US National Practice Patterns in Ambulatory Operative Management of Lateral Epicondylitis

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Abstract

Lateral epicondylitis is a common cause of elbow pain, frequently responsive to nonoperative management. There are multiple operative techniques for persistently symptomatic patients who have exhausted conservative therapies. Little is known regarding US national trends in operative management of lateral epicondylitis.

We conducted a study to investigate changes in use of ambulatory procedures for lateral epicondylitis. Cases of lateral epicondylitis were identified using the National Survey of Ambulatory Surgery and were analyzed for trends in demographics and use of ambulatory surgery.

Between 1994 and 2006, the population-adjusted rate of ambulatory surgical procedures increased from 7.29 to 10.44 per 100,000 capita. The sex-adjusted rate of surgery for lateral epicondylitis increased by 85% among females and decreased by 31% among males. Most patients were between ages 40 and 49 years, and the largest percentage increase in age-adjusted rates was found among patients older than 50 years (275%) between 1994 and 2006. Use of regional anesthesia increased from 17% in 1994 to 30% in 2006. Private insurance remained the most common payer.

Awareness of the increasing use of ambulatory surgery for lateral epicondylitis may lead to changes in health care policies and positively affect patient care.

First described by Runge[1] in 1873 and later termed *lawn-tennis arm* by Major[2] in 1883, lateral epicondylitis is a common cause of elbow pain, affecting 1% to 3% of the general population each year.[3,4] Given that prevalence estimates are up to 15% among workers in repetitive hand task industries,[5-7] symptoms of lateral epicondylitis are thought to be related to recurring wrist extension and alternating forearm pronation and supination.[8] Between 80% and 90% of patients with lateral epicondylitis experience symptomatic improvement with conservative therapy,[9-11] including rest and use of nonsteroidal anti-inflammatory medications,[12] physical therapy,[13,14] corticosteroid injections,[10,15,16] orthoses,[17,18] and shock wave therapy.[19] However, between 4% and 11% of patients with newly diagnosed lateral epicondylitis do not respond to prolonged (6- to 12-month) conservative treatment and then require operative intervention,[11,20,21] with some referral practices reporting rates as high as 25%.[22]

Traditionally, operative management of lateral epicondylitis involved open débridement of the extensor carpi radialis brevis (ECRB).[11,20] More recently, the spectrum of operations for lateral epicondylitis has expanded to include procedures that repair the extensor origin after débridement of the torn tendon and angiofibroblastic dysplasia; procedures that use fasciotomy or direct release of the extensor origin from the epicondyle to relieve tension on the common extensor; procedures directed at the radial or posterior interosseous nerve; and procedures that use arthroscopic techniques to divide the orbicular ligament, reshape the radial head, or release the extensor origin.[23] There has been debate about the value of repairing the ECRB, lengthening the ECRB, simultaneously decompressing the radial nerve or resecting epicondylar bone, and performing the procedures percutaneously, endoscopically, or arthroscopically.[24-28] Despite multiple studies of the outcomes of these procedures,[11,29-31] little is known regarding US national trends for operative treatment of lateral epicondylitis. Understanding national practice patterns and disease burden is essential to allocation of limited health care resources.

We conducted a study to determine US national trends in use of ambulatory surgery for lateral epicondylitis. We focused on age, sex, surgical setting, anesthetic type, and payment method.

Methods

As the National Survey of Ambulatory Surgery[32] (NSAS) is an administrative dataset in which all data are deidentified and available for public use, this study was exempt from requiring institutional review board approval.

NSAS data were used to analyze trends in treatment of lateral epicondylitis between 1994 and 2006. NSAS was undertaken by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC) to obtain information about the use of ambulatory surgery in the United States.

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Since the early 1980s, ambulatory surgery has increased in the United States because of advances in medical technology and cost-containment initiatives.[33] The number of procedures being performed in ambulatory surgery centers increased from 31.5 million in 1996 to 53.3 million in 2006.[34] Funded by the CDC, NSAS is a national study that involves both hospital-based and freestanding ambulatory surgery centers and provides the most recent and comprehensive overview of ambulatory surgery in the United States.[35] Because of budgetary limitations, 2006 was the last year in which data for NSAS were collected. Data for NSAS come from Medicare-participating, noninstitutional hospitals (excluding military hospitals, federal facilities, and Veteran Affairs hospitals) in all 50 states and the District of Columbia with a minimum of 6 beds staffed for patient use. NSAS used only short-stay hospitals (hospitals with an average length of stay for all patients of less than 30 days) or hospitals that had a specialty of general (medical or surgical) or children's general. NSAS was conducted in 1994, 1996, and 2006 with medical information recorded on patient abstracts coded by contract staff. NSAS selected a sample of ambulatory surgery visits using a systematic random sampling procedure, and selection of visits within each facility was done separately for each location where ambulatory surgery was performed. In 1994, 751 facilities were sampled, and 88% of hospitals responded. In 1996, 750 facilities were sampled, and 91% of hospitals responded. In 2006, 696 facilities were sampled, and 75% responded. The surveys used *International Classification of Diseases, 9th Revision, Clinical Modification* (*ICD-9-CM*) codes[36] to classify medical diagnoses and procedures. To produce an unbiased national estimate, NCHS used multistage estimate procedures, including inflation by reciprocals of the probabilities of sample selection, population-weighting ratio adjustments, and adjustment for no response.[37]

Demographic and medical information was obtained for people with an *ICD-9-CM* diagnosis code of lateral epicondylitis (726.32), using previously described techniques.[38] Data were then recorded for age, sex, facility type, insurance type, anesthesia type, diagnoses, and procedures.

