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(WITH FIVE PLATES)

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Curator, Division of Physical Anthropology  
U. S. National Museum



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## INTRODUCTION

My attention to the subject of early noncurative removal of teeth in America was called more directly in 1914 by a request from Dr. J. W. Jackson, of England, for information as to such practice on this continent. Not long after, Dr. Jackson<sup>1</sup> published an interesting paper on such a procedure in the neolithic times of Britain, in which he quoted my reply to him, as follows (p. 78):

Dr. A. Hrdlička informs me that the only dental mutilation of which he has a direct and positive knowledge is the filing of the front teeth among the prehistoric Tarasco, and some other tribes in Central and Southern Mexico. He states further that he has often seen in prehistoric skulls from Mexico and other localities a complete loss of the median upper incisors, and it is quite possible that in some of these cases at least the teeth were removed ceremonially; but he has no absolute proof of such a practice, and has never met with it among the living Indians. Personally, he is inclined to believe that the practice has existed in some parts of America.

During our excavations in Alaska, 1926-38, we have repeatedly come across crania and lower jaws which showed plainly that some or even all their incisors, and in a few instances even a canine, had been removed in life, and everything indicated that the removal had been that of healthy teeth, that it took place in youth, and that it was not accidental. As specimens of this nature accumulated, it became evident that we were confronted here with a definite custom, which in all probability was a part of the initiation rites of the youth, parallel to that in aboriginal Australia and other parts of the world, and which conferred on the sufferers a certain distinction.

As the Alaskan materials accumulated, it was seen that the practice varied in frequency, and also in intensity, in different parts of the

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<sup>1</sup> Jackson, J. W., Dental mutilations in neolithic human remains. *Journ. Anat. and Physiol.*, vol. 49, pp. 72-79, 1914-15.

region; that it affected both sexes; that it was carried out, probably with the help of a sinew, by forcibly pulling the upper teeth forward, or downward and forward, and lower teeth forward, or upward and forward; that it resulted in general in the breaking of the anterior wall of the alveolus, rarely even in the breaking of the crown from the root and a retention of the latter; and that as a rule, with rare exceptions, it was followed by a normal healing, with subsequent gradual absorption of the affected alveolar portion.

I have since noted many an example of such a loss of teeth, but there was not sufficient incentive to make a special study of the matter until my recent trip to the U.S.S.R., when I found that the practice was once widespread also over Siberia.

During the examination, in the summer of 1939, of large parts of the Siberian craniological collections in Leningrad, Moscow, and Irkutsk, I came repeatedly across such tooth ablation in materials from the neolithic to recent periods. The kind and number of removed teeth, the nature, as far as discernible, of the operation, and the after effects all were practically the same as those in Alaska. But the practice in Siberia evidently reached farther back in time.

On my return I reexamined parts of our collections and came across so much of interest that I undertook a closer survey of the conditions connected with this practice.

A search through literature soon made it evident that thus far the presence of the practice of ritual and other noncurative tooth ablation on this continent has failed to be definitely reported. I addressed six of the foremost American workers in anthropology and ethnology for information as to any publications on, or knowledge of, ritual or related teeth removal in America, and the answers were all negative. A search through the writings on the subject elsewhere was almost equally disappointing as far as both the American continent and Siberia were concerned; but it produced two or three valuable old references to such practices in ancient Darien and Peru and showed that such ablations, together with tooth filing, had been met with repeatedly by Japanese scholars in the skulls of the neolithic Ainu.

A direct examination of our collections soon showed how easy it is to pass over such details when special attention is not directed to them. Some of the material had been studied for conditions of the teeth by dentists and anthropologists without the true facts having been discerned. I myself have missed them in some of the older series. Even with experience, however, and direct focusing on the

subject, the true or full diagnosis of the cases falling into this category is not easy.

#### MUTILATION OF TEETH

There are but a few parts of the human body that somewhere, at some time, have not been subjected to mutilation. The head and even the neck (Burma) were deformed; ears, nose, and lower lip pierced for introduction of decorative objects, lower lip stretched, beard elapidated, face and body tattooed or scarred, breasts compressed, genitals cut, legs and feet deformed, and fingers cut off. The motives for, and the objects of, these practices were multiple. They were simple decoration; forms of class, tribal, ritual, or individual branding; testimony of distinction or of endurance; sacrificial offering; grief manifestation; or simply a fashion, and rarely a punishment for transgression.

