A case study in estimating age based on forensic odontological findings in skeletal remains

Nobutaka Okusa, Hitoshi Nishio, Hiroshi Noda and Shinji Tatsumi

Department of Legal Medicine, Kinki University Faculty of Medicine, Osakasayama, Osaka, 589-8511, Japan

Abstract

A method for estimating age based on occlusal wear of the teeth and palatine suture morphology has been widely used. This allows us to estimating age based on macroscopic findings. However, even if the living status and jaw growth are taken into consideration, the accuracy of this method is not sufficient. In this case, a marked difference was observed in estimated age between two methods based on the degree of occlusal wear and palatine sutures. To avoid this discrepancy, a number of approaches, including radiography, a comparison of the morphology of teeth using a study model, and data preparation employing dental charts are necessary. Some factors, such as distortion, growth and developmental disorders of the jaw bone, diet, occlusal relationship, and habits often influence age estimation especially when the dental attrition degree of the tooth is used. When there is a discrepancy in the estimated age, caution should be exercised. There is an individual difference in the status of the synchia. We observed a case that misled us into presuming younger age. It is rare that estimated age is higher than a real age. Age estimation is performed from both sides of dental attrition and palatal suture in this time. This case demonstrated a large discrepancy in age estimation between dental attrition and sutures of the palatine bone.

Key words: forensic odontology, dental attrition, age estimation, palatine suture

Introduction

In skeletal or charred remains lacking the soft tissue, hard tissues such as the teeth, bone, nails, and hair provide important information. In particular, the teeth are important because the influences of external physical and chemical factors are slight. Many methods for estimating age from skeletal remains have been reported. Ogata et al. evaluated part of the skull based on radiographs and the palatine sutures, and estimated the age. Kimura et al. estimated age based on the degree of occlusal wear by employing Takei's method for personal identification. Tomaru et al. estimated age based on the degree of occlusal wear of the mandibular incisors, and reported a correlation between the occlusal wear index and age. In our department, we have also made an identification by superimposition using dental films in a previous case, as well as for suspect identification. In this paper we report a case in which there was a marked difference between the age estimated based on the degree of occlusal wear and that based on the palatal sutures of skeletal remains.

Case

In April in a previous year, a primary school student playing in the mountains discovered a skeletonized femur, and reported it with his mother to the police. During a search of the vicinity, the right femur, right tibia, mandible, and skull were discovered. Since the sites of discovery differed among these bones, we analyzed to determine whether the bones belonged to

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the same person and estimated age.

**Forensic odontological findings**

The autopsied cadaver had 2 mandibular and 7 maxillary remaining teeth (total, 9 teeth). The postmortem missing teeth were the left central incisor, left lateral incisor, left canine, left first and second premolars, left first and second molars, and the right central incisor (8 teeth) in the maxilla and the left canine, left first and second premolars, and the right first and second premolars (5 teeth) in the mandible (total, 13 teeth) (Figs. 1, 2, 3). There was a maxillary fracture with a border between the hard and soft palates; almost all horizontal plates of palatine bone is lacked. Alveolar bone of maxillary right molar is lacked. And it is unknown whether the maxillary right second molar was present. Concerning the palatine sutures, since there were clear incisor sutures on the left and right sides and the left transverse palatal suture, the age was estimated to be about 20-30 years. However, occlusal wear was marked in the anterior area of the mandible, and the cusps and edges had largely disappeared (Figs. 3, 4). The exposure of dentin was seen observed in zonal patterns. In addition, when the method of Takei was used, it was calculated with 60.4 years old, suggesting an age of more than 60 years. No treatment scars were noted in the remaining teeth.

**Discussion**

In living bodies and cadavers for analysis, worn, treated, and carious teeth are often mixed. In this case, the degree of occlusal wear is examined. In skeletal remains, the palatine sutures are also examined. We found that, the
estimated age based on the degree of occlusal wear (young age) markedly differed from that based on the palatal sutures (advanced age). The age difference was about 30 years, which may be associated with jaw growth, the ingested types of food, occlusal relationship, and habits. Among jaw deformities and growth abnormalities, mandibular protrusion due to maxillary hyperplasia or mandibular hyperplasia is often observed, as well as maxillary protrusion, cross bite, and open bite. Cases of maxillary undergrowth due to the prevention of maxillary sinus enlargement by chronic sinusitis during the growth period have been reported. Thus, a more careful and detailed interpretation of findings is important. This case showed no mandibular overgrowth due to the mandible deformity. Excluding the mandibular protrusion, the crowding of the mandibular anterior teeth could be suspected. Therefore, we speculate that insufficient growth space during infancy induced occlusal abnormality, and excessive tooth contact in the crowding area during mastication caused occlusal wear abnormality. However, Abe et al. classified malocclusion into superoinferior, anteroposterior, horizontal, crowding, and spaced dental arches, and performed mastication experiments using various types of food. These experiments demonstrated that it was difficult to eat many types of food with superoinferior or anteroposterior malocclusion. Miyatani et al. measured the mean occlusal force during mastication in patients with malocclusion, and reported that the patients had a lower occlusal force than normal occlusion. In addition, compared with females, males show no significant correlation between masticatory ability and maxillofacial or dental arch morphology. Therefore, mild crowding except greater number of teeth does not markedly affect the masticatory muscle strength or masticatory ability. In this case, we speculate that the masticatory muscle or ability had not been affected, but excessive occlusal wear due to crowding in addition to physiological occlusal wear was the reason for the estimation of more than 60 years of age.

Concerning the palatal sutures, the closure state markedly varies among individuals, and the age estimated based on sutures is lower than the chronological age. As Sakaue et al. showed, estimation of the minimal age based on macroscopic findings alone, tends to cause errors even if attention is paid to the occlusal relationship. In addition to macroscopic findings, radiography is sometimes used. X-ray films provide information on the degree of tooth calcification, the presence or absence of the pulp, and treatment states. The possibility of locating antemortem films is high, and these films can be useful data for comparison. In addition, the morphology and state of crowns can be evaluated in a study model, and dental charts can be produced. Therefore, radiography in addition to macroscopic findings provides data to support dental charts and is also useful for comparison with a study model. These methods are indispensable for the accurate estimation of age and subsequent rapid identification. This rare case, which showed a large discrepancy in age estimation between dental attrition and sutures of the palatine bone, led us to reconsider not only the accuracy of the usual estimation methods but also various factors of aging from anatomophysiological findings and the roentgenological point of view. In conclusion, it is necessary to combine several findings derived from alveolar bone degree without depending on one estimate alone. Both sides of the dental attrition degree and the suture to improve the reliability of the age estimation. Forensic age estimation from skeletal remains is still important. We should take occlusal growth into consideration if the estimated age shows inconsistency.

References


