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Periodontal Diseases in Anthropology

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1. Introduction

Dental caries and periodontal disease are two of the most common human diseases along with the common cold. Signs of dental caries have been seen even in early hominids (*Australopithecus*). It is well known that many signs of dental caries and periodontal disease were also seen in the Krapina Neanderthals and the archaic *homo sapiens* Kabwe man (also called “Broken Hill Man”: human from 300,000-130,000 years ago) (Fig. 1). Dental caries and periodontal disease are not diseases that appeared in the modern era, so-called “modern diseases” or “diseases of civilization.” Instead, they are ancient diseases with a long history of afflicting mankind. Therefore, the study of dental caries and periodontal disease in ancient people can be a major key to unlock information on their daily lives and behavioural patterns. Such a study on ancient human skeletal remains can provide information on dietary habits and lifestyles in various stages of human evolution, including diet, subsistence and oral hygiene.

Dental caries is considered to be the disease with the most case reports in dental paleopathology. The reason is that dental caries occurs in teeth which have the hardest tissue in the human body. Therefore, even if ancient human skeletal remains are excavated in poorly preserved conditions, dental caries can be distinguished relatively easily and data can be accumulated easily for statistical analysis. Studies of dental caries date back to the Meiji and Taisho era in Japan. Today, studies on dental caries are still being actively conducted by (including myself) Sakura; 1964; Sakura, 1989; Yukinari, 1975; Turner, 1979; Inoue et al., 1981; Fujita et al., 1994; Fujita, 1995; Fujita & Suzuki; 1995; Fujita and Hirano, 1999; Fujita, 2002; Oyamada et al., 2004; Temple, 2007a, 2007b; Temple and Larsen, 2007; Oyamada et al., 2010). Since there are many studies on dental caries in ancient human skeletal remains from various countries, this chapter will use the results of recent studies as reference (Garcin et al., 2010; Meller et al., 2009). What about the other prevalent disease, periodontal disease? Unfortunately, there are almost no comprehensive studies on periodontal disease in anthropology (Fujita, 1999; Reich et al., 2011; Meller et al., 2009; Silvestoros et al., 2006). Although teeth are made of the hardest material in the body, alveolar bones are fragile. Periodontal disease occurs in this fragile type of bone. Thus, an examination of alveolar bone is not always easy in ancient human skeletal remains that were buried in the soil for many years and a statistical study can be difficult to perform.



Fig. 1. Signs of dental caries and periodontal disease in the Kabwe man. Surprisingly, a fossilized man from over 100,000 years ago had advanced periodontal disease and dental caries as shown.

As is commonly known, humans underwent evolutionary development from Australopithecine, *Homo erectus*, Neanderthal man, to modern human (Cro-Magnon man and onward). Unfortunately, fossilized human bones earlier than those of Neanderthal man have not been found in Japan. Even modern human bones from the Pleistocene epoch are rare. Therefore, human skeletal remains from the Jomon period and onward are the remains that can be analyzed and statistically examined as a collection or “group.” This chapter will examine how periodontal disease and dental caries have changed in Japanese people from the Jomon period onward.

2. High prevalence of dental caries in Jomon people

In my study of the Jomon people, the surprising result was the high incidence of dental caries, although it was lower than that of the general modern population. When the prevalence of dental caries among the Jomon people was compared to those from similar societies of hunters and gatherers, the Jomon people generally had a higher prevalence of dental caries. Table 1 shows the prevalence of dental caries among people from similar stages of hunter and gatherer societies as the Jomon people.

The prevalence of dental caries was much larger in the Jomon people than even the present day Inuits of Greenland or Aboriginal people of Australia. The Jomon prevalence of dental caries was very high, unlike any other hunter and gatherer societies in the world. Most of the hunters and gatherers who do not farm have a very low prevalence of dental caries. With the transition of their economy from hunting and gathering to farming, the incidence of dental caries is known to increase sharply. In Japan, the prevalence of dental caries increased sharply in the Yayoi people who adopted agriculture. The high prevalence of dental caries in the Jomon people is thought to demonstrate the intake of large amounts of cariogenic starchy foods prepared in a way to further facilitate dental caries' occurrence. In recent years, we have examined dental caries in excavated human skeletal remains from approximately BP 2100 and AD 400-700 in the Korean peninsula and found low prevalence of dental caries (Fujita and Choi, 2008; Fujita et al., 2011). These people had knowledge of agriculture, but their prevalence of dental caries was similar to, or even less than, those of the Jomon people of Japan. This result has drawn much interest for the following reasons: it indicates that the spread of agriculture was not necessarily the same on the Korean peninsula or the Japanese islands. In addition, people who lived in geographical conditions more suited for hunting and gathering very likely practiced these activities for subsistence even if they knew about agriculture.

