

### PROBLEM STATEMENT

Peripheral neuropathy (PN) may cause regional bone loss that may not be detected by lumbar spine or hip bone mineral density (BMD) assessments.

### HYPOTHESIS

We tested two hypotheses: 1) people with diabetes mellitus (DM) and peripheral neuropathy (PN) with and without Charcot neuroarthropathy (CN) will have reduced BMD in the foot compared to the lumbar spine and hip of young healthy control (YHC) subjects. 2) People with DMPN and CN will have greater percentage of osteopenia/ osteoporosis in the foot compared to YHC and DMPN.

### PURPOSE

The purpose of this study is to determine regional BMD, related regional T-scores and WHO classification of normal osteopenia/ osteoporosis in the lumbar spine, hip and calcaneus in a sample of young healthy control subjects and subjects with DM and peripheral neuropathy (PN) with and without acute Charcot neuroarthropathy (CN).

### SUBJECTS

We studied 56 people:

- 16 young healthy control (YHC) subjects
  - Age: 27 ± 5 yrs, Sex: 8 M & 8 F, BMI: 25 ± 4
- 20 with DM and PN
  - Age: 58 ± 11 yrs, Sex: 9 M & 11 F, BMI: 32 ± 8
  - 2 – Type 1 DM; 18 – Type 2 DM
  - DM Duration: 14 ± 13 yrs
- 20 with DMPN and CN
  - Age: 55 ± 9 yrs, Sex: 10 M & 10 F, BMI: 37 ± 7
  - 3 – Type 1 DM; 14 – Type 2 DM; 3 – PN Only
  - DM Duration: 17 ± 10 yrs

### METHODS

Subjects had a DXA scan (Discovery, QDR Series, Hologic Inc, Bedford, MA) of the lumbar spine & left hip and calcaneal quantitative ultrasonometry (QUS, Sahara, Clinical Bone Sonometer, Hologic Inc) of left foot (YHC, DMPN) or involved foot (DMPN/CN) to determine BMD and related T-scores.



### DATA ANALYSIS

Total lumbar spine, hip and calcaneal BMD were compared using a Group x Measure ANOVA with  $\alpha = 0.05$  set for significance. For each group, the percent of individuals' regional T-score classified according to the WHO classification for normal, osteopenia/ osteoporosis were determined.

### RESULTS

	YHC	DMPN	DMPN/CN	p Value
LSpine BMD (g/cm <sup>2</sup> )	1.06 ± 0.13	1.10 ± 0.17	1.10 ± 0.10	p > 0.05
L Spine T-score (SD)	-0.17	0.00	0.27	
Osteopenic/porotic (%)	19	18	16	
Left Hip BMD (g/cm <sup>2</sup> )	1.08 ± 0.13	1.03 ± 0.18 ‡	0.93 ± 0.15 *	p = 0.00
Left Hip T-score (SD)	0.78	0.12	-0.31	
Osteopenic/porotic (%)	6	12	37	
Calcaneal BMD (g/cm <sup>2</sup> )†	0.696 ± 0.13	0.557 ± 0.21 §	0.441 ± 0.12 *	p = 0.00
Calcaneal T-score (SD)	1.02	-0.21	-1.25	
Osteopenic/porotic (%)	12	53	67	

\* - DMPN/CN < DMPN & YHC; ‡ DMPN = YHC; § DMPN < YHC

† - YHC & DMPN: L calcaneus only; DMPN/CN: Involved only (8 R & 12 L)