Descriptive statistics consisted of means and standard deviations for continuous variables and frequency and percentages for discrete variables. Because NSAS data were collected on the basis of a probabilistic sample scheme, they were analyzed using a sampling weighting method. Sampling weights (inverse of selection probability) provided by the CDC were used to account for unequal sampling probabilities and to produce estimates for all visits in the United States. A Taylor linearization model provided by the CDC estimates was used to calculate standard error and confidence intervals (CIs) of the data. Standard error is a measure of sampling variability that occurs by chance because only a sample rather than the entire universe is surveyed. To define population parameters, NCHS chose 95% CIs along with a point estimate. Direct statistical comparison between years cannot be performed because of sampling differences in the database compared between years. The CIs, however, can suggest statistical differences if the data are nonoverlapping. US census data were used to obtain national population estimates for each year of the study (1994, 1996, 2006).[39] Rates were presented as number of procedures per 100,000 standard population. For age, a direct adjustment procedure was used, and the US population in 2000 was selected as the standard population. Applying sex-specific rates to the standard population and dividing by the total in the standard population, we calculated sex-adjusted rates for each year. All data were analyzed using SPSS Version 20 software.

Results

A total of 30,311 ambulatory surgical procedures (95% CI, 27,292-33,330) or 10.44 per 100,000 capita were recorded by NSAS for the treatment of lateral epicondylitis in 2006 (**Table 1**). This represents a large increase in the total number of ambulatory procedures, from 21,852 in 1994 (95% CI, 19,981-23,722; 7.29/100,000) and 20,372 in 1996 (95% CI, 18,660-22,083; 6.73/100,000).

Between 1994 and 2006, the sex-adjusted rate of ambulatory surgery for lateral epicondylitis increased by 85% among females (7.74/100,000 to 14.31/100,000), whereas the rate decreased by 31% among males (8.07/100,000 to 5.59/100,000) (Table 1). The age-adjusted rate of ambulatory surgery for lateral epicondylitis increased among all age groups except the 30–39 years group (**Table 2**). The largest increase in age-adjusted rates was found for patients older than 50 years (275%) between 1994 and 2006.

During the study period, use of regional anesthesia nearly doubled, from 17% to 30%, whereas use of general anesthesia decreased, from 69% to 57% (**Table 3**). At all time points, the most common procedure performed for lateral epicondylitis in ambulatory surgery centers was division/release of the joint

Table 1. Changes in Population- and Sex-Adjusted Rates of Ambulatory Surgery for Lateral Epicondylitis

	Year			
Sex	1994	1996	2006	% Change, 2006 vs 1994
Male	8.07	5.85	5.59	–31
Female	7.74	8.4	14.31	85
Overall	7.29	6.73	10.44	43

Table 2. Age-Adjusted Rates[a] of Surgery for Lateral Epicondylitis With Use of US Population in 2000 as Control

	Year			
Age, y	1994	1996	2006	% Change, 2006 vs 1994
≤29	3.38	1.99	5.59	65
30-39	20.92	23.87	12.51	–40
40-49	41.98	30.79	57.01	36
≥50	8.59	12.47	32.23	275

[a]Per 100,000 capita.

capsule of the elbow (**Table 4**). Private insurance remained the most common source of payment for all study years, ranging from 52% to 60% (**Table 5**). The **Figure** shows that, between 1994 and 2006, the proportion of surgeries performed in a freestanding ambulatory center increased.

Discussion

In this descriptive epidemiologic study, we used NSAS data to investigate trends in ambulatory surgery for lateral epicondylitis between 1994 and 2006.[32] Our results showed that total number of procedures and the population-adjusted rate of procedures for lateral epicondylitis increased during the study period. The largest increase in age-adjusted rates of surgery for lateral epicondylitis was found among patients older than 50 years, whereas the highest age-adjusted rate of ambulatory surgery for lateral epicondylitis was found among patients between ages 40 and 49 years. These findings are similar to those of previous studies, which have shown that most patients with lateral epicondylitis present in the fourth and fifth decades of life.[22] Prior reports have suggested that the incidence of lateral epicondylitis in men and women is equal.[22] The present study found a change in sex-adjusted rates of ambulatory surgery for lateral epicondylitis between 1994 and 2006. Specifically, in 1994, surgery rates for men and women were similar (8.07/100,000 and 7.74/100,000), but in 2006 the sex-adjusted rate of surgery for lateral epicondylitis was almost 3 times higher for women than for men (14.31/100,000 vs 5.59/100,000).

