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Trends in Open and Endoscopic Cubital Tunnel Release in the Medicare Patient Population

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Abstract

Background: Cubital tunnel syndrome (CUT) is the second most common peripheral neuropathy with an annual incidence of 24.7 per 100 000, affecting nearly twice as many men as women. With increasing focus on cost-effectiveness and cost-containment in medicine, a critical understanding of utilization of health care resources for open and endoscopic approaches for cubital tunnel release is of value. The purpose of this study was to evaluate the costs and utilization trends of open and endoscopic cubital tunnel release. **Methods:** We performed a retrospective review of a Medicare database within the PearlDiver Supercomputer (Warsaw, Indiana) for procedures performed from 2005 to 2012. Annual utilization, charges, reimbursement, demographic data, and compound annual growth rate were evaluated. **Results:** Our query returned 262 104 patients with CUT, of which 69 378 (26.5%) and 4636 (1.8%) were surgically managed with open and endoscopic release respectively. Average charges were higher in endoscopic release ($3798) than open release ($3197) while reimbursements were higher in open releases ($1041) than endoscopic releases ($866). Both were performed most commonly in the <65 years age range. **Conclusions:** Despite the unexpectedly lower reimbursement rate with endoscopic release, endoscopy utilization is growing faster than open releases in the Medicare population. Lower reimbursement is likely related to lack of a dedicated current procedural terminology (CPT) code for endoscopic cubital tunnel release.

Keywords: cubital tunnel release, endoscopic, open decompression, ulnar nerve, minimal invasive

Introduction

Cubital tunnel syndrome (CUT) is the second most common peripheral neuropathy with an annual incidence of 24.7 per 100 000, affecting nearly twice as many men as women.[9] There are many direct causes of CUT, yet a significant number of patients experience idiopathic neuropathy due to external compression and traction of the ulnar nerve.[12] Nonsurgical management is recommended for the majority of patients; however, up to 42% fail conservative treatment and are considered for surgery.[3] Surgical management for ulnar nerve entrapment was first described in 1816, and since that time, various treatment modalities have been described including decompression, transposition, and epicondylectomy.[2,3,11]

Decompression is the most prevalent means of treatment, and can be performed endoscopically or with an open approach.[15] Recent studies have shown no difference in outcome between in situ decompression and more invasive approaches such as transposition.[8] In addition, they have concluded that simple decompression is as efficacious as decompression with transposition.[8] As such, in recent years, in situ decompression has become the procedure of choice in many centers.

Tsai and colleagues were among the first to introduce an endoscopic technique in 1999.[17] Since then, a number of systems have been introduced and are in common usage. These include systems that rely on a cannulated push cut technique under direct endoscopic visualization—Endorelease (Integra, Plainsboro, NJ), Clear cannula (AM Surgical, Smithtown, NY), and Segway.[4] The Hoffman system (Storz) relies on direct dissection under endoscopic visualization through a small incision.[7]

Recent studies have demonstrated favorable clinical outcomes with an endoscopic approach, including decreased

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pain, scar tenderness, and numbness, and an expedited postoperative return to full recovery.[11,14,18] Concerns for an endoscopic approach are that it can be technically demanding, with a possibility of injury to ulnar nerve, cutaneous sensory nerves, and subcutaneous veins if not properly executed. Nevertheless, the popularity of endoscopic approaches is increasing, likely due to patient desire for a smaller scar and faster recovery. A comparative study of open and endoscopic in situ decompression found that both had equivalent results, with less pain and higher satisfaction with the endoscopic group.[18] Conversely, the open group had a higher complication rate in this study.

With increasing focus on cost-effectiveness and cost-containment in medicine, a critical understanding of utilization of health care resources for open and endoscopic approaches for cubital tunnel release is of value. Identifying the specific demographic or socioeconomic contexts in which an endoscopic or open approach to CUT is used will allow surgeons to better manage patient expectation and allocation of health care resources.

The purpose of this retrospective study of a national longitudinal database was to evaluate the costs and utilization trends of open and endoscopic approaches for decompression of the ulnar nerve within a large patient database.