| Groups | Age | Economic level | Caries rate (%) |
|-------------------------------------|----------------------|------------------------------|-----------------|
| Jomon (Japan) | 15,000-2,300 yrs BP | hunting-gathering | 8.2 |
| Jomon (Hokkaido) | 15,000-2,300 yrs BP | hunting-gathering | 2.6 |
| Yayoi (Doigahama, Japan) | 2,000 yrs BP | agriculture | 19.7 |
| Yayoi (Mitsu, Japan) | 2,000 yrs BP | agriculture | 16.2 |
| Kofun (Japan) | ca. AD 1700-1400 yrs | agriculture | 8.3 |
| Muromachi (Japan) | ca. AD 1400 yrs | agriculture | 14.6 |
| Edo (Japan) | AD 1603-1868 yrs | agriculture | 12.1 |
| Old Copper (USA) | 7,600 yrs BP | hunting-gathering | 0.4 |
| SJO-68 (USA) | 3,000 yrs BP | hunting-gathering | 2.4 |
| Australian Aborigine (Australia) | Modern | hunting-gathering | 4.6 |
| Inuits (Denmark) | Modern | hunting-gathering | 2.2 |
| Inuits (USA) | Modern | hunting-gathering & trade | 1.9 |

Caries rate (%): 100 (cariou teeth/ teeth present)

Table 1. Comparison of the prevalence of dental caries among various groups. Many hunters and gatherers of the world have low prevalence of dental caries, but the Jomon people had a very high prevalence rate. The dental caries prevalence increased in Yayoi individuals from the Northern Kyushu site, but decreased in Japanese people in subsequent periods. The prevalence has not increased dramatically up to the modern period.

3. Close association between dental caries and periodontal disease

3.1 Elderly-type dental caries in modern times

The title of this book is "Periodontal Diseases," but the focus of the above section was dental caries. The reason is that dental caries and periodontal disease have a close association in ancient people. Therefore, it seemed inappropriate to discuss either one as a disease independent of the other. This section will discuss dental caries and periodontal disease in Japanese people from the Jomon period. In this process, the reader will gain an understanding of the close association between dental caries and periodontal disease in ancient people.

Dental caries in the Jomon people can be compared with that in modern day people in a few ways. I focused on the sites where dental caries occurred. The preferred sites for dental caries are occlusal and interproximal areas in modern day people. The Jomon people were more susceptible to dental caries in the interproximal and buccal cervical areas, and root areas (Fig. 2). Occlusal dental caries were rare.



Fig. 2. Dental caries that developed in the root areas in Jomon people. The figure shows a typical pattern of cervical root dental caries in Jomon people.

The pattern of carious sites in the Jomon people is very similar to that found in the modern day elderly. The direct cause is the exposure of cervical and root areas due to gingival recession and alveolar bone loss. Crowns are covered by enamel, but cervical and root areas are composed of cementum. Therefore, these areas are structurally weaker against the invasion of dental caries. Figure 3 is an oral image of a man in his 70s who presented to the Department of Oral Surgery of the Tokyo Metropolitan Geriatric Hospital. His gingiva was inflamed and his alveolar bone was receded. He clearly had periodontal disease. Unlike the

Jomon people, this patient did not have buccal dental caries, probably due to the effects of brushing teeth. However, the occurrence of root dental caries due to alveolar bone loss was determined to be almost the same as in the Jomon people. Therefore, the pattern of dental caries in the Jomon people was similar to the elderly-type dental caries in modern times.



Fig. 3. Root dental caries in a modern day 70 year old person The root dental caries shown are very similar to dental caries in Jomon people. The labial and buccal surfaces of the cervical root areas were dental caries-free, probably because of brushing teeth.

Interestingly, researchers from various countries also obtained similar results on carious sites in ancient man. Moore and Corbett, and Whittaker et al. studied the dental caries in ancient English man (Moore and Corbett, 1973; Whittaker et al., 1981). Lunt et al. studied dental caries from prehistoric times and medieval Scotland (Lunt, 1974). All of these researchers indicated that there were high incidences of cervical and root dental caries. Below I raise two factors explaining the aforementioned results.