Among the parts and organs affected by such practices the teeth received a large share of attention. They were stained black or red, filed in many different patterns, inlaid with gold or precious stones, or wholly removed by knocking out or extraction. These practices were limited to the teeth that showed most—the incisors, the canines, and even the anterior premolars. They differed from tribe to tribe, locality to locality, and even in smaller groups. A single tooth in some cases was knocked out to brand a slave. In rare instances (Africa, Japan), the lower incisors were removed and the upper serrated by filing, possibly from cosmetic or other motives; most often, however, the teeth were removed, in a few places seemingly only in the females or males but mostly in both sexes, as a part of the ritual of initiation of the boy or girl into manhood or womanhood.

Such practice of a ceremonial ablation of two or more of the front teeth was widely spread over the world and dated from remote antiquity. It originated apparently during upper paleolithic times, extended irregularly over a large part of the Old and even the New World during the neolithic period, and remained to be practiced among various peoples down to recent and even to the present time.

Since the latter part of the last century the whole subject of dental mutilation outside of America (and Siberia) has received considerable scientific attention, particularly by the Germans, the French, and the Japanese, and there are a number of comprehensive contributions to it in literature. The most notable of these are those of Von Ihering,<sup>2</sup>

<sup>2</sup> Von Ihering, H., *Die künstliche Deformierung der Zähne*. *Zeitschr. Ethnol.*, vol. 13, pp. 213-262, 1882.

Hamy,<sup>3</sup> Lasch,<sup>4</sup> Ankerman,<sup>5</sup> Van Rippen,<sup>6</sup> Lignitz,<sup>7</sup> Koganei,<sup>8</sup> Wittek,<sup>9</sup> and Hasebe,<sup>10</sup> all of whom give references to further literature. Except for the Japanese, however, the authors named devote most of their attention to teeth filing, inlays, and other decorations.

#### ANTIQUITY

No trace of ritual removal of teeth has as yet been noted in the middle or older paleolithic. According to present evidence, the practice originated in postglacial, upper paleolithic times, after man had reached the modern type, had multiplied considerably and spread far over the Old World, and had had time to develop some forms of society and religion.

The oldest instances of what is evidently ritual tooth ablation were reported in 1895 by Newton<sup>11</sup> in the Galley Hill skull; in 1932-33 by Boule and Vallois in the Asselas and Afalou upper paleolithic crania from southern Sahara; and by Keith in Miss Garrod's mesolithic or Caspian skulls from Shukba, Palestine. In neolithic times the practice

<sup>3</sup> Hamy, E. T., *Les mutilations dentaires aux Mexique et dans le Yucatan*. Bull. Soc. Anthropol. Paris, vol. 5, pp. 879-887, 1882.

<sup>4</sup> Lasch, R., *Die verstümmelung der Zähne in Amerika und Bemerkungen zur Zahndeformierung im Allgemeinen*. Mitt. Anthropol. Ges. Wien, vol. 31, pp. 13-22, 1901.

<sup>5</sup> Ankerman, B., *Kulturkreise und kulturschichten in Afrika*. Zeitschr. Ethnol., vol. 37, p. 65, 1905.

<sup>6</sup> Van Rippen, Bene, *Mutilations and decorations of teeth among the Indians of North, Central and South America*. Journ. Allied Dental Soc., vol. 13, pp. 219-242, 1918.

<sup>7</sup> Lignitz, H., *Die künstlichen Zahnverstümmelungen in Afrika im Lichte der Kulturkreisforschung*. Anthropos, vols. 14-15, pp. 891-943, 1919-20; vols. 16-17, pp. 247-264, 866-889, 1921-22.

<sup>8</sup> Koganei, Y., *Über die künstliche deformation des Gebisses bei den Steinzeitmenschen Japans*. Mitt. Med. Fak. Univ. Tokyo, vol. 28, pp. 429-485, 1922.

<sup>9</sup> Wittek, M., *Die künstlichen deformierungen der Zähne bei den wilden Völkern*. Inaug.-Diss., Breslau, 70 pp. 1924.

<sup>10</sup> Hasebe, K., *Über die Zahnverstümmelungsformen bei den Steinzeitmenschen Japans*. Arb. Anat. Inst. Sendai, vol. 11, pp. 61-106, 1925.