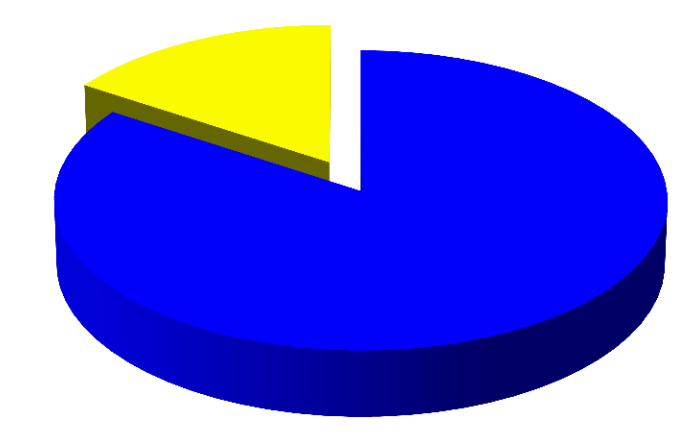
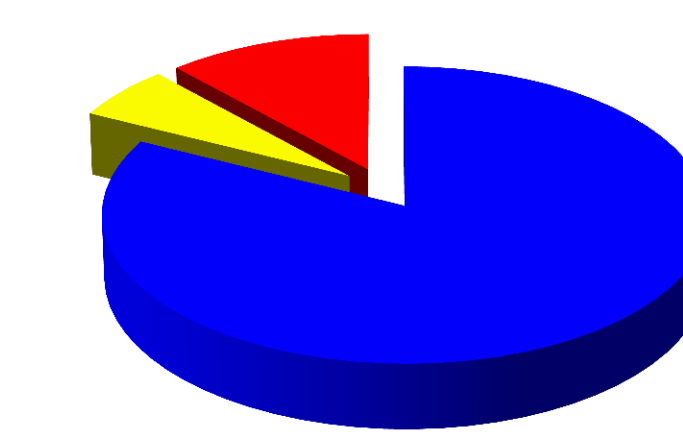
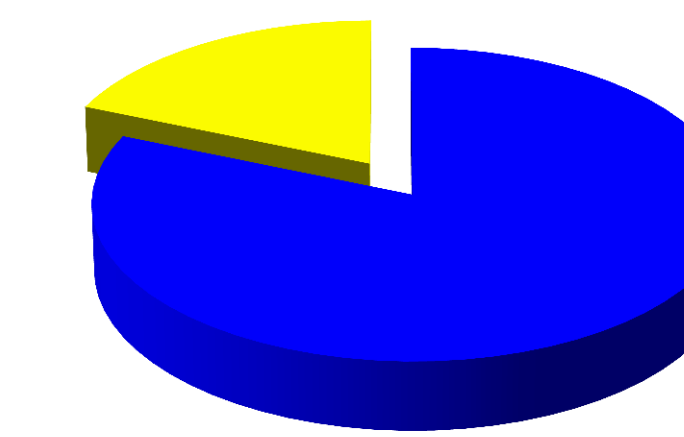
### RESULTS, cont.

YHC

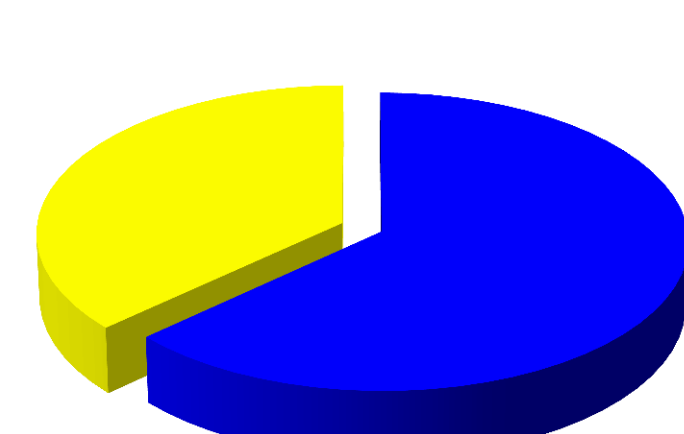
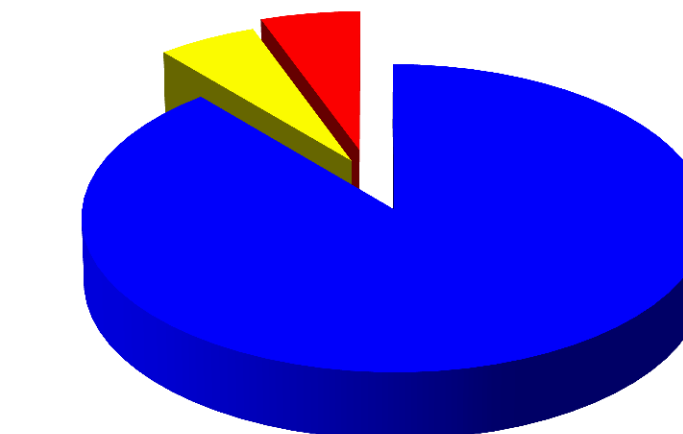
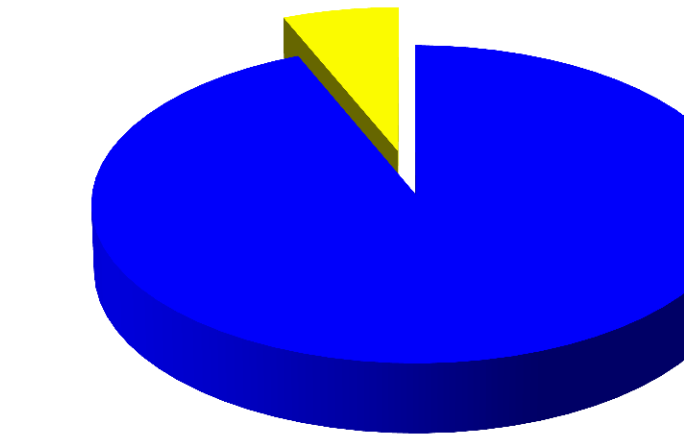
DMPN