4. Decreasing attrition levels with changing time periods

4.1 Dental attrition level and close association with the incidence of dental caries

The progress of attrition was incomparably fast in people in ancient times and the Middle Ages relative to modern day people. If dental caries in the occlusal pits and fissures was slight, the progression of attrition could have been faster than that of such dental caries. Therefore, it is speculated that dental caries itself could have disappeared in many cases. This phenomenon is seen in modern day Nigeria. Kubota et al. conducted follow-up surveys among Nigerians with dental diseases. Class I dental caries in 11 first and second molars

and class II dental caries in 2 second molars from the 1986 survey had disappeared in the 1991 survey and were healthy and sound (Kubota et al., 1993).



Fig. 4. Occlusal dental caries in Jomon people. This type of dental caries was rarely encountered in Jomon people except in young individuals. The absence of such dental caries is thought to be closely associated with marked attrition levels in Jomon people.

Figure 4 shows occlusal dental caries in the Jomon people. Although the prevalence of occlusal dental caries was low in the Jomon period, it certainly did exist. Cusps and fissures were well preserved on this individual's occlusal surfaces. An anthropologist who is familiar with the bones and teeth of ancient skeletal remains can easily determine that the individual was rather young. That is, such an individual with well preserved cusps and fissures could have occlusal dental caries.

The Jomon people were eating food that was much harder than the food modern day people eat, therefore, their dental attrition was considerable. Occlusal dental caries is speculated not to have occurred in an individual with occlusal surfaces, such as those shown in Figure 4. In other words, occlusal dental caries should have occurred in young people, but it would not be found in individuals beyond a certain age as dental attrition progressed with aging. If attrition was very considerable, slight occlusal dental caries could have disappeared due to dental attrition as in the aforementioned Nigerian cases.

Factors other than diet likely also contributed to marked dental attrition in the Jomon people. As shown in Figure 5, dental attrition of the anterior teeth could have occurred due to use of teeth for hide tanning, just as with the Inuit people. It is speculated that teeth were used as "tools." There was pulp exposure in this individual. Even if the Jomon people ate hard food, factors other than diet must be considered to explain the extreme dental attrition to this extent. Since teeth are the hardest structures in the body, they were likely "important tools" for ancient people.

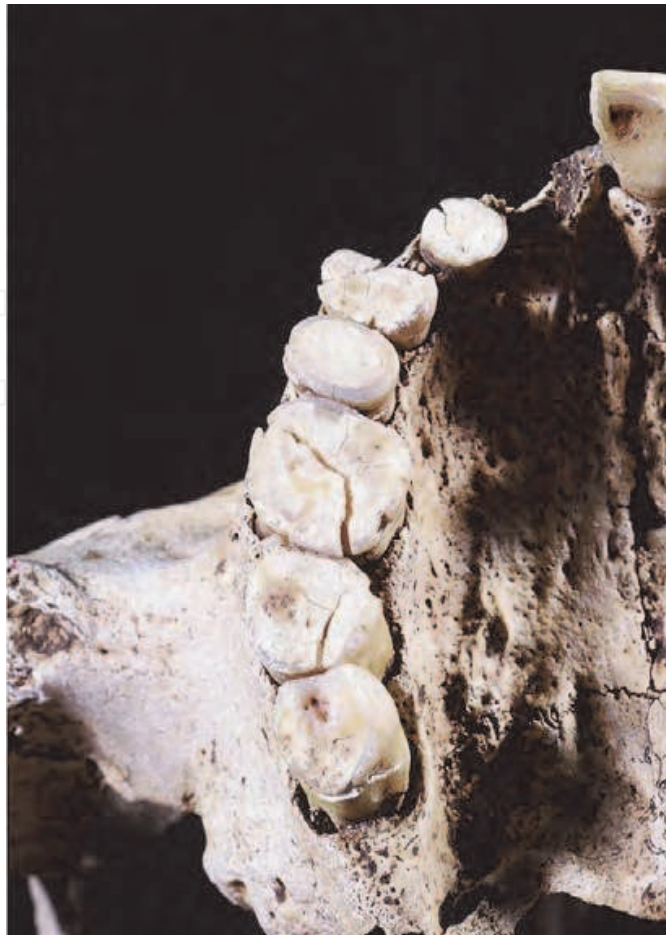


Fig. 5. Teeth with marked attrition in Jomon people. The occlusal surfaces were flattened and dental caries were probably difficult to develop on such surfaces.