<sup>11</sup> Newton, E. T., *Quart. Journ. Geol. Soc.*, vol. 51, p. 508, 1895, quoted in Jackson, J. W., *Journ. Anat. and Physiol.*, vol. 49, p. 72, 1915: "The only evidence of missing teeth in British fossil human remains appears to be that of the famous and much disputed Galley Hill skeleton described by Mr. E. T. Newton in 1895. In his description of the lower jaw the author remarks: 'On each side of the symphysis the alveolar border is broken; but while portions of the alveoli for the two outer incisors are preserved, there are no traces of the alveoli for the two median incisors, which must have been either very short or else lost during life, and the alveoli filled up by bone.'"



was apparently already widely spread over Africa, Australia, continental Asia, and Japan, and had even reached some spots in Europe.<sup>12</sup> In our time it still survives in Africa, Australia, probably Mongolia, and possibly parts of South America.

#### RECOGNITION

As the effects on the jaws of the removal of healthy teeth differ but little, if any, from those following a loss of teeth from accident or other causes, the question naturally poses itself, how can the observer safely diagnose his cases? Such a diagnosis, with sufficient experience, is fortunately not overdifficult. The criteria of ritual or related loss of teeth are lack of evidence of disease; symmetry or near symmetry of the removals; repetition of similar losses in the same group; the breaking of the labial wall of the alveolus; signs that the removal has taken place in youth; existence of the practice among neighboring or related peoples; and sometimes legendary or other relevant information. Primitive people, especially in youth, have suffered but little, or not at all, from caries; an accident would only very exceptionally produce a symmetrical loss of teeth, and such a loss would not be likely to be repeated in others of the same group and especially in both sexes. The picture of the jaws after ritual or other intentional ablations of sound teeth, once learned, is too characteristic to be forgotten or to lead to serious errors. A real difficulty is encountered only in groups where caries was more common, and in the aged who have lost many teeth from various reasons.

In the writer's reports here only those cases were included where no reasonable doubt as to the nature of the tooth loss existed. However, the matter deserves some further consideration.

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<sup>12</sup> Jackson (*ibid.*) reports the following cases from the neolithic of England: "*Neolithic cave on Warton Crag, Lancashire.* The history of the Warton finds is as follows: In 1909, whilst excavating in the Dog Holes cave, I discovered a number of human remains, amongst them being a lower jaw which was remarkable for the absence of the second premolar teeth on either side, and with all traces of the alveoli obliterated. I also met with an upper jaw from which the two median incisors had been extracted some time before death.

"In 1912, whilst conducting further excavations at the same cave, I had the good fortune to discover another human lower jaw exhibiting exactly the same remarkable dental mutilations as in that found in 1909." (Pp. 72, 73.)

". . . In searching through the large number of human remains from the Perthi Chwareu caves (now in the Manchester Museum), I discovered another example of an upper jaw where the two median incisors have been removed, but in this case both alveoli are completely grown up with bone." (Pp. 75-76.)

Ritual and other intentional noncurative forms of tooth extraction, found in skeletal materials, must be differentiated from:

- 1, Congenital absence of teeth;
- 2, loss by accident;
- 3, extraction for caries;
- 4, loss by disease;
- 5, loss in old age.

1. A congenital absence of any of the frontal dental elements, aside from impactions and outside of the white race, is very rare and perhaps limited to the lateral incisors. It is doubtful if in the American Indian there is ever a congenital absence of one or both of the median incisors, canines or premolars. In the few instances of Indian skulls with an apparently congenitally missing anterior tooth that have come under my observation, the absent unit was without exception a single upper lateral incisor, and in view of later experience I could in none of these cases remain certain that the absence was truly congenital. In a congenital case there would be no alveolus and probably not even a space for it, with the neighboring teeth in apposition. There are a few instances where there is a space large enough for a tooth between two other teeth, with the alveolar border well represented and showing no sign of a previous alveolus or of any injury. Should such cases occur in a group where no ablation was practiced, the diagnosis would be easier; but where one is found in a series in which other specimens show clearly intentional removals, the possibility that they may be merely exceptionally well-healed cases after an early extraction cannot be excluded. It is indeed quite evident now that any reports on "congenitally absent" teeth in the Indian, hitherto made, need revision. But even if such cases as those mentioned above were congenital, there are so very few of them that they could not seriously interfere with the study of the conditions under consideration.