DMPN/CN

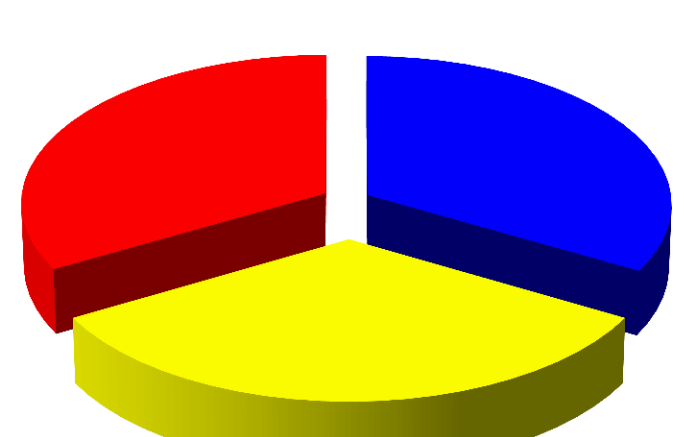
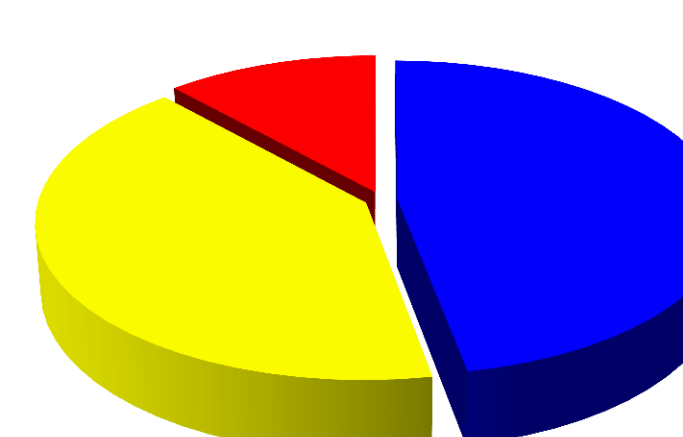
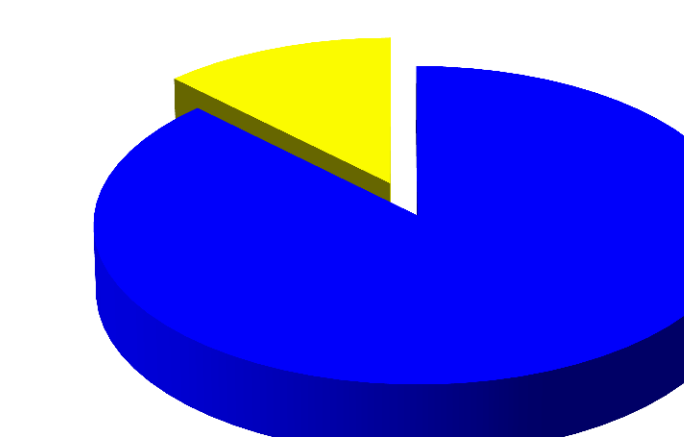
Lumbar Spine



Total Hip



Calcaneus



■ Normal ■ Osteopenic ■ Osteoporotic

### CONCLUSIONS

Lumbar spine & hip DXA do not reflect PN- and CN-induced regional foot osteopenia/ osteoporosis. A greater percentage of people were classified with osteopenia/ osteoporosis in the calcaneus due to PN & CN compared to YHC and DMPN groups and in the DMPN group compared to YHC due to PN.

### CLINICAL RELEVANCE

In people with DMPN with or without CN, foot BMD and related T-scores should be included in the BMD assessments to determine the presence of regional osteopenia/ osteoporosis.