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Instrumented Outpatient Anterior Cervical Discectomy and Fusion: Is it Safe?

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Anterior cervical discectomy and fusion procedures are one of the most common procedures performed in spinal surgery. Increasingly they are being performed on an outpatient basis. The primary impetus for performing procedures as an outpatient is potential cost savings. However, there are few studies discussing the safety of performing the procedure in an ambulatory setting. This is a retrospective review of our initial experience in performing anterior cervical discectomy and fusion procedures with instrumentation (ACDFI) in an ambulatory surgery center dedicated to spine surgery. Patients were selected for outpatient surgery if they had limited co-morbidities and the surgery involved only 1 or 2 levels. One hundred fifty-two patients underwent outpatient ACDFI during the study period (2007–2009). Six patients returned to the hospital emergency room after discharge. The reasons for evaluation included 2 for neck pain, 1 for dysphagia, 1 for vocal cord paralysis and dysphagia, 1 for nausea, and 1 for cervical swelling. Only 1 of the 6 patients required admission to the hospital. None of the 6 suffered any long-term sequelae. The overall complication rate was 3.9%. A self-reported survey was completed by 75 patients within 6 months of surgery, and there was a 100% satisfaction rate among responders. ACDFI can be performed safely on an outpatient in selected patients with a high degree of patient satisfaction. Our experience is consistent with those of previous investigators.

Key words: Outpatient anterior cervical discectomy safe, Fusion, Instrumented

Anterior cervical discectomy and fusion procedures with instrumentation (ACDFI) is increasingly performed on an outpatient basis. Smith and Robinson[1] were the first to describe the procedure without the use of instrumentation as a treatment of degenerative cervical spine disease. Complications associated with anterior cervical discectomy and fusion (ACDF) procedures include airway

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compromise due to cervical swelling or a hematoma and postoperative bleeding in the epidural space leading to neurologic injury.[2] These complications are fortunately rare but potentially devastating. For this reason spine surgeons were initially reluctant to perform the procedure on an outpatient basis. However, investigators during the past decade have described their initial experience with performing the procedure on an outpatient basis. Cost containment has been a primary driver for performing more surgical procedures on an outpatient basis.

In this report we describe our initial experience with performing ACDFI on an outpatient basis in an outpatient surgery center dedicated to spine surgery. We believe refinements in surgical technique during the past two decades have made it feasible to perform ACDFI as an outpatient procedure. These include the use of allograft bone instead of iliac crest grafts, thus decreasing postoperative pain and the use of cervical plating. Our purpose was to determine whether performing ACDFI as an outpatient was safe. We also hoped to determine whether patients thought the outpatient experience was favorable.

Materials and Methods

Patients undergoing ACDFI on an outpatient basis during the period 2007 to 2009 were identified from a prospectively maintained database. Investigational review board approval was obtained before starting the study. All patients underwent surgery at an outpatient surgery center dedicated to performing spine surgery. The surgery center is a separate facility that is adjacent to a full-service hospital. A retrospective medical record review was performed on all patients identified. All patients had preoperative magnetic resonance imaging for diagnosis and had been treated with nonoperative modalities before surgery. All patients scheduled for outpatient surgery were included. Criteria for inclusion as a potential outpatient ACDF included (1) non-Medicare insurance because spine procedures covered by Medicare insurance cannot be done at an ambulatory surgery center; (2) limited comorbidities as judged by the treating surgeon; (3) living more than 1 hour away from the center; (4) home environment is not conducive to an outpatient procedure (lives alone); and (5) patient did not wish to undergo an outpatient procedure. The Smith-Robinson surgical technique was used.[1] Surgery was performed from a left-sided Smith-Robinson approach. Inner body fusion was performed in all patients using allograft bone, thus obviating the need for an iliac crest graft. All patients had an instrumented fusion using an anterior cervical plating system. All patients were monitored in the surgery center for a minimum of 4 hours before discharge. Demographic data including age, sex, surgical levels, as well as postoperative complications were reviewed. In addition, a survey was sent to all patients 1 month after surgery to gain a better understanding of the outpatient experience.

