Stepping Outside the Operating Room: How Do Surgical Treatments for Charcot Neuroarthropathy Compare?

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INTRODUCTION: Charcot neuroarthropathy (CN) of the foot is a debilitating condition associated with diabetic neuropathy that involves progressive bone and joint destruction. Previous literature suggests the prevalence of CN is between 0.8%-8% in diabetic patients; however, CN diagnosis relies on skilled physician judgment, ultimately making management difficult. Physicians must account for the location, deformity, stage, and presence or absence of infection to appropriately treat CN. Correct diagnosis and treatment is essential to improving patients' quality of life, but treatment varies with no definitive best-practice guidelines. Here, we provide demographic and all-cause mortality data for patients who underwent arthrodesis, exostectomy, minor amputations, and below-the-knee amputation (BKA), to evaluate the outcomes and characterize the populations managed with surgery for Charcot neuroarthropathy of the foot.

METHODS:

Institutional review board approval was obtained. A database of all patients from 1/1/2000 to 1/31/2022 with CPT and ICD codes indicating a diagnosis of Charcot neuroarthropathy who underwent exostectomy, arthrodesis, and/or amputation was created from the electronic medical record. Demographic and mortality data was collected for the study sample, including date-of-birth, sex, race, and all-cause mortality. Procedure data was also collected, which included date, code, and description. Amputation patients were separated into major and minor; major include transtibial and trans-metatarsal, whereas minor include toe and metatarsal amputations. Descriptive statistics were conducted and single-factor ANOVA and Chi squared tests were used for analysis.

RESULTS: Of the 2,066 patients; 557 had arthrodesis, 493 had exostectomy, 681 had minor amputation, and 335 had major amputation. Average age was 58.17 ± 13.8 overall, and 54.8 ± 13.6, 55.0 ± 13.0, 61.6 ± 13.6, and 61.5 ± 13.4 years for arthrodesis, exostectomy, minor amputation, and major amputation, respectively. Females accounted for 56.6% of arthrodeses, 56.8% of exostectomies, 34.5% of minor amputations, and 28.4% of major amputations performed ($p<0.001$). Patients were predominantly white in each group and overall, 2.1% were tobacco smokers. Mortality was 10.6%, 11.4%, 33.8%, and 31.9% in the arthrodesis, exostectomy, minor amputation, and major amputation groups, respectively (Figure 1).

DISCUSSION AND CONCLUSION: This is the first report of significant sample size (>2,000 patients) comparing both demographics and mortality between common surgical procedures for Charcot neuroarthropathy. Patients undergoing both minor and major amputations were more likely to be older and male compared to those undergoing less intensive operations. Most importantly, this data demonstrates that patients undergoing amputation have significantly worse mortality (33.8% and 31.9%) than those who undergo arthrodesis (10.6%) and exostectomy (11.4%). Future studies may include an analysis of cause-specific mortality for patients diagnosed with CN to evolve clinical and surgical management.

Table 1: Demographics & mortality of patients who underwent surgical intervention for Charcot neuroarthropathy of the foot

					BKA					
	Arthrodesis		Exostectomy		Minor Amputations		Major Amputations		p-value	Total (N)
Patients (N,%)	557	0.270	493	0.239	681	0.330	335	0.162		2066
Age (Average, St Dev)	54.8	13.6	55.0	13.0	61.6	13.6	61.5	13.4		
Median	56		55		62		62		**<0.001**	
Minimum	11		13		5		9			
Maximum	90		91		95		89			
Sex (Count,%)										
Female	315	0.566	280	0.568	235	0.345	95	0.284	**<0.001**	925
Male	242	0.434	213	0.432	446	0.655	240	0.716		1141
Race (Count,%)										
White	506	0.908	430	0.877	586	0.860	289	0.863		1811
Black or African American	24	0.043	16	0.032	40	0.059	21	0.063		101
American Indian/ Alaskan Native	0	0.000	0	0.000	2	0.003	0	0.000	**0.010**	2
Native Hawaiian or Pacific Islander	0	0.000	0	0.000	1	0.001	0	0.000		1
Asian	1	0.002	1	0.002	3	0.004	2	0.006		7
Two or More Races	8	0.014	21	0.043	17	0.025	5	0.015		51
Other Race	18	0.032	24	0.049	30	0.044	15	0.045		87
Unavailable	0	0.000	1	0.002	0	0.000	2	0.006		3
Number of Deaths (Count,%)	59	0.106	56	0.114	230	0.338	107	0.319	**<0.001**	452
Number of Tobacco Smokers (Count,%)	8	0.014	5	0.010	22	0.032	8	0.024	**0.040**	43