

Patterns of Violent and Non-Violent Trauma in a Medieval Population from Giecz, Poland

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Figure 1. Modern map of Poland with location of Giecz

Figure 2. Stronghold and site map of Giecz complex

Introduction

The purpose of this poster is to present preliminary investigations into trauma prevalence in a medieval sample from Giecz, Poland (Fig 1). Giecz was fortified as a military center by Piast rulers as early as the 10th century. The stronghold at Giecz played an important role in formation of the Polish state and by the 11th century it served as not only a military hub but also as a political administration and exchange center¹. After invasion by the Czech prince Brzetyslaw (AD 1038) in which the population was captured, Giecz was once again resettled and its inhabitants took advantage of the previously destroyed settlement site (Gz4 on Fig 2) for interring their dead through the 12th century. While it is known that Giecz continued to function as a political and religious center utilizing the massive fort constructed there, it is unknown how extensive of a military effort was undertaken at Giecz during this time².

The objective of this research is to identify sex and age differentiated patterns in traumatic injuries in the Giecz population. Assuming the role of military troops was restricted to males and that those soldiers participated in battle, the following hypotheses were tested:

- 1) Males have a higher frequency of trauma than females
- 2) A high frequency of trauma is the result of intentional violence



Anterior view of left radius and ulna. Well-healed fractures on proximal and distal end of ulna (arrows). Note response of radius to extensive bone modeling on ulna.

Materials & Methods

- Mature individuals of the Giecz Collection were analyzed for evidence of traumatic injury.
- The sample was divided by sex (Fig 3) and age: Young Adult (20-34 years), Middle Adult (35-49 years), and Old Adult (50+ years) (Fig 4). All categories were well represented in the sample except for old adults.