Fig. 6. Anterior teeth with pulp exposure in Jomon people. The pulp exposure could have been caused by some type of tasks performed using teeth. In the modern era, Inuits are known to use their teeth for hide tanning.

Our study has shown that the level of dental attrition clearly decreased as time approached closer to the present (Fujita, 1993; Fujita and Ogura, 2009). In Japan, dental attrition was most severe in the Jomon people and decreased in the order of Kofun, Kamakura, Muromachi and Edo people, thus, dental attrition decreased as the time periods approached the present. As a result, Edo people developed dental caries that caused large cavities on the occlusal surfaces, such as shown in Figure 6. Dental caries causing this type of large cavity on the occlusal surface was not seen in the Jomon period because of marked dental attrition.

5. High incidence of periodontal disease in ancient people

The second reason for the high incidence of root dental caries is periodontal disease, which is speculated to have also occurred at a very high frequency during the Jomon period. Periodontal disease and dental caries have a close association. When alveolar bones were examined in people from the Jomon period to the Edo period, many individuals had considerably advanced bone resorption. As in modern day people, bone resorption due to periodontal disease was seen in ancient people.

The incidence of periodontal disease is closely associated with aging. Thus, the following paragraph will briefly describe aging and lifespan of the Jomon people.

The average lifespan of the Jomon people has been estimated to be less than 15 years for both males and females. This short average lifespan was due to the remarkably high infant mortality prevalence which reduced the overall average lifespan of people in the Jomon period. In anthropology, when studying a group with an extremely short lifespan, focus is placed on the average life expectancy of the 15 year old survivors. Fifteen is an age at which a person gains some degree of resistance to diseases. In the Jomon individuals who survived the first 15 years of life, the average life expectancy was considered to be approximately 15 years. That is, an average lifespan of such individuals was approximately 30 years (Kobayashi, 1967). Even if there were some individuals with a lifespan longer than 30 years, the alveolar bone resorption in the Jomon people is speculated to have progressed 20-30 years faster than in modern day people. This notion suggested that the Jomon people physiologically aged considerably faster due to various physical stresses that modern day people are not subject to. It also suggested that periodontal disease was very common in the time period without special measures for disease prevention and treatment. As previously mentioned, the average lifespan was less than 15 years in the Jomon people. It was approximately 15 years in the Muromachi period and approximately 20 years in the Edo period. According to Japanese government statistics of the Taisho period, it was 42 years for both men and women. That is, the average lifespan of Japanese people remained almost unchanged from the Jomon period to the Edo period, even though the Jomon people lived several thousand years ago on what is now the Japanese islands. Lifespan increased dramatically in more recent times, only in the decades after World War II, and Japan has now become the country with the longest lifespan in the world. This longevity is thought to be the result of improved nutrition and medical advancement. It can easily be speculated that people from a time with much shorter lifespans had poor nutrition, hygiene and medical care, just as with the people in modern developing countries, and that they lived in societies with high rates of infant mortality. As mentioned earlier, these people had various physical stresses, the prevalence of their physiological aging was fast and they developed periodontal disease at a young age.

6. Evidence of periodontal disease in ancient human skeletal remains

It is very difficult to obtain strong evidence of periodontal disease in ancient human skeletal remains. In general, periodontal disease is studied in such remains by (1) obtaining findings of horizontal and vertical resorption of the alveolar bone or osteoporosis-like findings, and (2) measuring the degree of alveolar bone loss with a calliper. These methods are effective and will naturally continue to be used in the future. However, they have several problems, for example, even if the individual had periodontal disease, when the teeth were lost in the affected area, bony tissue would have gradually filled those tooth sockets in the alveolar bone. Thus, there would have been no evidence of such tooth sockets or inflammatory lesions after 1-2 years. In this type of case, we can only observe the form of the individual at the time of death through the skeletal remains. It is difficult for us to determine whether or not tooth loss in this type of an area was caused by periodontal disease. In addition, alveolar bone loss gradually advances due to aging, even without inflammatory lesions such as periodontal disease. Therefore, even if the alveolar bone loss can be measured by a calliper, we cannot necessarily attribute it to periodontal disease.