Results

From the period 2007 to 2009, 152 patients were identified from the prospective database and underwent a subsequent retrospective review. There were 77 men and 75 women. Surgery was performed by 6 different surgeons, including the senior author. Of all surgeries performed, 103 were single level and 49 were 2 level. There were 13 cases of myelopathy and 139 cases of radiculopathy; 77 patients had a drain placed at the time of surgery. The 13 patients with myelopathy were due to spondylotic disc herniations, resulting in spinal stenosis. Patients presenting with radiculopathy had magnetic resonance imaging evidence of a disc herniation consistent with their symptoms. In 65 patients the drain was removed before discharge from the surgery center and 12 patients had the drain removed the next day in the office. All patients were discharged by 6 hours after surgery. Six patients returned to the hospital emergency room, and 1 was readmitted. The reasons for return included 2 for neck pain, 1 for dysphagia, 1 right vocal cord paralysis with dysphagia, 1 for nausea, and 1 for cervical swelling. All patients were discharged from the emergency room except 1. This patient experienced cervical swelling and dysphagia occurring 48 hours after leaving the surgery center. He was treated with parenteral steroids and was discharged from the hospital after 48 hours. This patient experienced no long-term sequelae. The overall complication rate is 3.9%. In 103 of 152 patients long-term data were available regarding cervical fusion (solid arthrodesis). Fusion was determined by radiographic analysis of postoperative plain X-ray films at 6 to 12 months by a radiologist and treating surgeon. Of the 103 patients, 98 were determined to have a solid fusion (95.1%). Of the 5 patients without a solid arthrodesis, 4 were asymptomatic, and 1 underwent a subsequent posterior fusion with an excellent outcome.

A survey was mailed to all patients 30 days after surgery to better determine their overall experience

with the outpatient procedure. Surveys were returned by 75 patients, giving a yield of 49%. Of these 74 patients (98% of responders) thought that the pain was controlled during the first 48 hours after surgery; 1 patient thought that the pain was only partially controlled. Seventy-four patients (98% of responders) did not experience postoperative nausea or vomiting; 1 patient experienced postoperative nausea, which the patient felt was ''tolerable.'' Seventy-five patients (100% of responders) would have the surgery performed again on an outpatient basis. They (100% of responders) thought that their overall experience was favorable.

Discussion

Ambulatory cervical spine surgery has become a common practice during the past decade. Tomaras *et al*[3] reported on a large group of patients undergoing a posterior cervical laminoforaminotomy for cervical radiculopathy in 1997. This was one of first large series discussing outpatient cervical spine surgery involving 200 patients. No patients in their series required subsequent hospitalizations during the immediate postoperative period. The experience of spine surgeons with ambulatory cervical spine surgery using the posterior approach is not necessarily translatable to anterior cervical spine surgery. The potential problems with acute airway compromise postoperatively due to swelling or bleeding and development of acute epidural hematoma make ambulatory surgery with an anterior approach potentially problematic. Silvers *et al*[4] described the first series of patients undergoing ambulatory anterior cervical spine surgery. In that study the outpatient group was compared with a retrospective group undergoing anterior cervical discectomy and fusion with allograft bone with hospitalization. Instrumentation was not used in their series. There were no significant differences between the two groups with regard to complications or clinical outcome. The conclusion of their study was that ACDF could be performed safely on an outpatient basis. Erickson *et al*[5] also reported on a series of patients undergoing outpatient noninstrumented anterior cervical procedures with satisfactory results. They included patients who had a bone graft harvested from the iliac crest for arthrodesis.