2. Teeth lost by accident, unless this also affected the alveolar process, would leave the same lesions as those forced out by design. But accidents are much more variable than a definite practice, both as to time and kind, and would present less symmetry and less repetition. The American skulls from tribes where, or times when, no ablation was practiced are as a rule free also from accidental losses, though there may possibly be a group or groups where, owing to some peculiar habits, accidental knocking out of teeth may have occurred. Such incidents, I am told, take place occasionally during the game of lacrosse among the present Iroquois, but the Iroquois skulls in our possession show no such injuries, nor have they been reported from the many other lacrosse-playing groups. Moreover, there were groups—and, of

course, women in general—who did not play lacrosse, yet show a variety of ablations.

3. Caries, especially in the canines and median incisors, was either completely absent, as in the Eskimo or other Alaskan as well as the older Siberian groups, or developed infrequently and later in life; and, when the disease occurred, extractions—as seen from skulls and as has been learned among the living—were practiced but very seldom. The criteria for distinguishing a noncurative ablation from that for caries are the absence or rarity of caries in the group; the absence of the disease from the denture of the individual under examination, or its absence at least from the teeth adjoining the lesion; indications that the ablation of the front teeth took place early in life; and the symmetry or resemblance of the removals and their repetition in the group.

4. The diseases other than caries which occasionally caused the loss of teeth among the American natives, were abscesses about the roots, pyorrhea, and scurvy. Apical abscesses were fairly common in the elderly and old, absent to rare in the younger. The tooth often remained until it must almost have dropped out, and there was left in and above the alveolar process a characteristic smooth hollow which would always be easy of recognition. Moreover such abscesses in general followed advanced abrasion of the teeth with exposure of the pulp, which of course did not take place in youth. Pyorrhea, absent in the Eskimo, was limited among the Indians to some of the elderly, especially among the sedentary tribes. Just how many teeth were lost through it, it is impossible to say, but such losses would be irregular. Scurvy, too, was not a disease of the young, and it affected all or nearly all the teeth, resulting, when not fatal, in a characteristic picture of the jaws. With adequate experience and ordinary care, there is no great danger of confounding the noncurative ablations with loss of teeth from any of these pathological conditions.

5. Old age, at least in the sedentary American groups, often played havoc with the teeth and with the alveolar processes. The agencies were extreme abrasion, abscesses, pyorrhea, and extrusion of the teeth with retraction of the alveolar processes. In most of the skulls of the very old the change in the jaws had reached such a degree that the distinguishing of any early ablations becomes difficult or quite impossible. Such specimens are best left out of consideration. Almost equally difficult are cases in which, from some cause other than very old age, there has been a loss of more or less of the back teeth including one or both the premolars, on one or both sides. Unless such a loss of

the premolars was fairly recent or occurs in a skull in which there was no ablation of any of the other front teeth, its correct diagnosis is impossible.

As to *removals of teeth for punishment*, this would in all probability be limited to a few individuals or to a restricted locality, would show only one type, and would be found only in adult or elderly males. It may, however, have been more extensively practiced. But a clear recognition of such cases in skeletal collections, without some additional information, would be impossible.

A simple *branding*, as that of slaves, could only be recognized with the aid of sufficient circumstantial evidence. This would include a different kind of burial, perhaps a different skull type, knowledge of such practice in the region, and uniform limited removal of teeth.

*Ablation in young children*, considerably before puberty, could only be surmised if the changes in the alveolar process were extreme and the approachment of the neighboring teeth considerable; but the question would call for corroboration by the skulls of children from the same locality.

A removal of one or more of the front teeth *on the death of a beloved husband or child*, while not reported, cannot be said to have been impossible; but such cases would likely be limited to women. They could not be distinguished in skeletal material.

#### EFFECTS ON JAWS

The effects of the early removal of from one to all of the front teeth varied with the number of teeth that had been removed and with the length of time that had elapsed since the removal. In both respects such effects paralleled closely those of modern extractions. There was but one difference—the labial wall of the affected alveolus was, in most of the cases here dealt with, broken through as a result of the crudeness of the operation. Subsequently, as a rule there was normal healing, followed slowly by a closure of the empty alveoli and a gradual absorption of those parts of the alveolar process that had sustained the now missing teeth. In some of the minor cases there took place considerable approach of the remaining teeth, though they never came to a full apposition; in other cases the neighboring teeth and parts were but little affected. The elapsed time since the extraction was naturally a factor in these changes. When teeth were removed from one jaw only, the opposing teeth extruded more or less, without being lost.

