Paleopathology in Pamdom, Patakfalva: A Case Study of Cribra Orbitalia in a Non-Adult From The Székelyföld

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Abstract

This research represents a case study of a single non-adult skeleton (SIR 542) recovered from Pamdom, Patakfalkva. The Papdomb (Romanian: Văleni) archeological site denotes a medieval church and its associated cemetery in Văleni, Hagrita County, Romania.(See Fig. 1 in Appendix). This research represents a case study of one of over 661 graves excavated at this site. (Zeidlik et al.). SIR 542 is a non-adult,[1] 2-3-year-old skeleton from the associated graveyard with cribra orbitalia, a recognized paleopathology. Understanding this paleopathology (the physical or mental conditions observed in the skeletal record) deepens our understanding of the interactions between the biological and social realities of past peoples. This research uses modern American bioarchaeological methods in excavation and analysis to shed light on the biocultural lives of historical Székely peoples. This case study aims to add a complementary paleopathological perspective to the rich historical record maintained by historians and keepers of oral Székely narratives.

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Location

SIR 542 and was found beneath another skeleton (SIR 533) in Trench 23 (See Fig. 2) from a site called “Pamdom” in the town of Patakfalva.

Historically and contemporarily, the graveyard where SIR 542 was interred is located at the Pamdom site in the Székelyföld (Székely Land), the tradiational home of the Székely people. The Székelyföld has been highly contested since the Late Medieval period, existing as an

[1] The term “non-adult” is used in this paper rather than “child” or “baby” because those are socially constructed categories that may not have been applied in the same way to this individual or the Szekley community at that time.

independent nation, as a part of the Hungarian Kingdom, the vassal state of Transylvania, and contemporarily as a part of the country of Romania. The site was first mentioned in 12th century text, but Székely historians believe that the site had been in use at least a century prior (Fejérpataky, 133).

The church and the associated graveyard were used through the High and Late Medieval period (1000CE- 1500CE) and into the Early Modern Period (1500CE-1700CE). The site, and the surrounding village of Patakfalva, was the site to important political events during the 800 years it was in use. (Fejérpataky, 135). The political upheavals during this period caused the loss of many documents describing daily lofe, leaving researchers to fill in information that can be gleaned from the skeletal record about the lives of non-adults in this region, such as SIR 542.

Methods

Age-at-death estimation was performed via dental estimation using AlQahtani's London Atlas (AlQahtani) and placed the SIR 542's age at the time of death between 2 and 3 years. Due to the extremely well-preserved mandible and maxilla and the relative reliability of dental analysis (Roberts), researchers felt comfortable with this relatively narrow age range. Sex estimation using established methods was not possible for this skeleton due to its relatively young age.

Upon visual analysis of skeletal remains, researchers noted porosity on the right super-orbital roof. Under pi-illumination microscopy (See Fig. 3), this porosity was noted as the distinctive pin-prick marks of cribra orbitalia (CO). This discovery directed researchers to consider the cause of this specific pathology and the implications CO could have had on the lives of historical Székely non-adults and their wider community.

Paleopathology

Understanding what diseases or illnesses may have affected this historic population not only offers researchers and descendant community members insight into more information about the distribution and antiquity of a disease; paleopathology also provides a biological perspective on the cultural lives of historical peoples. Due to this being a single skeleton case study, making sweeping statements about the effect of cribra orbitalia on this population is challenging. However, combining this case study with stable isotope analysis done on a culturally similar neighbouring Székely village allows researchers to generate a more informed hypothesis on the causes and possible effects of CO on this population.

Cribra orbitalia (also referred to as porotic hyperostosis) is arguably the most documented paleopathology in the archeological record. (Euber, Spender, Cook, 9-13). Further, CO is not restricted to a specific time period or geographic range. (Nathan, Hass). The prevalence of this condition is likely due to two factors: CO is visible to the naked eye in non-adults and does not require destructive analysis to examine closely. Secondly, many different etiologies cause CO. The direct cause of the porosity is due to massive red blood cell production that leads to the soft marrow inside the compact bone swelling and expanding against and through the super-orbital bone (Walker et al.). This causes the super-orbital bone to have pin-prick marks through it.

In non-adult skeletons, the pin-prick marks are visible, as they have not had time to heal. (Steven). The etiology has been the focus of several studies, and an association with chronic iron deficiency anemia has long been suggested. (Rivera and Lahr). Researchers disregard the anemia hypothesis due to conflicting hematological and archeological research. Iron-deficiency anemia is a distinct lack of red blood cells, and a dramatic increase in red blood cell production causes CO. Hematological research has demonstrated that if an individual is iron deficient, they simply would not have the capacity to sustain massive red blood cell production necessary to create the porosity (Walker).