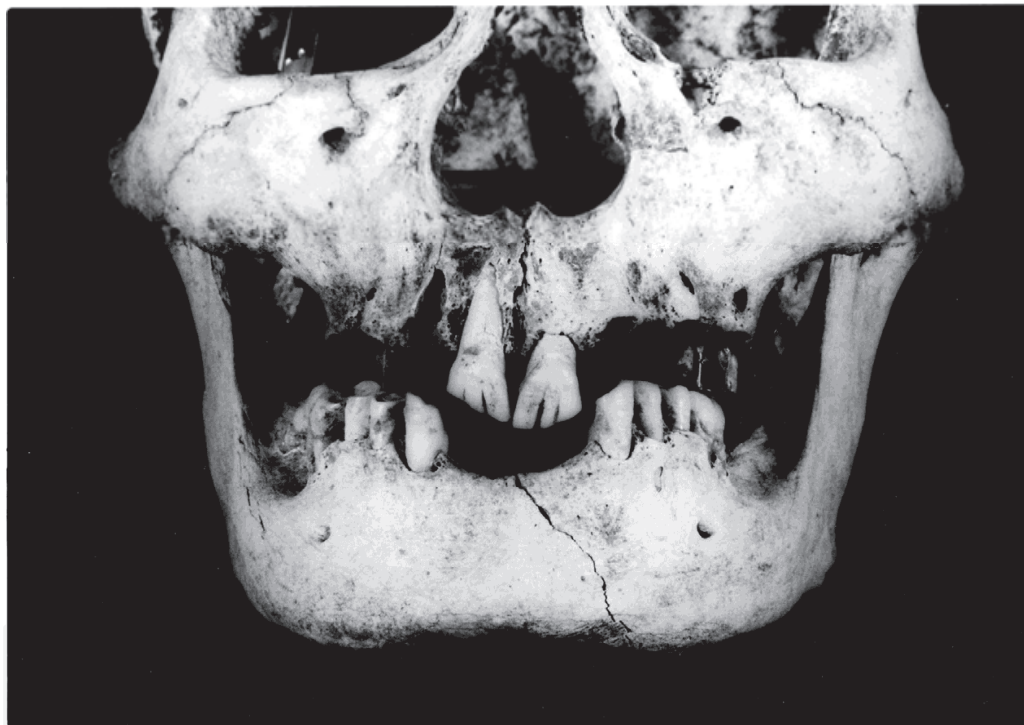


Fig. 7. Ritual tooth ablation in Jomon people. Mandibular four incisors were extracted. Maxillary incisors forked: "Sajyo kenshi" in Japan.

For the above reasons, I examined the absence or presence of dental caries and the state of tooth loss in 76 Jomon individuals in whom maxillary and mandibular alveolar bones remained complete (Fujita, 1999). The advantages of this method were elimination of bias due to the observed number of tooth types, comparisons of the same number of teeth in the maxillae and mandibles, and similar examinations performed with individuals as a unit. I compared teeth from the first premolar or second premolar to the second molar because the Jomon people often extracted their anterior teeth (incisors, canines and sometimes first premolars) as their custom (Fig.6).

| | Tooth number comparison | No. of missing teeth in maxilla | No. of missing teeth in mandible | No. of Observed teeth ¹⁾ | Significance ²⁾ |
|-------------|-------------------------|---------------------------------|----------------------------------|-------------------------------------|----------------------------|
| Whole Jomon | 4-7 | 67 | 34 | 1216 | *** |
| Whole Jomon | 5-7 | 45 | 26 | 912 | * |

1)maxilla and mandible teeth were pooled

2)* : $P<0.05$; *** : $P<0.001$

Table 2. Comparison of the number of lost teeth between the maxillae and mandibles in Jomon people. The number of lost teeth was significantly greater in the maxillae than mandibles.

| | Tooth number comparison | No. of missing teeth in maxilla | No. of missing teeth in mandible | No. of Observed teeth ¹⁾ | Significance ²⁾ |
|-------------|-------------------------|---------------------------------|----------------------------------|-------------------------------------|----------------------------|
| Whole Jomon | 4-7 | 41 | 64 | 1216 | * |
| Whole Jomon | 5-7 | 34 | 59 | 912 | ** |

1) maxilla and mandible teeth were pooled

2)* : $P<0.05$; ** : $P<0.01$

Table 3. Comparison of the number of carious teeth between the maxillae and mandibles in Jomon people. The number of carious teeth was significantly greater in the mandibles than maxillae. When Table 2 was also considered, periodontal disease is suggested to be the cause of lost maxillary teeth in Jomon people.

