



بهترین وب سایت جشنواره وب ایران به انتخاب مردم

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برآورد هیستولوژیکی سن در هنگام مرگ از طریق اندام‌های تحتانی قطع شده: مسائل عدم استفاده، سن بالا و بیماری در تحلیل استخوان آسیب دیده

چکیده

مطالعات هیستولوژیکی (بافت شناسی) در مورد بافت استخوان بهبود یافته پس از قطع عضو از نظر علمی نسبتاً نادر است. این مطالعه ویژگی‌های هیستومورفولوژیکی (بافت شناسی و ریخت شناسی) بخش‌های نازک استخوان ران از شش قطع عضو یک طرفه و دو طرفه از سن و جنس مشخص شده را توصیف می‌کند. بخش‌های نازک از میانه استخوان ران راست و چپ از هر شخص قطع شده و به دنبال روش‌های استاندارد پزشکی قانونی برای تخمین بافت شناسانه سن مرگ از استخوان ران انسان تجزیه و تحلیل شد. سن مربوط به بافت در برآورد سن در لحظه مرگ برای بخش‌های نازک شده از استخوان قطع شده به طور پیوسته‌ای (در همه نمونه‌ها) کمتر از سن تقویمی واقعی هر فرد بود، که نشان دهنده تأثیرات منفی قطع عضو در استفاده موثر از این روش جهت تخمین سن در لحظه مرگ است. ماهیت هر قطع عضو ناشناخته است، که نشان می‌دهد عوامل جایگزین می‌توانند مسئول کند شدن تغییر و یا برگشت استخوانی باشند که در قسمت‌های نازک از استخوان قطع شده دیده می‌شود. اول، منطقی است که فرض کنیم قطع عضو در این نمونه می‌تواند ناشی از عوارض دیابت باشد نه ضربه، بنابراین اثرات احتمالی در بازسازی استخوان به دلیل بیماری بررسی می‌شود. دوم، تحرک افراد متعاقب در پی قطع عضو برای نتایج هیستومورفولوژیک (بافت شناسی و ریخت شناسی) ناشناخته است که می‌تواند به دلیل وجود پوکی استخوان باشد.

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Histological estimation of age at death in amputated lower limbs: Issues of disuse, advanced age, and disease in the analysis of pathological bone

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ABSTRACT

Histological studies of healed bone tissue following amputation are relatively rare in the literature. This study describes the histomorphological features of femoral thin sections from six uni- and bi-lateral amputees of documented age and sex. Thin sections were cut from the midshaft of both the right and left femora from each amputee and analyzed following standard forensic methods for histological estimation of age at death from the human femur. The histological age at death estimations for the thin sections from amputated bone were consistently lower than the actual chronological age of each individual, suggesting that the effects of amputation prohibit the effective use of age at death estimation methods. The nature of each amputation is unknown, which suggests that alternative factors could be responsible for the slowed bone turnover seen in the thin sections from the amputated bone. First, it is reasonable to assume that the amputations in this sample could have resulted from complications of diabetes mellitus rather than trauma so the possible effects on bone remodeling due to disease are explored. Second, the mobility of the decedents following their amputations is unknown so the histomorphological results could be due to disuse osteoporosis.

1. Introduction

Histological investigations of the human femora have been pursued by researchers interested in the development and application of age estimation methods since the 1960s.^{1–22} Microstructural studies of hard tissue amputation are scarce in the forensic and medical literature. Researchers have occasionally reported on the histomorphology of individuals that experienced amputation and subsequent disuse of the limbs,^{14,17} but these reports are often singular case studies. In contrast, this study provides a sample of six individuals who lived with their lower-limb amputations for a number of years, allowing for healing and remodeling to occur in the affected bone.

This study has two goals: 1) to describe the histological features of the midshaft of a unique sample of uni- and bi-lateral amputated human femora from a documented medical collection; and 2) to determine if traditional forensic age at death methods^{8,9} can be used to accurately age these pathological bone samples. The midshaft of the human femur has been consistently used in forensic age at death estimations with success, but rarely do researchers include pathological bone in their histological age at death analyses. Because of the fragmentation or incomplete recovery of the skeleton in many forensic cases, traditional sites of age estimation (e.g. pubic symphysis, sternal rib ends) are sometimes absent or poorly preserved and so histological aging methods must be employed.

2. Materials and methods

Femoral midshaft samples were removed from the right and left limbs of six amputees of documented age and sex with full permissions from the Willed Body Program at Michigan State University. All femora in the sample showed vascular attrition of the amputated distal end with healed endosteal calluses indicating that the limb had not recently been severed.^{23,24} Each midshaft sample measured approximately one inch in length. The bone samples of two individuals were too friable for thin sectioning, so the femoral sections recovered from the six individuals numbered ten in total. While causes of death for each individual were known, a complete medical history was not available so the timing and reason for the amputations remains unknown.

Midshaft segments were cleaned using a detergent solution following standard bone maceration procedures. When necessary, the samples were embedded in an epoxy resin prior to thin sectioning so that the bone did not splinter when exposed to the wafering saw. A Buehler Isomet 1000 thin-sectioning machine was used to cut a thin section measuring 0.7–0.8 mm from the sample depending on the integrity of the cortical bone. Cuts were made at a speed ranging from 100–200 rotations, according to the strength of the bone. Thin sections were ground by hand with 600 grit sandpaper, mounted onto glass microscope slides using Permount affixer, and shielded with cover glass. Images were produced and analyzed using a compound light-

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