Further, recent research on current non-adult populations suggests that the majority of individuals living with CO are not iron deficient (Walker). Therefore, the iron deficiency anemia hypothesis was disregarded.

There are many reasons, aside from anemia, why the soft marrow could swell. From complex and rare genetic illnesses that cause overly-large red blood cells (megaloblastic anemia), a localized injury to the area, nutritional deficiencies, to sexually transmitted infections (particularly diseases that pass from mother to child) (Rothschild et al.). The lack of a distinct cause encouraged researchers to posit more than one differential diagnosis, as seen below.

The extreme prevalence and lack of distinct etiology make it challenging to say the exact cause of SIR 542's cribra orbitalia. Researchers felt comfortable ruling out physical trauma to the eyeorbit or surrounding cranium because there was no sign of damage or evidence of healing damage to the cranium. Further, in conversation with the director of lab activities, researchers understood that cribra orbitalia had been observed in many non-adult individuals interred in the same ossuary of the churchyard and in the associated graveyard as SIR 542 who were recognized upon visual exam to have cribra orbitalia (Kelly). For this reason, researchers focused on etiologies affecting more than one person.

There are many possible causes aside from the ones ruled out above. In this case study, researchers posited that SIR 542's cribra orbitalia could be either caused by thalassemia or scurvy.

Thalassemia

Thalassemia is a genetically inherited disease that is relatively uncommon (0.08% of the population) in the modern world. (Chaichun). Specifically, Thalassemia is a blood disorder that causes a decrease in the production of hemoglobin. When there is less hemoglobin in life-sustaining red blood cells, they do not function as well and degrade more rapidly, which means that individuals with thalassemia typically have a lower function red blood cell count than healthy individuals. This deficit in functional red blood cells causes the body to increase red blood cell production, leading to swelling of the eye orbit, causing the porosity recognized as cribra orbitalia.

Due to the rarity of thalassemia and the lack of a sequenced genome, it is impossible to say with certainty that SIR 542 (or any individual in the region) would have experienced this

condition. However, research into the genomes of modern Hungarians and Romanians[2] who have thalassemia suggests that the mutation responsible for the disease[33]is historical, meaning the mutation on the gene did not happen recently and could extend far into the historical record) (Ringalhann). Further, thalassemia is far more common in the Carpathians (Transylvania is located in the Carpathians) and Mediterranean regions than in other places (Horányi, 162). The history of where the Székely people come from needs to be clarified. The Székely people migrated in the 11th century to the Székelyföld (their ancestral land) and consider themselves descended from Atila the Hun, who led their first ancestor to the Székelyföld (Larsen and Jones). Other historians suggest that Székelys branched off from mainland Hungarians (Kristó, 33-34). Either way, it is possible that either one of these ancestral populations carried the mutation for thalassemia into the Székelyföld during migration. This means that historically, there may have been an increased prevalence of the mutation for thalassemia in the Székelyföld. Researchers posited that possible early migrations from the Huns and Turks into Hungary introduced the mutated allele responsible for thalassemia into the gene pool of modern Hungarians and Romanian. (Horányi). This is meaningful because it means historic Székelys could have carried the mutation for thalassemia.

It is more likely than not that SIR 542 did not experience thalassemia in their life. However, this connection between the modern prevalence of thalassemia in adjacent contemporary populations (Romanians and Hungarians) suggests that it is possible. Further research could be done using ancient genome sequencing on skeletons in Patakfalva or other areas of the Székelyföld.

Scurvy

Scurvy is a condition caused by vitamin C (ascorbic acid) deficiency. Humans cannot produce vitamin C independently and must obtain it from their diet. Lack of vitamin C leads to a breakdown in connective tissues in the body, which causes abnormal external bleeding and internal hemorrhaging(Deirawan, 1458). This extensive bleeding causes the body to produce more red blood cells to compensate for losing blood cells to the bleed. . Research has also suggested that because scurvy can weaken the bones, porosity would form quite easily in the orbital bone (Zuckerman et al.). Despite the known pathophysiology of scurvy, researchers could not locate data about the diets of Székelys living in Pamdom, Patakfalva that could elucidate if non-adult Székelys would have experienced scurvy during their lives.

There needs to be more research produced for this specific group of Székelys, particularly regarding the diets of non-adults. This lack of data makes it challenging to determine precisely what SIR 542 would have consumed in their life. Much of the written literature concerning the

[2] The sociocultural identity of modern Székelys is complex, as they are a marginalized group in Romania and have experienced their land changing hands many times. Typically, they do not identify as Romanian and may feel more closely connected to Hungarians.