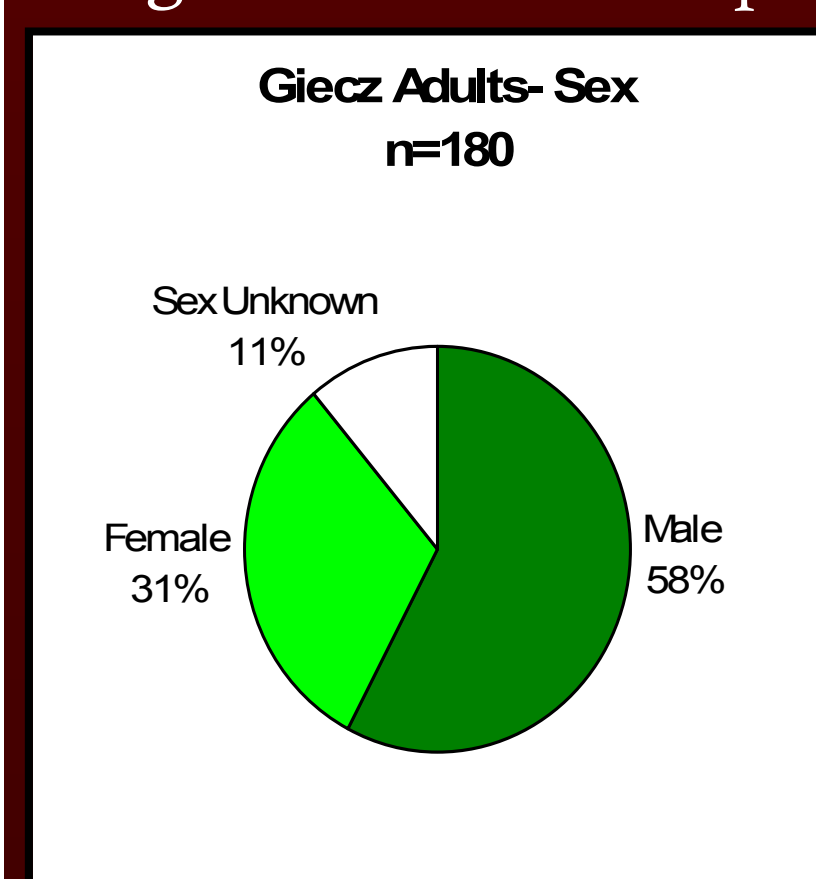


Figure 3. Sex distribution of Giecz sample

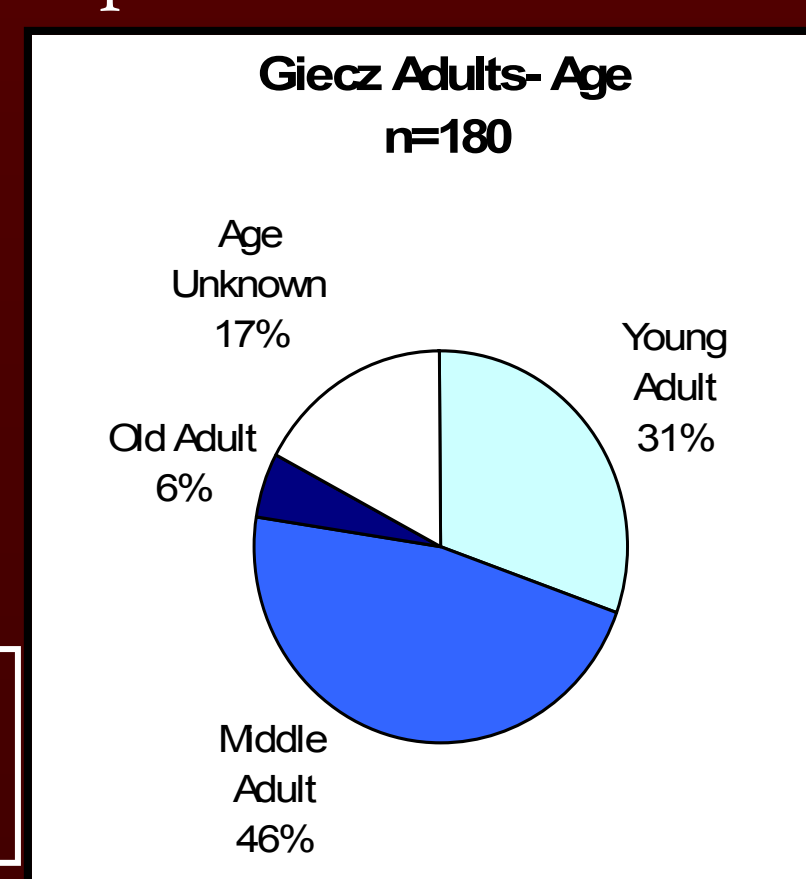


Figure 4. Age distribution of Giecz sample

- Trauma was recorded whether it occurred ante- or peri-mortem as indicated by presence of fracture, sharp or blunt force impact defect, weapon wound, amputation, osteochondritis dissecans, or Schmorl's nodes.
- A simple correspondence analysis was performed to determine relationships between individuals in demographic cohorts (Young Male, Young Female, Middle Male, Middle Female, Old Male, Old Female) and skeletal elements affected by trauma (Upper Limb, Scapula, Clavicle, Radius, Ulna, Hand, Lower Limb, Femur, Tibia, Fibula, Foot, Trunk, Sternum, Ribs, Vertebrae, Thoracic Vertebrae, Lumbar Vertebrae, Cranium).

Results & Discussion

- The frequency of trauma in Giecz adults was high at 49% (88/180).
- Null hypothesis 1 was rejected. Giecz males have a higher incidence of trauma than females at 56.7% (59/104) and 42.9% (24/56) respectively (Fig 5). This comparison was not statistically significant ($\chi^2=1.35, p>0.05$). This sex specific pattern remained consistent when the body was divided into regions (see Fig 7).
- Each age cohort revealed a high incidence of trauma, with no statistically significant difference between them ($\chi^2=0.81, p>0.05$). Young adults had 49% (27/55), and the Middle and Old adult cohorts had slightly higher amounts with 60% each (50/84 and 6/10, respectively) (Fig 6). Trauma divided by body region shows a general increase with age, specifically for the upper limb and trunk regions (Fig 8).

