

Osteochondritis Dissecans as Evidence of a Labor Intensive Adolescence?

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Introduction

- The purpose of this poster is to provide further evidence for a labor-intensive lifestyle for the population at Giecz.
- Specifically, this research aims to show that adolescents took part in active labor and suffered from trauma along with adults as a result of a heavy agricultural workload.**

Background: Osteochondritis dissecans

- Osteochondritis dissecans (OCD) is characterized by an osteochondritic defect on an articular surface. OCD most often affects the knee joint, specifically the medial femoral condyle. The talus and capitulum are other common sites for the lesion.
- The etiology of OCD is incompletely understood. It is thought to have a genetic component (Kenniston et al. 2008), and a genetic predisposition for this condition is usually indicated by the presence of multiple lesions at multiple joints (Paes 1989). However, the etiology currently favored by clinicians is repetitive traumatic events that cause microfractures, osteonecrosis, and eventual separation of a loose body (Gangley et al. 2006). Overuse of a joint puts skeletally immature individuals who are very physically active at high risk of developing OCD (Jones and Miller 2001).
- In skeletal remains, active OCD is identified by a clearly defined circular lesion in subchondral cortical bone with exposure of underlying trabeculae. Rounded borders or a smoothed depression can indicate healing. The presence of OCD in some archaeological populations is suggested to be related to stress from occupational trauma and agricultural activities (Wells 1974).



Figure 4. Case 2: OCD with partial healing on lateral condyle of right femur in an 18-22 yr old male (G. 3/07)



Figure 5. Case 3: OCD on posterior aspect of distal epiphysis of right tibia in a 9-10 yr old (G. 25/06)



Figure 3. Case 1: Bilateral OCD on capitulum of right and left humeri in a 12-13 yr old (G. 30/05)

Background: Giecz

- The cemetery at Giecz (site Gz4 - see Fig 1) contains the skeletal remains of a medieval (11-12th c.) population (n=277) that inhabited an administrative military center at an economically-important trade route in central Poland (see Fig 2). The rural population at Giecz had an agriculturally-driven lifestyle, but they likely also served to maintain the massive earthen stronghold located there.



Figure 2. Modern map of Poland with location of Giecz

- It is unlikely that the majority of people buried at Giecz were involved in military battles, as evidence of intentional violence there is rare (Justus and Agnew 2009). However, stress-related and traumatic injuries are common in medieval agricultural populations because of a severely laborious lifestyle (Judd and Roberts 1999).

- The frequency of trauma in Giecz adults is 49% (88/180) and of those exhibiting trauma, 96.6% (85/88) were categorized as having stress-related or accidental injuries. For many skeletal elements, a significantly higher rate of such injuries (Fisher's exact test, $p < 0.05$) was found in Giecz adults (n=180) than in a contemporaneous and geographically similar adult urban population (Poznań-Sródka). This suggests the Giecz population's agricultural lifestyle was relatively physically demanding (Agnew et al. 2010).



Figure 6. Case 4: OCD with partial healing on medial condyle of right femur in a 16-18 yr old (G. 3/03)

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Discussion

- For this study, adolescence was defined as 10-20 years of age, at death. All skeletons within this range in the Giecz Collection were examined for evidence of trauma and osteochondritis dissecans. In the adolescent sub-sample (n=32), 5 skeletons exhibit osseous defects consistent with OCD (15.6%). No loose bodies were recovered.
- Case 1** (Fig 3): Bilateral lesions on each capitulum of humeri in a 12-13 year old of unknown sex. No evidence of healing. Note: bilateral manifestation of OCD, especially in the elbow, is rare (Bednarz et al. 1998).
- Case 2** (Fig 4): Lesion on lateral condyle of right femur in an 18-22 year old male. Moderate healing on defect borders.
- Case 3** (Fig 5): Lesion on posterior aspect of distal epiphysis of right tibia in a 9-10 year old of unknown sex. No evidence of healing.
- Case 4** (Fig 6): Lesion on medial condyle of right femur in a 16-18 year old of unknown sex. Partial healing along borders of defect.
- Case 5** (Fig 7): Lesion on medial condyle of left femur in a 12-14 year old of unknown sex. No evidence of healing.



Figure 7. Case 5: OCD on medial condyle of left femur in a 12-14 yr old (G. 22/02)

Conclusions

- While it is recognized that other factors, such as genetics, play a role in the development of OCD, trauma from overuse and repetitive high-stress activity is implicated as a causal factor in the Giecz adolescents described here.** These activities are consistent with the labor intensive lifestyle typical of agriculturalists. Additionally, to maintain a fortification of the magnitude of the Giecz stronghold would have required extensive labor, increasing the risk for traumatic injury. It is likely that sub-adults represented part of the labor-force in Giecz and were considered adults in many activities.
- Further support for the proposed physically demanding labor experienced in Giecz can be found in two additional adolescent skeletons. The first, an 11-12 year old, exhibits spondylolysis in a lumbar vertebra. It is noted that this defect may have a genetic component. However, the second, a 16-18 year old, exhibits compression fractures in thoracic vertebrae 10-12 with notable wedging of T11. It is unusual for such a young individual to suffer this type of stress fracture and it is considered a traumatic injury.
- Since osteochondritis dissecans in adolescence can accelerate degenerative processes in adults (Twyman et al. 1991), future research will incorporate severity of degenerative joint disease (DJD) into detailed hypotheses concerning physical activity levels and lifestyle of the entire Giecz population.