Methods

A retrospective review of a Medicare database within the PearlDiver Supercomputer (Warsaw, Indiana) was performed for patients undergoing open (OCUTR) or endoscopic cubital tunnel release (ECUTR) from 2005 to 2012. The PearlDiver database is a publicly available, Health Insurance Portability and Accountability Act (HIPAA)-compliant national database compiled from a collection of private payer records. This database contains current procedural terminology (CPT) and International Classification of Diseases, Ninth Revision (ICD-9) codes. This study was exempt from institutional board review.

Patients with CUT were identified by ICD-9 codes 354.2 and 955.2. OCUTR was identified by CPT code 64718 alone. Patients who had CPT 64718 linked with CPT 24305, 24999, 24356, 29999, or 64999 were excluded from the OCUTR cohort. Per recommendations from the American Association of Hand Surgery (AAHS), 64718 is coded with 24305 for submuscular transposition, 24999 for subfascial or subcutaneous transposition, and 24356 for medial epicondylectomy. Excluding CPT 64718 linked with 29999 and 64999, as seen below, would rule out patients who might have had an endoscopic procedure instead of an open one.

Patients who underwent ECUTR were identified by linking CPT 29999 and 64999 with CUT ICD-9 codes. CPT 29999 is a code billing for an unlisted arthroscopic procedure while CPT 64999 bills for an unlisted nerve procedure. Both can be used for billing for ECUTR as no dedicated CPT code exists for ECUTR. To ensure as much data accuracy as possible, we excluded patients from the ECUTR cohort with CPT 29999 and 64999 linked to 29830 (diagnostic elbow arthroscopy) and 29834-38 (elbow arthroscopy codes). This served to exclude patients who may have had an unlisted elbow arthroscopy procedure coded with CPT 29999 or 24999. Coding CPT 64718 is specifically defined by the Centers for Medicare and Medicaid services (CMS) as an open procedure hence claims submitted for ECUTR using CPT 64718 would likely have been denied and excluded from the database. Annual utilization, charges, reimbursement, demographic data, and compound annual growth rate (CAGR) were also evaluated.

Statistical analysis of this study was performed with Minitab version 17 (State College, Pennsylvania) and was primarily descriptive with paired t tests to determine significance where appropriate.

Results

Our query returned 262 104 CUT patients, of which 67 883 (25.9%) and 4636 (1.8%) were surgically managed with OCUTR and ECUTR, respectively (remainder treated conservatively or spontaneously resolved). CAGR was significantly higher in ECUTR (12.6%) than OCUTR (8.6%) ($P < .001$). Annual growth and utilization of both techniques is detailed in Table 1 and Figure 1. Average charges were higher in ECUTR ($3798) than OCUTR ($3197) while reimbursements were higher in OCUTR ($1041) than ECUTR ($866) (Table 2, Figure 2). The shortfall in reimbursement was noted to be growing with each year, but more in ECUTR. In 2012, the shortfall in reimbursement for ECUTR was 1.5 times that for OCUTR.

Both OCUTR and ECUTR were performed most commonly in the under 65 years age range (OCUTR 35.6%, ECUTR 34.7%) followed by the 65 to 69 years age range (OCUTR 22.7%, ECUTR 21.9%) (Table 3). OCUTR was performed slightly more in males (51.6%) than females (47%) and ECUTR was essentially equal (female, 49.1%; male, 48.8%) (Table 4). Both approaches were utilized most in the southern US geographic region (OCUTR 40.6%, ECUTR 41.9%) (Table 5).

Discussion

Surgical approaches for treating CUT have traditionally been through an open approach but the endoscopic approach is increasingly used. This is likely due to an increase in the number of systems available and also greater patient and surgeon awareness of endoscopic techniques. The purported advantage of an endoscopic approach is a smaller incision with decreased soft tissue dissection and potentially more rapid recovery with less scarring, translated into faster return to work (RTW) times for patients.[17] Endoscopic

Table 1. Annual Open and Endoscopic Release.

Year	CUT	OCUTR	Growth	ECUTR	Growth
2005	26315	6451		368	
2006	28468	7314	13.4%	394	7.1%
2007	28606	7233	−1.1%	398	1.0%
2008	30104	7764	7.3%	450	13.1%
2009	32118	8556	10.2%	514	14.2%
2010	35215	9863	15.3%	794	54.5%
2011	39225	10865	10.2%	872	9.8%
2012	42053	11332	4.3%	846	−3.0%
Total	262104	69378		4636	
CAGR	6.9%	8.4%		12.6%	

Note. CUT = cubital tunnel syndrome; OCUTR = open cubital tunnel release; ECUTR = endoscopic cubital tunnel release; CAGR = compound annual growth rate.