In addition, third molars were also excluded because they were sometimes missing or unerupted. I was able to obtain very interesting results. When the Jomon people were analyzed as a group or by individual, the number of missing teeth was significantly greater in the maxilla than mandible (Tables 2 and 3). However, the number of carious teeth was higher in the mandible than the maxilla. These results showed that the phenomena occurring in the maxilla were exactly the opposite of those in the mandible. That is, the results are thought to indicate that the majority of maxillary teeth lost in Jomon people were due to periodontal disease. In another study, I found that Edo people also had a higher prevalence of tooth loss in the maxilla than the mandible. In modern people, the survival prevalence of the first premolars is slightly higher in the mandible than maxilla. The prevalence of the second premolars is similar in both jaws. The prevalence of the first molars and second molars is higher in the maxilla than in the mandible. Then why were teeth in the maxilla more easily lost than in the mandible in Jomon and Edo people? The maxilla consists of mainly cancellous bone and the mandible consists of mainly compact cortical bone. The maxilla is thought be more susceptible to tooth loss because it has weaker alveolar bone supporting the teeth compared to the mandible. As periodontal disease advances, the maxilla is presumed to lose the ability to support teeth at an earlier stage than the mandible. Nowadays anyone can visit a dental clinic and receive scientific dental care, but since people in past eras could not receive such modern scientific dental care, there were likely various differences in the conditions of periodontal disease between these people and modern people. In other words, modern dental treatments can be the reason for the high survival prevalence of maxillary teeth in modern people.

When one takes into consideration that dental caries and periodontal disease are the two major causes of tooth loss, periodontal disease is strongly suggested to be the cause of maxillary tooth loss. In ancient people in Japan (here “ancient” is used to mean antiquity), periodontal disease occurred in even the younger generations. The mechanism involved alveolar bone loss leading to exposed roots which developed dental caries.

As explained above, dental caries and periodontal disease in ancient skeletal remains are closely intertwined, and neither can be considered without the other. In ancient people with short average lifespans, their periodontal disease advanced from a relatively young age with dental caries development accompanying this advancement. Moreover, these people had multiple root dental caries – the elderly-type dental caries in modern times.

I recently conducted a study on the number of remaining teeth in Edo individuals (Fujita, 2011). According to the Japanese survey of dental diseases conducted in 1999, the number of teeth present (number of remaining teeth) was 25.22-28.55 teeth in individuals aged 20-49 years. From our examination of Edo individuals, the number of teeth present was 29.5 teeth in the early middle age males, 30 teeth in the early middle age females, 26.67 teeth in the late middle age males and 27.08 teeth in the late middle age females. These numbers were relatively high compared to those in the 1999 survey. It was unexpected that the Edo individuals had so many remaining teeth. The notion that “people of long past ages lost more teeth more quickly” is clearly untrue in people of Edo-period Japan. In our study, three males were estimated to be elderly and had no, or very few, remaining teeth. Two of them were edentulous in both jaws. Thus, the results showed that although remaining teeth were well-retained in the early and late middle age groups, the number of missing teeth increased rapidly and the remaining teeth were few in the elderly group. In general, the high number of remaining teeth can be explained by the low incidence of dental caries and periodontal disease, two of the main causes of tooth loss. In the case of the Edo people, one needs to also consider the difference in dental treatments between the Edo period and the present. Tooth extraction is performed relatively easily in modern day people as a part of dental treatment. In contrast, extraction could not be performed so easily in Edo people, even if they had dental caries or periodontal disease, and such teeth were often left untreated. Therefore, the number of remaining teeth could have been greater than expected in the Edo people. However, periodontal disease progressed to a severe level in elderly individuals over 50 years and tooth loss probably dramatically increased.

7. Site of dental caries closely associated with periodontal disease

Figure 7 is a plot of carious sites in Japan from the Jomon period to modern times. This figure indicates a few very interesting facts.

First, the percentage of dental caries on the occlusal surface is almost the same among people in modern times, the Kamakura period and the Edo period. The percentages are low for the Jomon and Kofun periods. As indicated previously in Figure 6, the occurrence of occlusal dental caries is thought to have been inhibited in the Jomon and Kamakura periods when attrition was considerable. In the Edo people, the attrition level was low and dental caries often developed on the occlusal surfaces. The incidence of periodontal disease was likely higher than that of occlusal dental caries and the percentage of root dental caries is speculated to have become high. There was generally high incidence of interproximal root dental caries in all time periods. It can be seen that interproximal root dental caries is the most characteristic dental caries of Japanese people throughout all aforementioned time periods. The incidence of dental caries was low for lingual surfaces and lingual root areas in all time periods, and the

cleaning action of the tongue is thought to be the reason. This tendency for higher incidence of root dental caries than occlusal dental caries was also seen in the human skeletal remains (AD 300-700) from the Yean-ri site in South Korea. The cause was obviously alveolar bone loss due to periodontitis leading to the exposure of roots and invasion of dental caries in those areas. Therefore, periodontal disease is not a modern disease, but existed with humans from ancient times. Our ancestors were also plagued by this disease.