We also found that the population-adjusted rate of lateral epicondylectomy increased drastically, from 0.4 per 100,000 in 1994 to 3.53 per 100,000 in 2006. Lateral epicondylectomy involves excision of the tip of the lateral epicondyle (typically, 0.5 cm) to produce a cancellous bone surface to which the edges of the débrided extensor tendon can be approximated without tension.[23] It is possible that the increased rate of lateral epicondylectomy reflects evidence-based practice changes during the study period,[27] though denervation was found more favorable than epicondylectomy in a recent study by Berry and colleagues.[40] Future studies should investigate whether rates of epicondylectomy have changed since 2006. In addition, the present study showed a correlation between the introduction of arthroscopic techniques for the treatment of lateral epicondylitis and the period when much research was being conducted on the topic.[24,25,28] As arthroscopic techniques improve, their rates are likely to continue to increase.

Our results also showed an increase in procedures performed in freestanding facilities. The rise in ambulatory surgical volume, speculated to result from more procedures be-

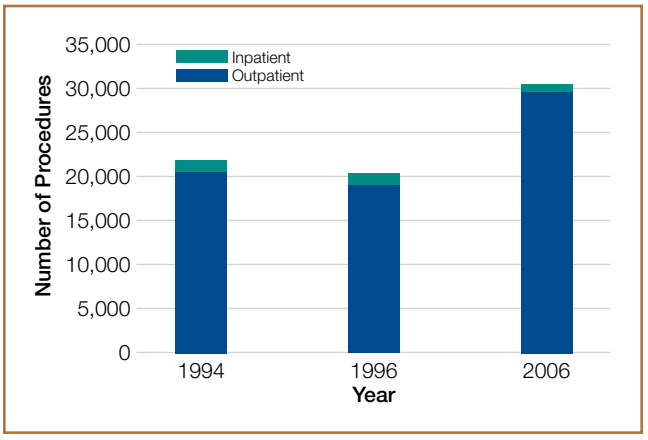

Figure. Proportion of ambulatory surgeries for lateral epicondylitis performed in freestanding ambulatory surgery facility versus hospital-based surgery center.

Table 3. Type of Anesthesia Used for Outpatient Surgery for Lateral Epicondylitis (Percentage)

	Year		
Anesthesia Type	1994	1996	2006
Topical	5	4	8
Intravenous sedation	8	13	11
Monitored anesthesia care	2	0.2	7
Regional block	17	20	30
General	69	61	57

Table 4. Changes in Population-Adjusted Rates of Ambulatory Surgery Procedures for Lateral Epicondylitis From 1994 to 2006

	ICD-9-CM	Year		% Change, 2006 vs 1994
Procedure	Code(s)	1994	2006	
Division/release of joint capsule of elbow	80.42	3.67	4.37	19
Simple decompression elbow	04.49, 04.04	0.25	0.26	4
Tendon release	83.13	0.61	1.73	184
Fasciotomy	83.14	1.01	1.79	77
Lateral epicondylectomy	77.82	0.4	3.53	783
Arthroscopic release	80.22	0	0.04	—

Abbreviation: *ICD-9-CM, International Classification of Diseases, 9th Revision, Clinical Modification.*

Table 5. Primary Source of Payment for Patients Undergoing Outpatient Surgery for Lateral Epicondylitis by Year (Percentage)

	Year		
Payer	1994	1996	2006
Private insurance	52	60	60
Government	3	6	15
Worker's compensation	36	25	23
Other	9	9	2

ing performed in freestanding facilities,[34] has been reported with knee and shoulder arthroscopy.[41] In addition, though general anesthesia remained the most used technique, our results showed a shift toward peripheral nerve blocks. The increase in regional anesthesia, which has also been noted in joint arthroscopy, is thought to stem from the advent of nerve-localizing technology, such as nerve stimulation and ultrasound guidance.[41] Peripheral nerve blocks are favorable on both economic and quality measures, are associated with fewer opioid-related side effects, and overall provide better analgesia in comparison with opioids, highlighting their importance in the ambulatory setting.[42]

Although large, national databases are well suited to epidemiologic research,[43] our study had limitations. As with all databases, NSAS is subject to data entry errors and coding errors.[44,45] However, the database administrators corrected for this by using a multistage estimate procedure with weighting adjustments for no response and population-weighting ratio adjustments.[35] Another limitation of this study is its lack of clinical detail, as procedure codes are general and do not allow differentiation between specific patients. Because of the retrospective nature of the analysis and the heterogeneity of the data, assessment of specific surgeries for lateral epicondylitis was limited. Although a strength of using NSAS to perform epidemiologic analyses is its large sample size, this also sacrifices specificity in terms of clinical insight. The results of this study may influence investigations to distinguish differences between procedures used in the treatment of lateral epicondylitis. Furthermore, the results of this study are limited to ambulatory surgery practice patterns in the United States between 1996 and 2006. Last, our ability to perform economic analyses was limited, as data on total hospital cost were not recorded by the surveys.

Conclusion

The increase in ambulatory surgery for lateral epicondylitis, demonstrated in this study, emphasizes the importance of national funding for surveys such as NSAS beyond 2006, as utilization trends may have considerable effects on health care policies that influence the quality of patient care.

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