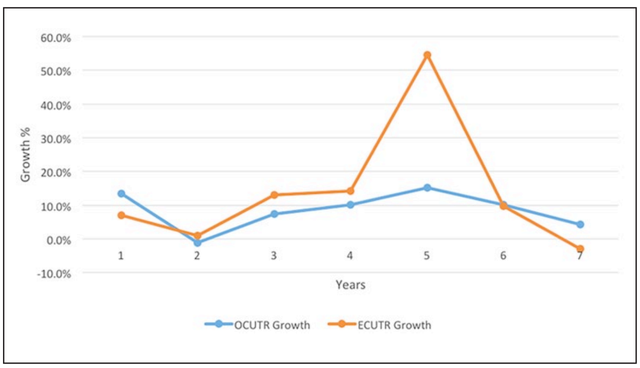

Figure 1. Annual open and endoscopic cubital tunnel release growth.
Note. OCUTR = open cubital tunnel release; ECUTR = endoscopic cubital tunnel release.

approaches cost more initially to set up, but economic benefits advocated include costs savings from decreased surgical and anesthesia times and faster RTW times for patients.[14,16] Currently, there is a paucity of literature investigating the trends in utilization and reimbursement of these approaches. The primary finding of this study was that ECUTR utilization is growing faster than OCUTR but the reimbursement shortfall for ECUTR is increasing.

The results of this study indicate that ECUTR (CAGR 12.6%) is becoming an increasingly popular approach compared with OCUTR (CAGR 8.4%). A study by Bain and Watts found that the proportion of patients satisfied with the outcome of OCUTR was 9 of 15 (60%) and 15 of 19 (79%) for ECUTR.[18] Furthermore, two studies have shown that both approaches have similar long-term functional outcomes, but with the OCUTR approach, both studies found a 20% and 23.7% rate of postoperative numbness compared with none in ECUTR, respectively.[6,18]

Our study found that the average Medicare charges were higher in ECUTR but reimbursements were unexpectedly lower compared with OCUTR during our 8-year study interval (2005-2012). The charges and Medicare reimbursements of OCUTR and ECUTR have not been adequately studied. One study investigated transposition with decompression and determined that the mean cost of decompression was \$6447 (95% confidence interval [CI], \$5079-\$7814), whereas transposition was \$6738 (95% CI, \$5371-\$8105) (P = .807).[15] However, this study did not differentiate between open or endoscopic procedures and placed Medicare, Medicaid, worker's compensation, and private insurance as one value. To date, there is no dedicated CPT code for ECUTR, thus the necessity to utilize an unlisted CPT 29999 or 64999 code may account for the lower comparative reimbursement.

Both approaches for CUT in our study were mostly used in patients younger than 65 years of age. These results are supported by a recent retrospective study on the demographics of CUT that found an average age of 55 ± 12.5 years.[10] The results of our study showed that OCUTR was performed at a slightly higher rate in males (52.4%) compared with females (47.6%) and was relatively equal for ECUTR (male, 49.9%; female, 50.1%). A multicenter study of different techniques for cubital tunnel release with mean follow-up of 92 months showed a similar demographic, with 56.8% of procedures performed on males.[1] Like that study, we found that CUT is not gender preferential (male, 50.6%; female, 49.4%) which is contrary to previous studies that suggest male dominance in CUT.[5,13]

This study is not without limitations. The PearlDiver database is reliant upon accurate CPT or ICD coding which creates the potential for a reporting bias. In addition, there is no dedicated CPT or ICD code for ECUTR which may also create a reporting bias. However, the strength of this study is the large patient population that was analyzed. In addition, our study investigates the utilization and reimbursement trends of OCUTR and ECUTR that has not been adequately studied previously.

Table 2. Average Charges and Reimbursements.