The frontal void in the dental arch, especially where more than one tooth was removed, must have caused difficulties in mastication, and especially in speech, but this evidently was no deterrent to the custom.

#### CONNECTION WITH ARTIFICIAL SHAPING OF TEETH

In many tribes in Africa the custom of knocking out some of the front teeth is found associated with artificial pointing or otherwise shaping of the teeth, and some authors (e.g., Lignitz) have expressed the opinion that the two practices may be closely related. It is possible that such a relation has developed in some of the African tribes, particularly those where the proximal edges of the upper median incisors are removed to form a pronounced notch between the teeth, which resembles the notch left after a removal of these teeth. In general, however, there is much to indicate that the two practices are quite separate. There are tribes in Africa in which either the shaping of the front teeth, or the knocking out of these teeth, exists alone. In Australia knocking out of the teeth is widely spread, but there is no shaping. The same is true of the upper paleolithic and neolithic crania from Africa and other parts of the Old World, in which one or more of the incisors have been removed in youth; and there is no shaping of the teeth in any of the Siberian or American series thus far found in which ritual tooth ablation had been practiced. Koganei,<sup>13</sup> however, has reported one such case in a neolithic Aino. In this case the upper incisors were all notched, and the lower ones had all been removed. On the other hand, tooth filing was in vogue among the pre-Columbian Tarasco, in Mexico, but as far as known there was no ablation.

It is further doubtful whether pointing and other shaping of the front teeth was practiced at the same age as the removal of teeth, and if it had the same significance. Ethnologically, of course, both practices belong to the large class of purposive mutilations of the human body; but whereas the loss of the front teeth was a mark of distinction, the shaping of teeth had rather an esthetic and otherwise psychological value.

<sup>13</sup> Koganei, R., On the custom of modifying the natural form of the teeth practiced among the stone-age people of Japan. *Journ. Anthropol. Soc. Tokyo*, vol. 34, pp. 349-367, 1919. (In Japanese.)

INTENTIONAL NONCURATIVE REMOVAL OF TEETH  
IN AMERICA AND SIBERIA

References to such removals in American literature are very scanty, and actual data are as yet nonexistent aside from three or four brief notices; as already mentioned, none have as yet been found in connection with Siberia.

The first known allusions to the practice of knocking out teeth in America occur in Gomara,<sup>14</sup> Pedro de Cieza,<sup>15</sup> and Garcilasso.<sup>16</sup> They extend to some of the tribes of Darien, Panama; the Guanavilcas of Ecuador; the old Peruvians. In Darien, Bancroft,<sup>17</sup> from early Spanish sources—possibly Oviedo, but also Gomara—reports that among the tribes of that region “the prisoner is the slave of the captor; he is branded on his face and one of his front teeth is knocked out.” As to the Guanavilcas, Pedro de Cieza<sup>18</sup> says that among these Indians the fathers used to knock out three upper and three lower teeth of their youngsters, believing that thereby they were offering a grateful sacrifice to their deity.

According to Garcilasso<sup>19</sup>—quoted by Lasch<sup>20</sup>—the Inca Huyna Capac punished a rebellious chief by having his teeth taken out, and this was to be applied also to his descendants. Martius<sup>21</sup> said that apparently punishment by removal of teeth was not rare among the old Peruvians.

Joyce,<sup>22</sup> after Cieza de Leon, gives the following account of a punishment by the Inca of insubordinate natives on the island of Puna and of the neighboring district of Huancavilla:

The Inca extracted a terrible vengeance; large numbers of the islanders and Huancavilla were put to death in a cruel fashion, and the survivors on the mainland were compelled, as a mark of disgrace, to extract four teeth in addition to the two which each individual removed in accordance with local custom. The imposed ordinance was still observed at the time of the Spanish conquest.

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<sup>14</sup> *Historia general de las Indias*, vol. 1, chap. 68, 1552. (1932 ed., Madrid.)

<sup>15</sup> *Istoria del Peru*, pp. 99, 106b, Venezia, 1556.

<sup>16</sup> *Commentarios Reales*, pt. 1, lib. 9, chap. 3, 1609.