Stieber *et al*[6] reported on the first group of patients in the medical literature undergoing anterior cervical spine surgery with instrumentation (ACDFI). Criteria for outpatient surgery in this series included 1 or 2 level involvement (C4/5 or lower), absence of myelopathy, subjective neck size, and estimated operative time. The outpatient group was compared retrospectively to a group of hospitalized patients. The outpatient group had a lower complication rate than the hospitalized group. The investigators concluded that the lower complication rate may be due to selection bias with regard to the outpatient group. Villavicencio *et al*[7] reported on a group of patients that they described as having undergone an ''outpatient'' ACDFI. They included patients undergoing 3 level surgeries, all of whom were admitted for a 23-hour stay in their free-standing ambulatory surgery center. In addition, patients were sometimes observed in their surgery center for up to 15 hours after completion of the procedure. Their study design calls into question whether it is truly representative of what can be safely accomplished on an outpatient basis in anterior cervical spine surgery given the long period of postoperative observation in the surgery center. Lui *et al*[8] described a group of 45 patients undergoing outpatient ACDFI. They included only single level surgeries. Their selection criteria for outpatient ACDFI included (1) minimum co-morbidities; (2) younger age (no specific age cutoff was mentioned); and (3) patient preference. Complications in the outpatient group were lower than in the inpatient group, likely as a result of selection bias. Garringer *et al*[9] reported on a group of 645 patients who were scheduled for outpatient ACDFI. Of these patients, 392 were further characterized (authors described as a focus group) including reasons for admission to the hospital and delineation of acute complications. We believe that the 392 ''focused'' group provides a more accurate picture of the complication rate associated with outpatient ACDFI. Only single level surgeries were included in the study. In that group 24 patients required admission to the hospital. Adverse events in this group included pain, nausea/ vomiting, chest pain or symptoms requiring medical evaluation, and 2 epidural hematomas. Both patients sustaining an epidural hematoma became symptomatic within 1 hour after surgery. No patients in their series required admission or subsequent hospitalization due to airway compromise. Most of the patients who required admission for pain control had an iliac crest graft. No patient in the series required hospitalization after discharge from the surgery center. The study by Garringer *et al*[9] did not use ''exclusion criteria'' before scheduling patients for outpatient ACDFI. This may explain the high rate of patients requiring admission, although they were originally scheduled as outpatients. In addition, this may explain the higher complication rate in their

Table 1 Current literature regarding anterior cervical discectomy and fusion

Series	Year	Patients	Levels	Plating	Exclusion criteria	Complications	Drain
Silvers	1996	50	1 & 2	No	No	1 (2%)	No
Stieber	2005	30	1 & 2	Yes	Yes	3 (10%)	Yes
Erickson	2007	56	1 & 2	No	Yes	3 (5.3%)	Yes
Villavicencio	2007	99	1 & 2	Yes	No	4 (3.8%)	No
Liu	2009	45	1	Yes	Yes	0	No
Garringer	2010	392	1	Yes	No	24 (6.1%)	No

series (6.1%). Table 1 summarizes the previous series regarding outpatient ACDF/ACDFI.

In our series 51.6% of patients had a drain placed at the time of surgery. Most drains were removed before discharge from the surgery center. Most previous studies did not report on the use of a drain. The benefit of using a drain in outpatient ACDFI is unclear. In addition, Erickson *et al*[5] used a home care nurse after discharge, who monitored the patient at 8, 16, and 24 hours after surgery. The nurse also administered 3 doses of intravenous antibiotic therapy in the home. We administered antibiotics orally after discharge from the surgery center. In our series we did not identify any surgical site infections. The series by Erickson *et al*[5] was the only one of those reviewed that used home nursing and administered home parenteral antibiotics.

The primary impetus for performing ADFI on an outpatient basis is cost savings—obviating charges for hospital admissions. Previous investigators have discussed the potential cost-saving benefits. Silvers *et al*[4] showed that, on average, there was a potential cost saving of $1,800 per case, which could be realized from performing the procedure on an ambulatory basis. Individual cost savings could translate into millions of dollars in aggregate analysis. However, economic savings cannot have paramount importance when making decisions regarding outpatient ACDFI. Ultimately, decisions should be made based on what is safest for the individual patient.

In conclusion, current evidence suggests that ACDFI can be performed safely on an outpatient basis in selected patients. Criteria for performing ACDFI on an outpatient basis should include (1) 1 or 2 level surgeries, (2) few co-morbidites such as obesity or heart disease, and (3) patient preference. Our study is consistent with the experiences of previous investigators.

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