Year	OCUTR charges	OCUTR reimbursement	Shortfall	ECUTR charges	ECUTR reimbursement	Shortfall
2005	$2450	$878	$1572	$2427	$621	$1806
2006	$2621	$929	$1692	$2803	$656	$2147
2007	$2810	$971	$1839	$2908	$690	$2218
2008	$3006	$999	$2007	$2844	$633	$2211
2009	$3252	$1070	$2182	$4055	$872	$3183
2010	$3503	$1102	$2401	$5179	$1209	$3970
2011	$3747	$1149	$2598	$4649	$1075	$3574
2012	$4002	$1142	$2860	$5516	$1169	$4347
Average	$3174	$1030	$2144	$3798	$866	$2932

Note. OCUTR = open cubital tunnel release; ECUTR = endoscopic cubital tunnel release.

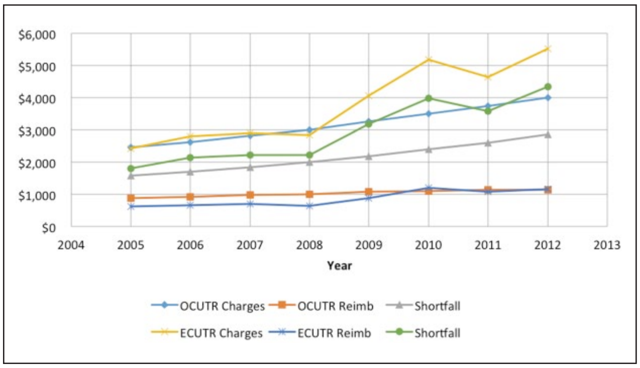

Figure 2. Annual average charges, reimbursements, and shortfalls for open and endoscopic cubital tunnel release.
Note. OCUTR = open cubital tunnel release; ECUTR = endoscopic cubital tunnel release.

Table 3. Open and Endoscopic Release by Age.

Age	CUT	OCUTR	ECUTR
Unknown	3793 (1.6%)	902 (1.3%)	61 (1.9%)
<65	76 256 (31.8%)	24 016 (35.7%)	1120 (34.7%)
65-69	51 988 (21.7%)	15 357 (22.8%)	705 (21.9%)
70-74	41 181 (17.2%)	11 564 (17.2%)	624 (19.3%)
75-79	31 947 (13.3%)	8290 (12.3%)	396 (12.3%)
80-84	21 261 (8.9%)	4829 (7.2%)	208 (6.4%)
>85	13 242 (5.5%)	2388 (3.5%)	112 (3.5%)

Note. CUT = cubital tunnel syndrome; OCUTR = open cubital tunnel release; ECUTR = endoscopic cubital tunnel release.

In conclusion, despite the unexpectedly lower reimbursement rate and various endoscopic techniques of ECUTR, ECUTR utilization is growing faster than OCUTR in the Medicare population. Lower reimbursement is likely related to lack of a dedicated CPT code for ECUTR. Reimbursement through the unlisted CPT codes 29999 and 64999 results in inaccurate reporting of the surgical complexity of ECUTR and also results in variable

Table 4. Open and Endoscopic Release by Gender.

Gender	CUT	OCUTR	ECUTR
Female	113 938 (48.6%)	31 458 (47.0%)	1381 (49.1%)
Male	116 837 (49.8%)	34 575 (51.7%)	1373 (48.8%)
Unknown	3794 (1.6%)	902 (1.3%)	61 (2.2%)

Note. CUT = cubital tunnel syndrome; OCUTR = open cubital tunnel release; ECUTR = endoscopic cubital tunnel release.

Table 5. Open and Endoscopic Release by Region.

Region	CUT	OCUTR	ECUTR
Midwest	73 605 (31.5%)	20 834 (31.2%)	923 (32.9%)
Northeast	43 044 (18.4%)	10 314 (15.4%)	366 (13.0%)
South	83 005 (35.5%)	27 131 (40.6%)	1176 (41.9%)
West	33 780 (14.5%)	8533 (12.8%)	340 (12.1%)
Unknown	198 (0.1%)	12 (0.0%)	−1[a]

Note. CUT = cubital tunnel syndrome; OCUTR = open cubital tunnel release; ECUTR = endoscopic cubital tunnel release.
[a]−1 = a patient count of less than 11.

reimbursement depending on the payer. A dedicated CPT code and relative value unit (RVU) for ECUTR should be formulated, similar to that used for endoscopic carpal tunnel release (29848), which may help decrease the shortfall in reimbursement.