<sup>17</sup> Bancroft, H. H., *The native races of the Pacific States*, vol. 1, p. 764. New York, 1874. (Does not give exact source of statement.)

<sup>18</sup> *Op. cit.*

<sup>19</sup> *Op. cit.*

<sup>20</sup> *Op. cit.*

<sup>21</sup> *Beiträge zur Ethnographie und Sprachenkunde, zumal Brasiliens, Amerika's*, vol. 1, p. 72.

<sup>22</sup> Joyce, Th. A., *South American Anthropology*, p. 58. London, 1912.

Schmidt<sup>23</sup> says:

In South America the knocking out of teeth is of the rarest occurrence; I find but three attested cases: among the Paresi, one of the Arawak tribes (the upper incisors);<sup>24</sup> on the West Coast of Ecuador among the Huankavilka (two or three of the upper and lower incisors); and among the Guayakil.<sup>25</sup>

Quoting from a manuscript by A. A. de Motta, Von den Steinen<sup>26</sup> reports that among the central-Brazilian tribe of Kabischi, "in general in both the men and the women the upper incisors are missing."

To these may be added the following: Davis<sup>27</sup> reports a female skull from Pisac, near Cuzco, in which "the front teeth have been punched out in early life" (p. 242); and a female Aymara skull, from Africa, in which "all the upper and one of the lower incisors have been knocked out in early life" (p. 244). Virchow<sup>28</sup> observed, once in a male skull of Santa Catalina and once in a female skull of Santa Barbara, a loss of the right upper median incisor with an obliteration of the alveoli that indicated an early loss. He also observed an ablation of both the lower median incisors in a female skull of Santa Catalina.<sup>29</sup>

#### NEW DATA

The above scanty records on purposeful ablation of sound teeth in America can now be supplemented by new evidence of importance. There are now in the Division of Physical Anthropology of the United

<sup>23</sup> Schmidt, P., *Kulturkreise und Kulturschichten in Südamerika*. Zeitschr. Ethnol., vol. 45, p. 1038, 1913: "Das Zahnausschlagen ist überhaupt in Südamerika äusserst selten; ich finde nur drei Fälle bezeugt: bei den Paresi, einem Arowak-Stamm (obere Schneidezähne), dann an der Westküste von Ecuador bei den Huankavilka (zwei oder drei Schneidezähne oben und unten), und bei den Guayakil."

<sup>24</sup> Von den Steinen, Karl, *Unter den Naturvölkern zentral-Brasiliens*, p. 427. Berlin, 1894.

<sup>25</sup> Verneau, R., and Rivet, P., *Ethnographie ancienne de l'Equateur*. Mission du Service Géographique de l'Armée pour la mesure d'un arc de méridien équatorial en Amérique du Sud 1899-1906, tom. 6, fasc. 1, p. 53, Paris, 1912; also Saville, M. H., *The antiquities of Manabi, Ecuador*. Contr. South Amer. Arch., vol. 1, 1907; vol. 2, p. 8, 1910.

<sup>26</sup> Op. cit. "Allgemein fehlen Männern und Frauen die oberen Schneidezähne."

<sup>27</sup> Davis, J. Barnard, *Thesaurus Craniorum*. London, 1867.

<sup>28</sup> Virchow, Rudolf, *Beiträge zur Craniologie der Insulaner von der Westküste Nordamerikas*. Zeitschr. Ethnol., vol. 21, p. 395, 1889.

<sup>29</sup> "Zweimal ist der rechte obere mittlere Schneidezahn ausgeschlagen und die Obliteration der Olveole deutet auf eine sehr frühe Entstehung: S. Catalina Nr. 9 (♂) und S. Barbara Nr. 6 (♀). Möglicherweise ist die Eutgernung absichtlich geschehen. Noch auffallender ist der Verlust der beiden unteren mittleren Schneidezähne bei dem weiblichen Schädel von S. Catalina Nr. 18."

States National Museum several large cranial collections that make feasible an exhaustive inquiry into the subject under consideration. First in importance are those from Alaska, Kodiak, and the Aleutian Islands; second, those from pre-Columbian burial grounds in Peru; and third, those from California, the Pueblo region, and Florida.

The data to be given must, however, be prefaced by certain precautions. The difficulties of these examinations have already been mentioned in part, but there are still others. The materials come largely from old burial grounds, and in these there is generally a large predominance of elderly and old people with scarcity of the young. Many of the skulls from such burials are more or less damaged; in the old, various teeth have been lost through disease and the alveolar processes were altered, and most of the skulls in the earlier collections are without lower jaws.