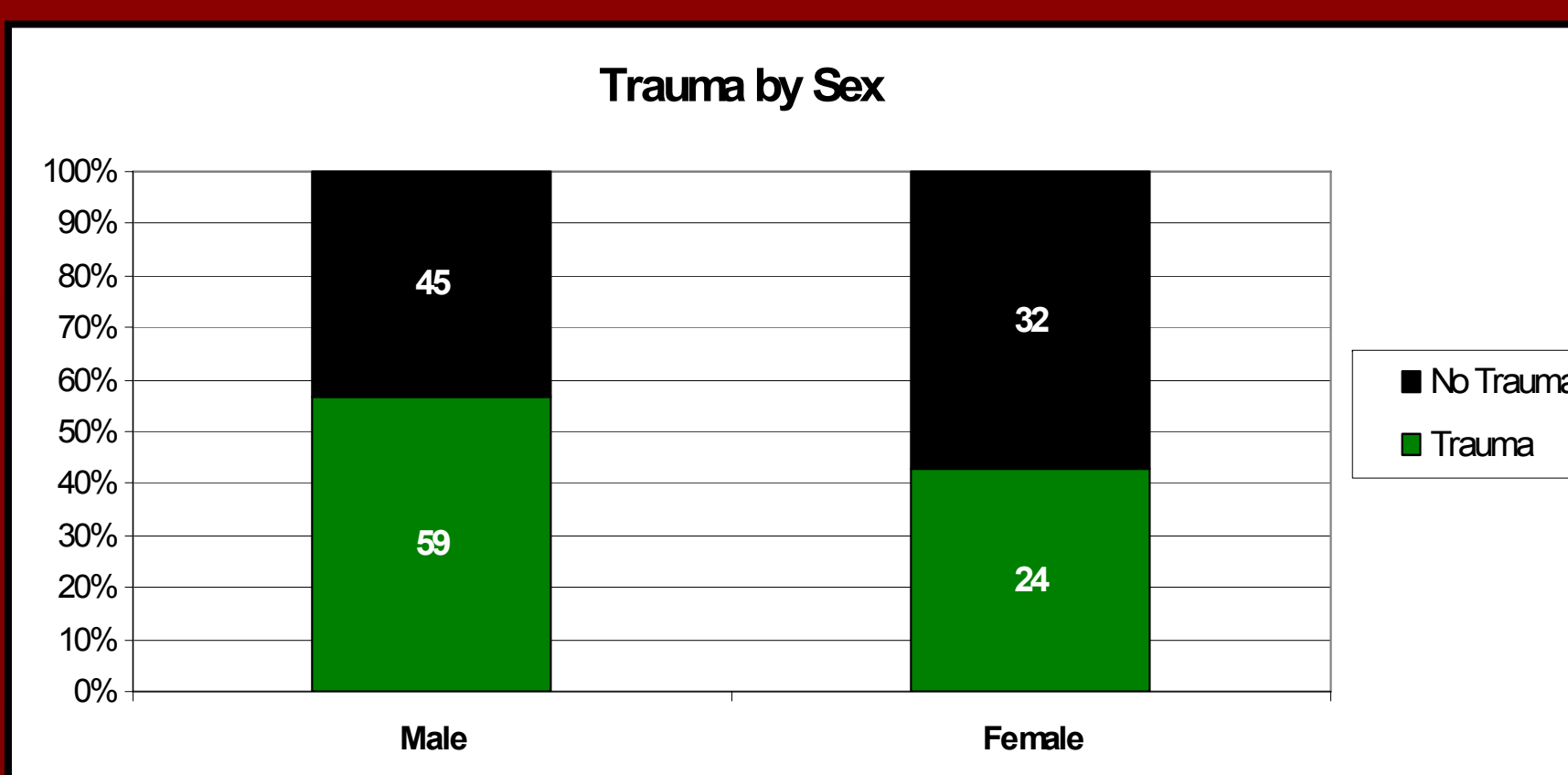


Figure 5. Sex differences in trauma ($\chi^2=1.35, p>0.05$)