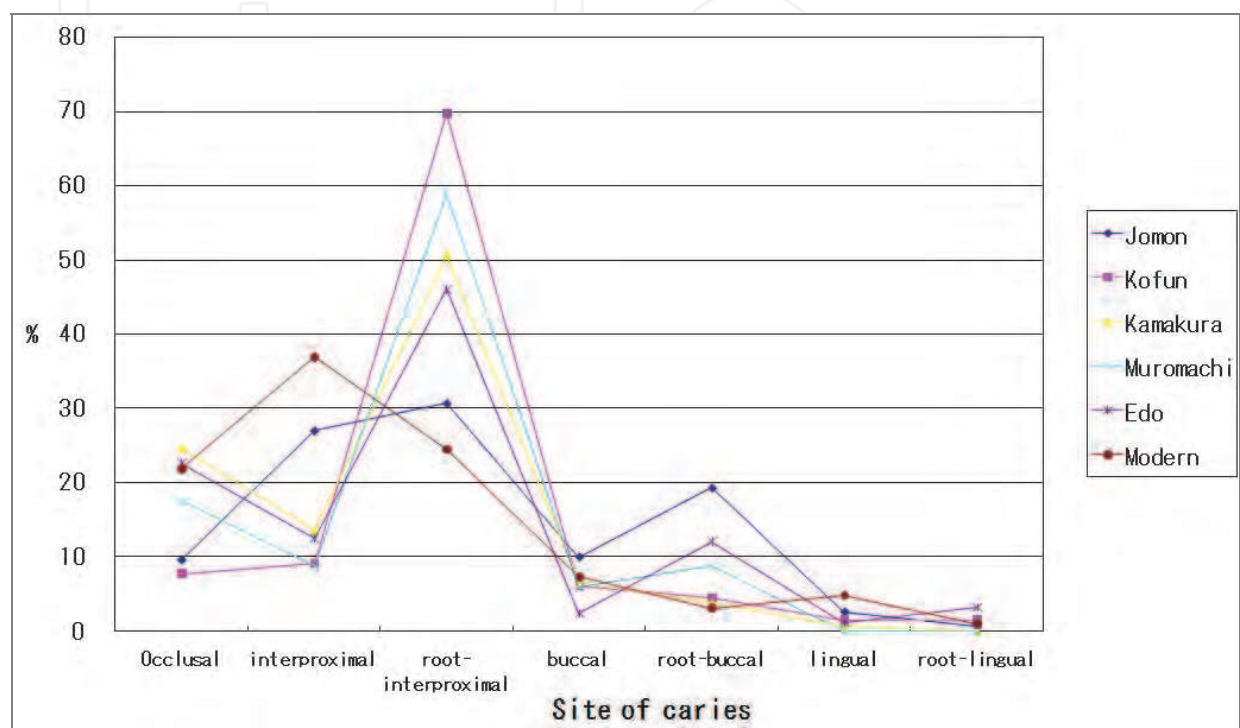


Fig. 8. Sites for dental caries' occurrences by time period. Multiple cervical root dental caries occurred in ancient people. The causes were likely root surface exposure due to periodontitis and lack of teeth brushing. Except in modern day people, the incidence of dental caries tended to be high in the interproximal cervical root areas.

