Osteobiography of Gröf Gr-21 from Keldudalur, Iceland

Myra Eckenhoff; Advisors: Kimmarie Murphy, Ph.D., Guðýn Zoéga, M.S.

Abstract

Around 1000 A.D., the Icelandic government declared a conversion from Paganism to Christianity for all Icelanders. Due to this sudden change and a lack of official churches to which to worship, many Icelanders built small, family Christian churches on their own land. Keldudalur, a farm in Northern Iceland, is now an archaeological site with the remains of such a church and cemetery. In 2002 and 2003, 52 Viking Age individuals were discovered in the cemetery at Keldudalur. One of these individuals, Gröf A-21, possessed multiple lytic foci in the skeletal system; marked by a differential diagnosis of the possible etiology of this pathology. Multiple myeloma, a disease which causes atypical blood cells to hinder the production of new blood cells in bone marrow, causes skeletal lesions that match the appearance and patterning found in the remains of Gröf A-21. However, there are other hematopoietic diseases that can have similar skeletal lesions to multiple myeloma, such as prostate carcinomas, breast carcinomas, leukemias, etc. When the visible lesions on Gröf A-21 were compared to the characteristics of these hematopoietic diseases, multiple myeloma seems to be the most likely cause of this pathology. Radiographs would have been necessary for a conclusive diagnosis, but the observational evidence suggests a differential diagnosis of multiple myeloma.

Introduction

The Viking Age in Iceland was an important time for the Icelandic peoples and Iceland's culture. Around 1000 A.D., the Icelandic government officially declared that Christianity was the country's new religion—thou

Methods

In the examination of the pathology on the human remains of Gröf A-21, I utilized several techniques that differed from traditional differential diagnosis. Understanding the bony response to processes such as disease or trauma is especially important, as there are only two ways that bone can react. The body can either produce new bone (proliferation), or lose bone (resorption) in response to tissue lesions (Winter 2003). One of the primary methods used in the paleopathological research, gross descriptions, require careful documentation of skeletal abnormalities. There are generally established criteria (Bullock and Ubelaker 1994; Ortner 2003, Steinbock, 1979), for detailed gross description, a necessary stage (2) (see standard methods for this examination), (3) a detailed description locations and distribution of altered bone, (4) a comparison to clinical descriptions of diseases with similar involvement (Smith and Ubelaker 1994-1996). Following this protocol, I examined and photographed the entire skeleton of Gröf A-21 in order to collect as much information about the lesions as possible for a differential diagnosis. Results

Discussion and Conclusions

After examining the data compiled in Table 1, I have come to the conclusion that Gröf A-21 suffered from multiple myeloma based on the following evidence: • Gröf A-21 was estimated to be 50+ years old at the time of death. All three hematopoietic diseases described in Table 1 could occur in an individual from the age range, although leukemia is less likely, given its tendency to occur in younger individuals (Ortner 2003). • Gröf A-21 presented 8-10 lesions. While this does not eliminate any of the hematopoietic diseases described in Table 1, breast carcinoma is more likely to occur in females than males, and multiple myeloma is more common in males than females (Otten 2003). • The lesions in Gröf A-21 are all osteolytic in nature. Osteolytic lesions with an absence of osteoblastic activity are almost always a sign of multiple myeloma. Osteoblastic bone formation, which would normally appear with metastatic carcinomas, is not present on Gröf A-21’s lesions, suggestive of multiple myeloma as opposed to metastatic carcinomas such as breast and prostate (Otten 2003). • The lesions, clavicles, vertebrae, ribs, and os coxae are covered in multiple myeloma as opposed to metastatic carcinomas such as breast and prostate (Otten 2003). • The scapulae, vertebrae, ribs, and os coxae are covered in osteolytic lesions in a symmetrical distribution (the highest being in the diameter), with sharp edges. This skeletal patterning of lesions is most consistent with those of multiple myeloma (Fig. 9). Prostate carcinomas have a similar distribution of lesions, but the size and shape of the lesions are more variable (Otten 2003). • The remains of Gröf A-21 are well preserved, and the distribution, type, size, and shape of all the lesions present indicate multiple myeloma. While much of the observational evidence from the gross description of the pathology found in the remains Gröf A-21 is highly suggestive of multiple myeloma, one must remain cautious when developing a differential diagnosis with archaeological material. First, the skull is typically involved in the disease process associated with multiple myeloma. Unfortunately, there are no lesions visible on the cranial or mandible. Second, it was unable to obtain radiographs on Gröf A-21 during the short time I was in Iceland during the summer. Since it is necessary for any differential diagnosis to include evidence from radiographs, a final diagnosis of multiple myeloma is tentative but highly suggestive.

References


Acknowledgements

I am deeply grateful to the Summer Science Program, sponsored by Kenyon College. My advisor, Kimmarie Murphy, Ph.D., Professor of Anthropology, Kenyon College; Guðýn Zoéga, M.S., Departmental Head of the Department of Archaeology at the Skagafjarðar Eyr, Iceland.

Table 1: Distinguishing characteristics of bone pathologies resulting from various hematopoietic diseases.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Age</th>
<th>Sex</th>
<th>Location</th>
<th>Lesion Size</th>
<th>Lesion Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple myeloma</td>
<td>45+</td>
<td>Males</td>
<td>Os coxae, sacrum, skull, mandible, clavicles, ribs</td>
<td>Concentrated in certain areas</td>
<td>Symmetrical</td>
</tr>
<tr>
<td>Breast carcinoma</td>
<td>40-70</td>
<td>Females</td>
<td>Os coxae, ribs, vertebrae, skull, mandible</td>
<td>Resorptive in nature</td>
<td>Asymmetrical</td>
</tr>
<tr>
<td>Prostate carcinoma</td>
<td>50-70</td>
<td>Males</td>
<td>Os coxae, mandible, vertebrae, ribs</td>
<td>Concentrated in certain areas</td>
<td>Symmetrical</td>
</tr>
<tr>
<td>Leukemia</td>
<td>20-60</td>
<td>Males and females</td>
<td>Skull, mandible, ribs, vertebrae, clavicles</td>
<td>Resorptive, distributed, asymmetrical</td>
<td>Asymmetrical</td>
</tr>
</tbody>
</table>

Figure 1: Map of the Skagafjórður, Iceland