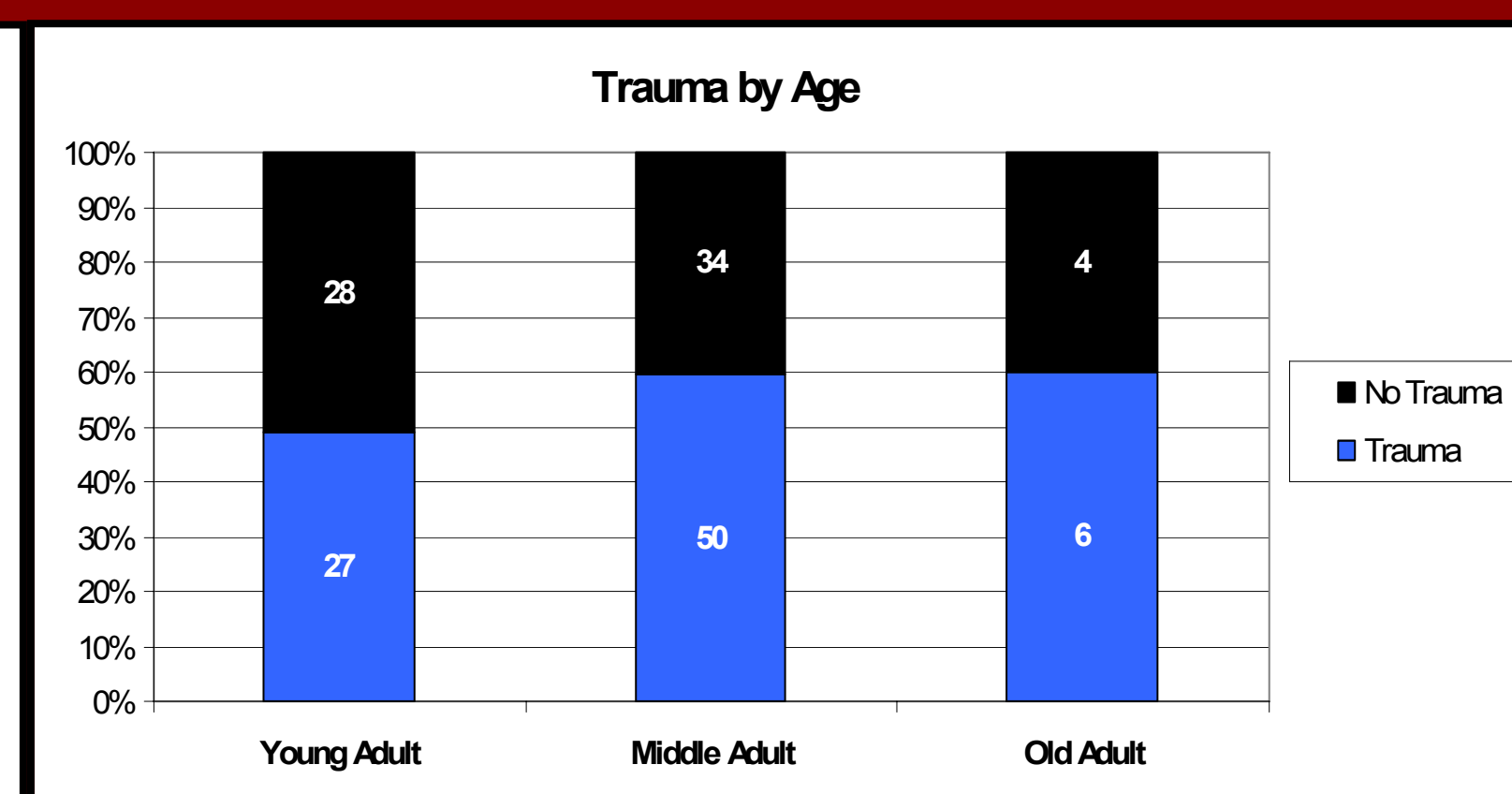


Figure 6. Age differences in trauma ($\chi^2=0.81, p>0.05$)



Posterior view of left patella with fracture and separation of lateral border

Left 8th-10th ribs exhibiting 5 fractures: 3 exhibit a bony response but are barely healed, and 2 are well-healed (arrows)

Dorsal view of 4th and 5th right metacarpals with well-healed fractures

Result & Discussion cont.

- The trunk consistently, by age cohort and sex, exhibited more trauma than any other body region (Figs 7 & 8). Fractures in the trunk region affected 82% (72/88) of all individuals with trauma, and individuals with vertebral fractures account for 87.5% (63/72) of those with trunk trauma.
- Males have a higher frequency of vertebral trauma than females with 44% (46/104) and 32% (18/56), respectively (Fig 9). Although this is not statistically significant ($\chi^2=1.33, p>0.05$), it is possible that males participated in more physically demanding labor than females. Vertebral trauma such as compression fractures, spondylolysis, and Schmorl's nodes were considered traumatic effects of repeated stress under intense loading conditions.

