pay under 68,000 €/QALY.[7]

Similarly, Willich et al. investigated conservative therapy in the form of acupuncture by performing a CEA assessing standard care supplemented with acupuncture in contrast to standard care alone for the treatment of chronic neck pain. The relative health benefits of each study group were determined using the SF-36 questionnaire once at baseline and then at 3 months. In this study, both direct and indirect costs were assessed for each of the 3451 patients, and it was determined that at 3 months, the ICER was in favor of the acupuncture treatment with 12,469€/QALY gained.[6]

Unfortunately, there is no current literature that directly compares cost-effectiveness of conservative modalities with surgery for the treatment of cervical disc degeneration. However, the CASINO trial is a promising study to fill this void. This ongoing RCT plans to evaluate conservative treatment and surgical modalities for the treatment of cervical disc herniation using an incremental cost-effectiveness analysis.[10–13]

4. Posterior cervical spine surgery

Between 2002 and 2009, the number of posterior cervical fusion (PCF) or discectomy cases remained relatively stable at 3000–4000 cases annually while ACDF cases increased to 186,000 in 2009.[4] These trends for the treatment of cervical degenerative conditions reflect a drift away from the posterior approach when treating cervical disc herniation as the anterior approach allows for direct anterior access to the cervical disc.[4] Furthermore, the posterior approach fails to address central disc pathology; rather, it is relatively effective for the treatment of foraminal stenosis/disc herniation.

A unique study by Tumialán et al.[14] compared the cost of ACDF to PCF in the military. Unfortunately, the authors did not assess outcome data and only accounted for direct (determined by TRICARE military reimbursement) and indirect costs preventing a cost-effectiveness analysis from being performed. Patients with ACDF took 14.8 weeks longer to return to active duty, resulting in an overall cost break of $20,000–30,000 for PCF over ACDF. Although no formal outcome questionnaires were used in the study, the authors state that ACDF provided greater long-term results.[14]

Ghogawala et al. examined anterior and posterior cervical surgical approaches using SF-36, EQ-5D, mJOA, and National