Ethical Approval

This project does not require institutional review board review as the patients' information were deidentified within the database.

Statement of Human and Animal Rights

Consents were not required, as patients' credentials were not identified.

Statement of Informed Consent

Informed consent was obtained when necessary.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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References

1. Bacle G, Marteau E, Freslon M, et al. Cubital tunnel syndrome: comparative results of a multicenter study of 4 surgical techniques with a mean follow-up of 92 months. *Orthop Traumatol Surg Res*. 2014;100(4)(suppl):S205-S208.
2. Bartels RH. History of the surgical treatment of ulnar nerve compression at the elbow. *Neurosurgery*. 2001;49(2): 391-399.
3. Boone S, Gelberman RH, Calfee RP. The management of cubital tunnel syndrome. *J Hand Surg Am*. 2015;40(9):1897-1904.
4. Cobb TK. Endoscopic cubital tunnel release. *J Hand Surg Am*. 2010;35(10):1690-1697.
5. Contreras MG, Warner MA, Charboneau WJ, Cahill DR. Anatomy of the ulnar nerve at the elbow: potential relationship of acute ulnar neuropathy to gender differences. *Clin Anat*. 1998;11(6):372-378.
6. Dützmann S, Martin KD, Sobottka S, et al. Open vs retractor-endoscopic in situ decompression of the ulnar nerve in cubital tunnel syndrome: a retrospective cohort study. *Neurosurgery*. 2013;72(4):605-616.
7. Hoffmann R, Siemionow M. The endoscopic management of cubital tunnel syndrome. *J Hand Surg Br*. 2006;31(1):23-29.
8. Macadam SA, Gandhi R, Bezuhly M, Lefaivre KA. Simple decompression versus anterior subcutaneous and submuscular transposition of the ulnar nerve for cubital tunnel syndrome: a meta-analysis. *J Hand Surg Am*. 2008;33(8):1314.e1-1314.e12.
9. Mondelli M, Giannini F, Ballerini M, Ginanneschi F, Martorelli E. Incidence of ulnar neuropathy at the elbow in the province of Siena (Italy). *J Neurol Sci*. 2005;234(1):5-10.
10. Naran S, Imbriglia JE, Bilonick RA, Taieb A, Wollstein R. A demographic analysis of cubital tunnel syndrome. *Ann Plast Surg*. 2010;64(2):177-179.
11. Oertel J, Keiner D, Gaab MR. Endoscopic decompression of the ulnar nerve at the elbow. *Neurosurgery*. 2010;66(4):817-824.
12. Omejec G, Podnar S. What causes ulnar neuropathy at the elbow? *Clin Neurophysiol*. 2016;127(1):919-924.
13. Richardson JK, Green DF, Jamieson SC, Valentin FC. Gender, body mass and age as risk factors for ulnar mononeuropathy at the elbow. *Muscle Nerve*. 2001;24(4):551-554.
14. Saw NLB, Jones S, Shepstone L, Meyer M, Chapman PG, Logan AM. Early outcome and cost-effectiveness of endoscopic versus open carpal tunnel release: a randomized prospective trial. *J Hand Surg Br*. 2003;28(5):444-449.
15. Soltani AM, Best MJ, Francis CS, Allan BJ, Panthaki ZJ. Trends in the surgical treatment of cubital tunnel syndrome: an analysis of the national survey of ambulatory surgery database. *J Hand Surg Am*. 2013;38(8):1551-1556.
16. Thoma A, Wong VH, Sprague S, Duku E. A cost-utility analysis of open and endoscopic carpal tunnel release. *Can J Plast Surg*. 2006;14(1):15-20.
17. Tsai TM, Chen IC, Majd ME, Lim BH. Cubital tunnel release with endoscopic assistance: results of a new technique. *J Hand Surg Am*. 1999;24(1):21-29.
18. Watts AC, Bain GI. Patient-rated outcome of ulnar nerve decompression: a comparison of endoscopic and open in situ decompression. *J Hand Surg Am*. 2009;34(8):1492-1498.