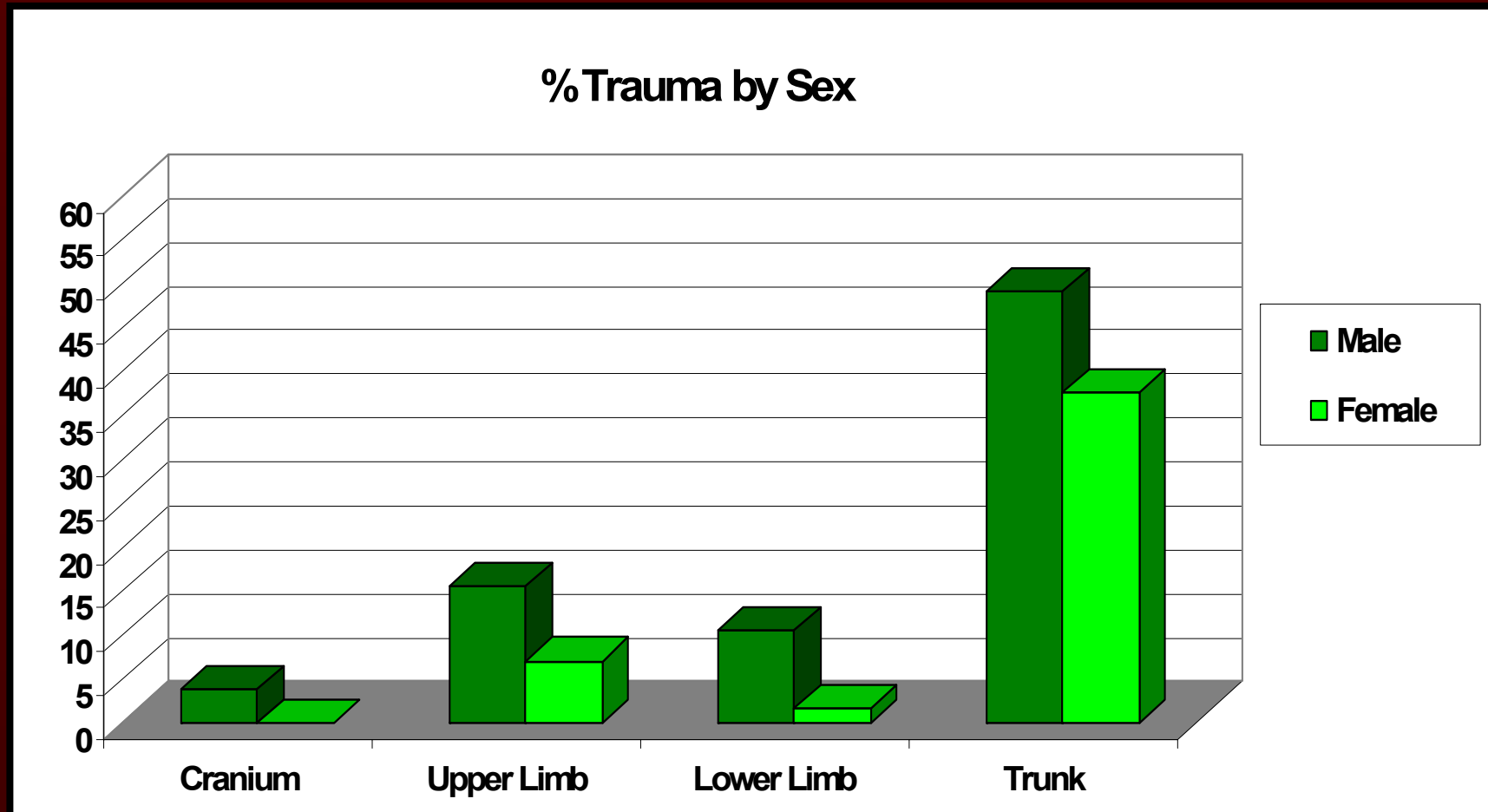


Figure 7. Sexes with region-specific trauma

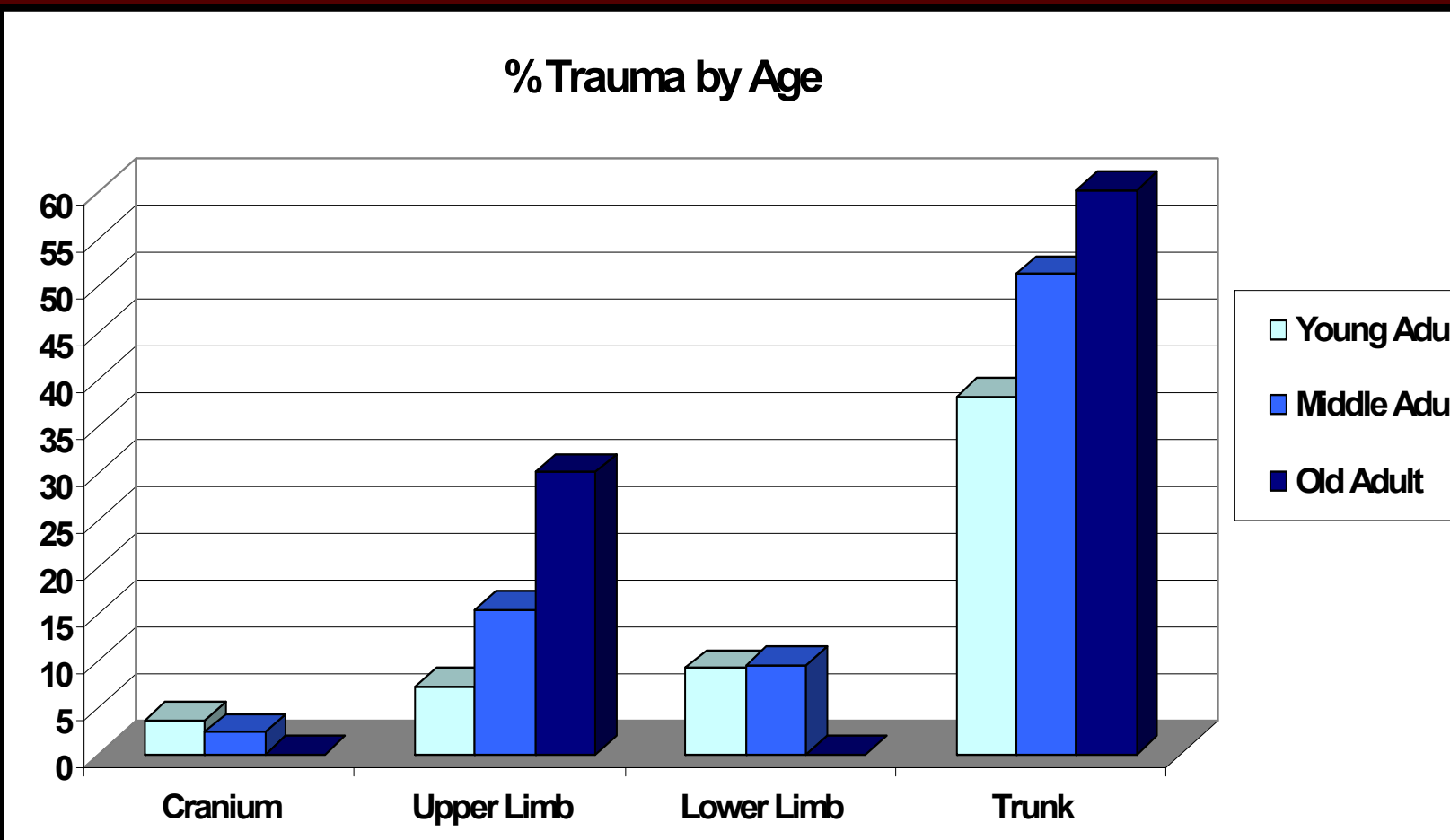


Figure 8. Age cohorts with region-specific trauma



Medial view of left femur with well-healed, mis-aligned fracture at mid-shaft

Lateral view of skull showing partially healed sharp force trauma to the left parietal, temporal, and zygomatic



Lateral view of vertebrae T11-L1 showing severe compression fracture of T12



Posterior view of L4 showing bilateral spondylolysis (pars interarticularis fracture)