[3] This description of thalassemia is simplified; in reality, the genetic makeup behind thalassemia is far more complex than described in this paper.

diets of Transylvanians[4]from this period has been destroyed due to sociopolitical upheaval during the period researchers are interested in (Papahangi). However, there has been research into the diets of other Székely people living in other areas of the Székelyföld contemporary to when SIR 542 was estimated to live. Historical Székelyföld laws dictate that the main crops people farmed were cereal grains (wheat, barley, oats, and millet) and animal husbandry of various cows, horses, and goats (Molnár). It is valuable to consider the nutrition of adults because they provide that nutrition to children via breastfeeding. We know that in Western and Central European villages during this time, children typically were weaning during the 1 to 3-year-old period and would supplement breastmilk with pap and pandas (Fulminante). Pap consists of watered-down flour or bread, while pandas are made from meat broth and softened grain, sometimes flavoured with milk or butter (Obladan). Due to their composition, both pap andpandas do not typically contain significant amounts of vitamin C.

Recent stable isotope analysis suggests that non-adults in this region would have been weaning (consuming pap/pandas) between 2 and 3 years old. This data comes from the Telekfalva site, roughly 11km from the Patakfalva site where SIR 542 was interred (Voas). Stable isotope analysis suggests that infants were likely consuming breast milk and were weaned using C_3 and C_4 grain-based pap/pandas (wheat and millet) and animal proteins in the form of milk or butter. SIR 542 would have likely been weaning during the period of death.
Further, SIR 542 had a carry (cavity) on the left maxillary incisor. The presence of a dental carry further strengthens the hypothesis that SIR 542 was not solely consuming breast milk, as sole breast milk consumption can offer some protection against carries (Branger). However, the higher sugar content in wheat and millet-based paps/pandas that SIR 542 would have been consuming could lead to carries similar to the ones observed in SIR 542. This suggests that SIR 542 was likely in the weaning period during their death.

Weaning can lead to nutritional deficiencies (like scurvy) because when infants consume most of their daily calories via breastmilk, they can access most of the nutrients their parent consumes. Adults in this region were likely to consume a wide variety of grains, dairy products, and fruits (domestic and foraged) and thusly are more likely to meet their vitamin C needs (Molnár). Paps and pandas have meager (if any) amounts of vitamin C, as grains do not typically have vitamin C (Carr). Non-adults (such as SIR 542) who get most of their calories from pandas could not access the higher amounts of vitamin C found in adult diets. This lack of vitamin C during the weaning period could have caused SIR 542 to develop scurvy.

Further exploration into the weaning diet of SIR 542, and other non-adult skeletons from the burial site, is warranted and necessary to confirm the scurvy-specific etiology in this case.

Conclusion

Understanding the etiology behind this and other cases of cribra orbitalia allows researchers to add reciprocal knowledge to the oral histories maintained by the Székely people. Thalassemia or scurvy, were they the true causes of SIR 542's cribra orbitalia, offer researchers

[4] Not everyone living in Transylvania, the region that the Székelyföld lies in, was/is Szekely

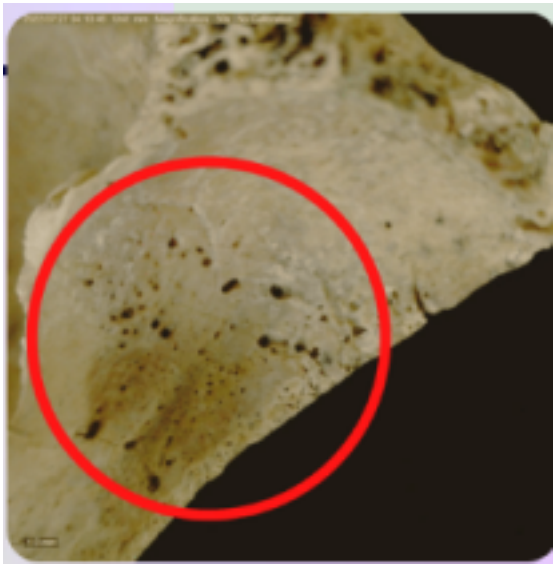
insight into the biocultural lives of non-adults. As a single case study, SIR 542 cannot tell a complete story about the lives of non-adults in the Székelyföld during the Late Medieval and Early Modern Periods. However, the proposed etiologies of scurvy and thalassemia create possible avenues for future research using stable isotope analysis and ancient genome sequencing.

APPENDIX

Figure 1 *Maps showing the location of Văleni village within the Feliceni Commune, Harghita County, and Romania*

Figure 2 *Map showing SIR 542 position under SIR 533 in the graveyard (Pamdom, Patakfalva)*

Figure 3 *Image of SIR 542's Cribra Orbitalia under pi-magnification*



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