8. Association of wedge-shaped defects with periodontal disease and teeth brushing

The major etiological theories of wedge-shaped defects involve loss of cervical enamel due to occlusal forces, bruxism, and teeth brushing. However, a clear theory has not been established regarding the cause of these lesions. Some researchers think that the cause is microfractures at the cervical regions due to occlusal forces, but are these microfractures really the cause? A wedge-shaped defect is often considered a geriatric problem in modern society. Ancient people ate harder foods than modern day people and the teeth of ancient people were subjected to stronger occlusal forces. As a result, their dental attrition was considerable. Thus, studies on ancient people can be important in understanding the cause of wedge-shaped defect. I have examined the absence or presence of wedge-shaped defects and the dental attrition level in ancient human skeletal remains from the Jomon period to the Edo period. These materials were from a total of 8002 individuals: 297 Jomon individuals, 60 Kofun individuals, 124 Kamakura individuals, 42 from Muromachi individuals and 105 Edo individuals. The level of attrition was determined by the method of

Fujita (1993). The number of individuals was insufficient for some time periods, so individuals of different ages and sexes were pooled together. The attrition levels were marked and the occlusal forces were speculated to be strong in the Jomon people who were hunters and gatherers in Japan. However, wedge-shaped defects were not observed in the cervical areas of the examined Jomon individuals (Fig.9). In subsequent periods (Yayoi, Kofun, Kamakura and Muromachi), attrition decreased perhaps because their food became softer. Wedge-shaped defects were not observed in any of these periods. It was found only in Edo skeletal remains (Fig.10). This result indicated that the origin of wedge-shaped defects in Japan was in the Edo period. In Japan, the practice of brushing teeth is thought to have begun with the introduction of Buddhism to Japan in AD 538, however, it is still unknown whether teeth brushing was performed on a regular basis. In the Edo period, teeth brushing was prevalent even among common people and tooth brushes (*fusayouji*) were used. In one theory, microfractures occur in the cervical regions due to strong occlusal forces. Based on this theory, there must be some signs of wedge-shaped defects in individuals with strong occlusal forces, such as in the Jomon individuals who had severe attrition exposing pulp. That is, our findings indicate the invalidity of this theory which states that occlusal forces produce abfractions and cause wedge-shaped defects. Instead, it is thought that periodontal disease occurred and the root surfaces became exposed. Subsequently, wedge-shaped defects are thought to have occurred due to the use of coarse abrasive powder or improper brushing of teeth. That is, a phenomenon similar to modern day incorrect brushing of teeth occurred in the Edo individuals. In Japan, the historical origin of wedge-shaped defects dates back at least as early as the Edo period, and periodontal disease and teeth brushing were strongly suggested to be the cause (Fujita, 2011).



Fig. 9. There is no evidence of wedge-shaped defects despite the severe dental attrition of Jomon people.



Fig. 10. Wedge-shaped defect in Edo people. The wedge-shaped defect probably developed because of teeth brushing of the root areas which were exposed due to periodontitis.

9. Conclusion

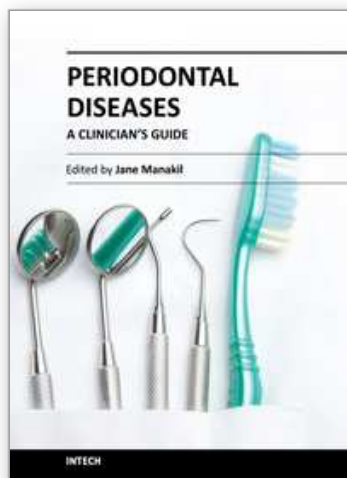
Dental caries and periodontal disease in ancient skeletal remains should not be treated as merely ancient objects or viewed from a single perspective. It is important to consider various factors, including environmental factors, which people of that time faced: average lifespan, diet, attrition, aging and teeth brushing habits. In other words, dental caries and periodontal disease in ancient skeletal remains can provide valuable information about the environmental and hygiene conditions of that time. Although teeth are small structures in the body, much information can be obtained from them. It is not an exaggeration to say that a thrill of dental paleopathology is being able to obtain such a wealth of information. Time periods are indeed borderless. Most readers of this book are likely dental and medical associated professionals, but no one actually knows what field of study will be useful to one's own research area. Therefore, it is important to be open to other areas of research so that one can obtain ideas useful to one's research. I will be happy if results of anthropologists who handle ancient remains can be utilized to create a new vision of 21st century dental hygiene and public health. Much about the present and the future can be learned from our ancestors and I hope that the information in this chapter can help open the door to such information.

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"Periodontal diseases" is a web-based resource intended to reach the contemporary practitioners as well as educators and students in the field of periodontology. It is fully searchable and designed to enhance the learning experience. Within the book a description is presented of the current concepts presenting the complex interactions of microbial fingerprint, multiple genotypes, and host modulations. In addition, an overview is given of the clinical outcome of the disease's progression, as influenced by the epigenetic factors. Emerging concepts on periodontitis as a risk factor for various systemic diseases and as a bilateral modulating factor have been elucidated in detail as well.

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