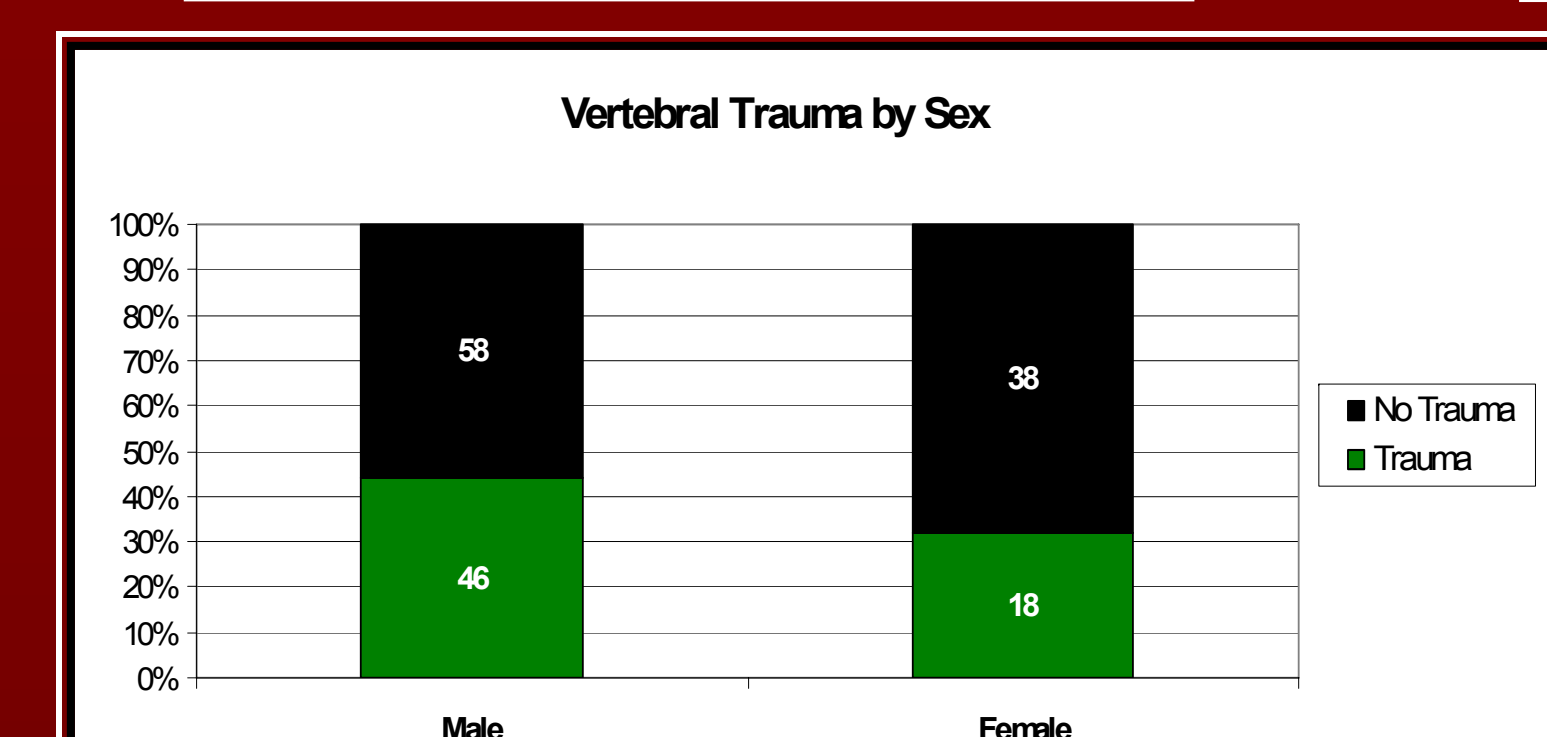


Figure 9. Sex differences in vertebral trauma ($\chi^2=1.33, p>0.05$)

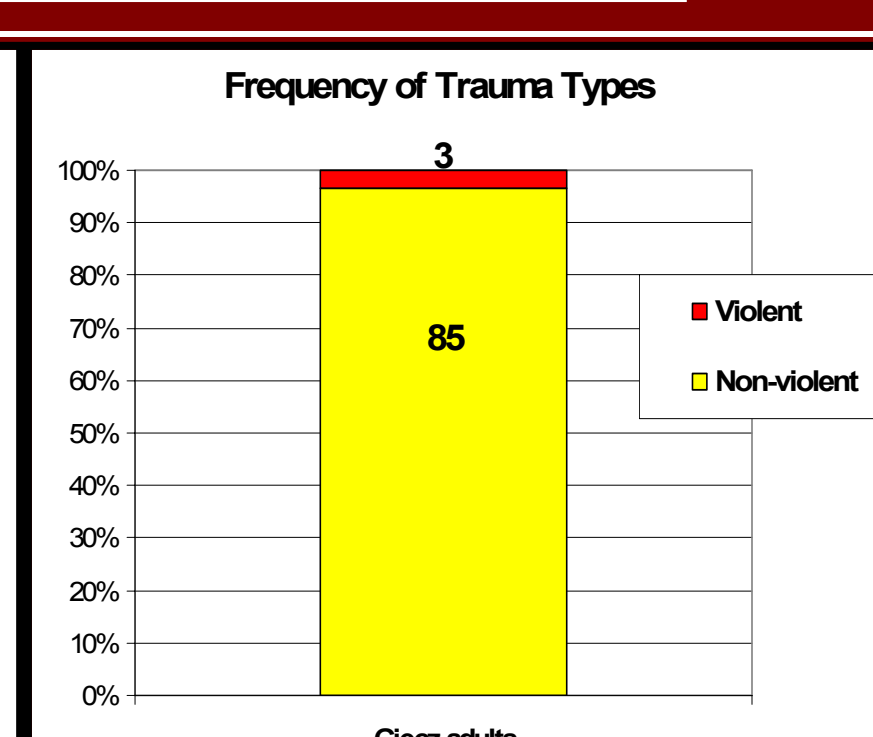


Figure 10. Violent versus non-violent trauma

Result & Discussion cont.

- Null hypothesis 2 failed to be rejected. Only 3.4% of all trauma (3/88) was intentionally violent in nature (Fig 10).
- Correspondence analysis revealed no significant relationships between demographic cohorts and any combination of skeletal elements. See Fig 11 for an example symmetric plot showing a lack of defined groups ($\chi^2=17.22, p>0.05$).

