Surgical Indications for Total Elbow Arthroplasty: National Trends in Case Volumes and Demographic Incidences From 2010-2018

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INTRODUCTION: Total elbow arthroplasty (TEA) is an effective treatment modality for various elbow pathologies including distal humerus fractures, rheumatoid arthritis, and osteoarthritis. However, the literature evaluating trends in the utilization of TEA is scarce. The purpose of this study was to identify volume and incidence trends of TEA, categorized by surgical indication, in the timeframe of 2010-2018 in the United States.

METHODS: The IBM Watson Health MarketScan Database was used to identify all patients that underwent TEA from 2010-2018 using Current Procedural Terminology (CPT) and International Classification of Disease (ICD) coding. Patients were categorized by surgical indication into the following subgroups: Distal Humerus Fracture/Post-Traumatic Sequelae, Rheumatoid Arthritis (RA), osteoarthritis (OA), and Other Indications. The annual incidence and procedural trends of primary TEA for each surgical indication were approximated using population estimates from the U.S Census Bureau. Further groupings assessed TEA utilization based on age, gender, and geographic region.

RESULTS SECTION: Between 2010-2018, a total of 6,522 primary TEA were performed. The total volume of TEA performed during this time decreased from 694 cases per year to 465 cases per year (33%). Overall, the majority of TEA from 2010-2018 were performed to treat distal humerus fractures/post-traumatic sequelae (53.9%, n = 3,514), while 22.3% (n = 1,457) were performed for RA, 10.8% (n = 702) for OA, and 13.0% (n = 849) for other indications. Both volume and incidence of TEA decreased regardless of surgical indication, gender, or age over this timeframe. RA had the greatest decreases in volume and incidence of TEA, which were 58% and 60%, respectively. OA had the smallest change in volume and incidence of TEA, with a 9% decrease in volume from 57 to 52 cases, and 14% decrease in incidence from 0.19 to 0.16 per 1,000,000 people. Frequency counts with corresponding confidence intervals were constructed using SPSS.

DISCUSSION: Overall, we observed a decrease in the volume and incidence of primary TEA in the U.S. in the timeframe of 2010-2018, regardless of surgical indication, gender, and age. Exploring the national trends of TEA utilization may motivate future studies seeking to advance treatment algorithms of various elbow pathologies and impact decision-making of appropriate interventions.

SIGNIFICANCE/CLINICAL RELEVANCE: Educating providers on the volume and incidence trends of TEA will allow them to anticipate future demand, inform patients on their treatment options, and guide further research.

IMAGES AND TABLES:

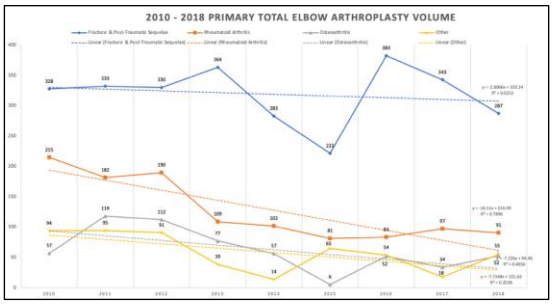

Table IV: Primary TEA Volume and Incidence by Age Group and Surgical Indication

	Volume			Incidence		
	2010	2018	% Change	2010	2018	% Change
Distal Humerus Fx + Fx sequelae						
< 45 yrs	35 (15-55)	12 (0-29)	-65.7	0.19 (0.08-0.30)	0.06 (0.00-0.15)	-66.3
45-54 yrs	34 (14-55)	26 (0-52)	-23.5	0.77 (0.31-1.24)	0.61 (0.00-1.23)	-20.5
55-64 yrs	64 (37-90)	39 (6-72)	-39.1	1.87 (1.07-2.63)	0.94 (0.15-1.73)	-49.4
≥ 65 yrs	195 (112-278)	190 (87-293)	-2.6	5.03 (2.88-7.18)	3.86 (1.77-5.77)	-23.3
Rheumatoid Arthritis						
< 45 yrs	37 (14-60)	0 -	-100.0	0.20 (0.08-0.32)	0.00 -	-100.0
45-54 yrs	57 (30-84)	17 (0-36)	-70.2	1.29 (0.68-1.90)	0.40 (0.00-0.84)	-69.0
55-64 yrs	66 (37-95)	37 (7-68)	-43.9	1.93 (1.08-2.77)	0.90 (0.16-1.62)	-53.5
≥ 65 yrs	55 (2-108)	37 (0-88)	-32.7	1.42 (0.05-2.79)	0.75 (0.00-1.74)	-47.1
Osteoarthritis						
< 45 yrs	2 (0-5)	4 (0-12)	100.0	0.01 (0.00-0.03)	0.02 (0.00-0.06)	0.0
45-54 yrs	16 (3-30)	24 (0-52)	50.0	0.36 (0.07-0.67)	0.56 (0.00-1.23)	56.0
55-64 yrs	25 (9-41)	10 (0-25)	-60.0	0.73 (0.27-1.18)	0.24 (0.00-0.60)	-66.8
≥ 65 yrs	14 (0-28)	14 (0-34)	0.0	0.36 (0.00-0.73)	0.28 (0.00-0.66)	-21.3
Other						
< 45 yrs	14 (0-29)	23 (0-47)	64.3	0.10 (0.00-0.16)	0.12 (0.00-0.25)	21.2
45-54 yrs	9 (0-18)	0 -	-100.0	0.20 (0.00-0.41)	0.00 -	-100.0
55-64 yrs	45 (21-69)	14 (0-36)	-68.9	1.30 (0.60-2.02)	0.34 (0.00-0.86)	-73.9
≥ 65 yrs	26 (0-62)	18 (0-52)	-30.8	0.70 (0.00-1.61)	0.37 (0.00-1.03)	-47.8
Total						
< 45 yrs	88 (55-122)	39 (9-70)	-55.7	0.47 (0.29-0.65)	0.21 (0.05-0.37)	-56.4
45-54 yrs	116 (79-154)	67 (24-109)	-42.2	2.62 (1.78-3.47)	1.56 (0.56-2.56)	-40.4
55-64 yrs	200 (151-248)	101 (49-153)	**-49.5***	5.82 (4.41-7.23)	2.45 (1.20-3.70)	**-57.9***
≥ 65 yrs	290 (185-396)	259 (137-380)	-10.7	7.49 (4.77-10.22)	5.26 (2.79-7.23)	-29.8

Incidence reported per 1,000,000
Variables represented as estimates with 95% confidence intervals
*Represents a statistically significant change

Table III: Primary TEA Volume and Incidence Estimates by Gender and Diagnosis

	Volume			Incidence		
	2010	2018	% Change	2010	2018	% Change
Distal Humerus Fx + Fx sequelae						
Male	65 (23-107)	70 (13-127)	7.69	0.44 (0.15-0.72)	0.44 (0.08-0.80)	1.20
Female	263 (182-344)	197 (101-294)	-25.10	1.70 (1.17-2.23)	1.20 (0.61-1.80)	-29.37
Rheumatoid Arthritis						
Male	50 (0-100)	0 -	-100.00	0.33 (0.00-0.67)	0.00 -	-100.00
Female	165 (117-213)	91 (28-153)	-44.85	1.07 (0.75-1.38)	0.59 (0.17-0.94)	-44.85
Osteoarthritis						
Male	25 (8-41)	11 (0-31)	-56.00	0.17 (0.06-0.27)	0.07 (0.00-0.20)	-58.65
Female	33 (13-52)	42 (10-73)	27.27	0.21 (0.09-0.34)	0.26 (0.06-0.45)	20.01
Other						
Male	52 (12-93)	5 (0-14)	-90.38	0.35 (0.08-0.62)	0.03 (0.00-0.09)	-90.96
Female	42 (18-66)	51 (4-97)	21.43	0.27 (0.11-0.43)	0.31 (0.03-0.59)	14.50
Total						
Male	192 (114-270)	85 (24-147)	-55.73	1.29 (0.76-1.81)	0.53 (0.15-0.92)	-58.40
Female	502 (404-600)	381 (254-508)	-24.10	3.25 (2.62-3.88)	2.32 (1.55-3.10)	-28.43

Incidence reported per 1,000,000
Variables represented as estimates with 95% confidence intervals
*Represents a statistically significant change