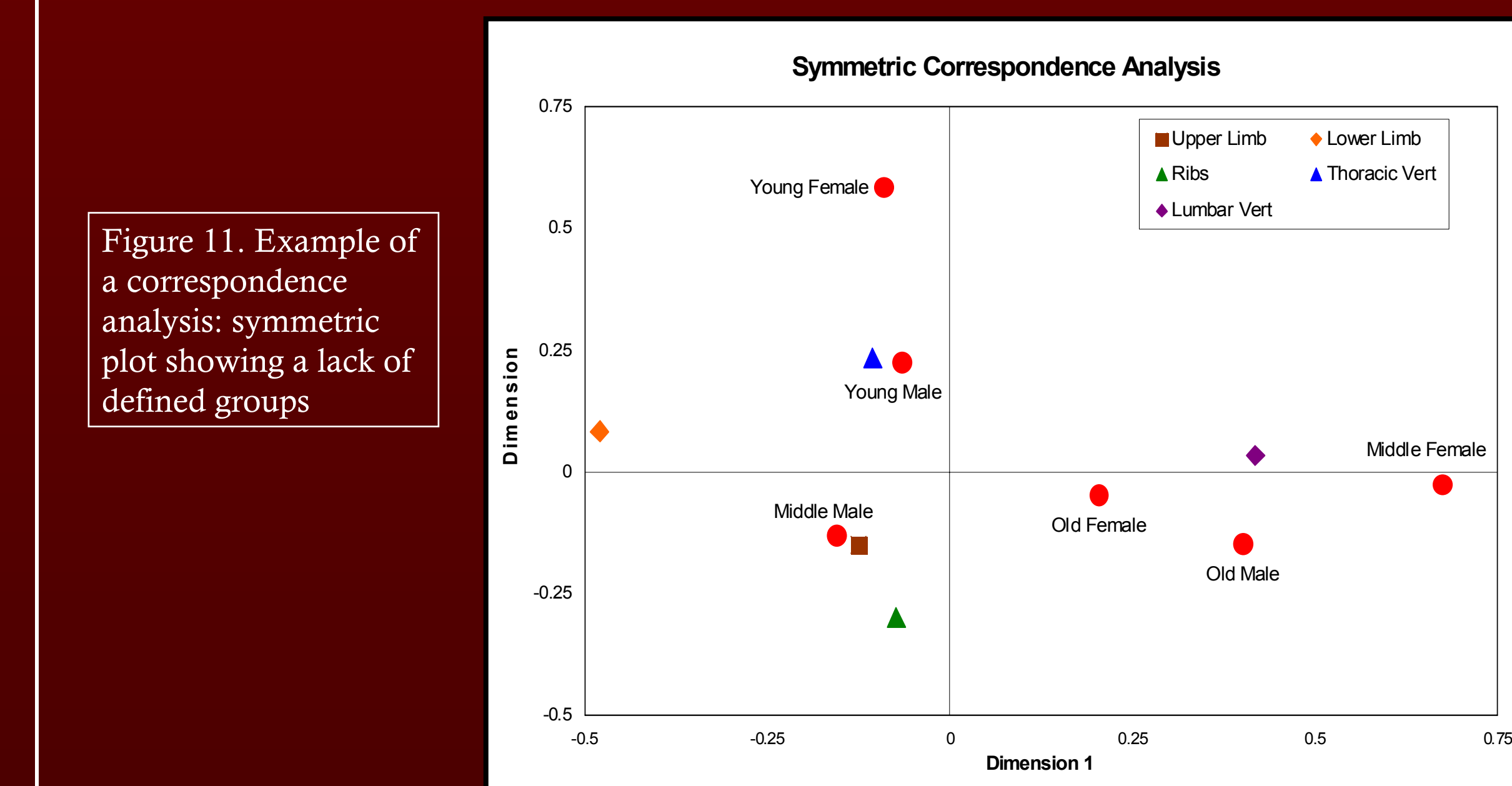


Figure 11. Example of a correspondence analysis: symmetric plot showing a lack of defined groups

Conclusions

- The tradition of military service likely continued in Giecz through the 13th century despite a lack of skeletal trauma resulting from intentional violence. It is possible that battles were not fought frequently by this population. However, to maintain a fortification of the magnitude of the Giecz stronghold would have required extensive labor by troops, putting them at high risk for traumatic injury. Since females and individuals of all ages are highly affected, an overall physically demanding lifestyle for the entire population is suggested as the cause for the elevated rates of trauma, specifically vertebral fractures. Future research will incorporate severity of degenerative joint disease (DJD) into detailed hypotheses concerning physical activity levels.

Acknowledgments:

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References Cited:

¹Barford P. 2001. The Early Slavs: Culture and society in early medieval Eastern Europe. Ithaca: Cornell University Press.
²T. Krysztofiak. 2007. Rozwój wczesnośredniowiecznego ośrodka grodzowego w Gieczu w świetle źródeł archeologicznych. In: A. Grygorowicz, K. Milecka, K. Tobolski (eds). Architektoniczno-przeznaczenie i przyrodnicze podstawy rekonstrukcji wczesnośredniowiecznych założen obronnych Gieczu, Poznań. p 15-39.