Notwithstanding all this, the diagnosis of the willful removal of one or more of the front teeth for other than curative purposes is fairly easy and safe, provided there is a sufficient number of specimens. The criteria are, it may be restated, the loss of such teeth from dentures in which the neighboring teeth show no signs of disease or injury; the limitation of the loss, in most cases, to the incisors, and in all instances to the teeth seen in such openings of the mouth as in laughter; the symmetry of the loss; the occasional presence of a similar loss in the two jaws; the repetition of the loss of the same dental elements in a group; in general, in adult skulls, the long period that had evidently elapsed since the extraction; and the similarity of the losses as well as of the defects they left, to losses and defects in peoples known to practice or to have practiced tooth ablation for ritual purposes.

In the data given in this paper, only those cases are included in which I could be fairly confident that the loss of the teeth in question was old, was not due to an ascertainable injury, and was not, in all probability, due to disease.

It should be said once more, however, that the data to be presented here cannot have any claim to precision. Correct records would only be possible on a series of well-preserved and complete skulls of young adults. Owing to the elimination of uncertain cases and of most of the aged, the data are doubtless below realities. Particularly is this so in the Peruvians, where there were many old, and where, owing to absence of the lower jaws, the corroborative evidence of these was wanting. In the Siberian skulls, too, the mandibles were mostly missing, but from Alaska and the Aleutians there were many complete skulls and skeletons.



It will doubtless be asked why these mutilations in Siberia and particularly in America have not been reported before. The answer in part has already been given; it is that in modern Indians and Eskimo the practice has failed to be observed; that in the skulls of some American groups, where the collections are small, such mutilations appear to be absent; that, aside from Kodiak and the Aleutian Islands where the evidence has but recently come to light, and aside from the Peruvian material which has not yet been well studied, the instances of the practice are limited and the evidence, owing to lack of direct attention to the matter, has been misunderstood or overlooked. It is very probable that when there are ample cranial collections from elsewhere in America, the practice will be found to have been even more extended than would appear from present observations.

Notwithstanding all the difficulties of the subject, there is ample evidence that noncurative removal of some to all of the front teeth has been a widespread procedure since neolithic times in northern Asia, and since the oldest known times in America; that it was practiced, according to the indications, not in early childhood but during adolescence; that it extended to both sexes, though not entirely equally, tending to predominate in the males; that there was large latitude and individuality as to the dental units removed and their number; and that it shows features indicating strongly that it was essentially a ritual, sacrificial observance.

The presentation of the facts in concise form is itself not easy. It will be simplest to show the records of the cases that could confidently be diagnosed as those of early and noncurative ablation, as given in the records, with each case representing a skull, with or without the lower jaw. Cases where the mandible was present and ablation existed in both jaws will be given individually. The percentages under the conditions will certainly be more or less below the realities. In the abstract chart, to make comparisons more feasible, the data will be only those on the upper jaws.

SIBERIA

*Neolithic (Irkutsk District)*

*Materials:* 66 adult skulls; 40 male, 26 female.

	Male		Female	
	Upper	Lower	Upper	Lower
<i>Early ablation of:</i>				
Both median incisors.....	5	...	...	...

No doubles (i.e., ablations in both jaws).

Percentage of skulls with ablation: Total 7.6; male 12.5, female 0.

*Encolithic (Gorni Altai Oirotskai)*

*Materials:* 8 adult skulls; 7 male, 1 female.

	Male		Female	
	Upper	Lower	Upper	Lower
<i>Early ablation of:</i>				
Both median incisors.....	1	...	...	...
Left median incisor.....	...	...	1	...

No doubles.

Percentage of skulls with ablation: Total 25.0.

*Samoyeds*

*Materials:* 21 adult skulls (no lower jaws); 12 male, 9 female.

	Male	Female
<i>Early ablation of:</i>		
Both median incisors.....	2	1

Percentage of skulls with ablation: Total 14.3.

*Voguls*

*Materials:* 45 adult skulls (no lower jaws); 18 male, 27 female.

	Male	Female
<i>Early ablation of:</i>		
Both median incisors.....	...	1
Right median incisor.....	...	3

Percentage of skulls with ablation: Total 8.9; male 0, female 14.8.

*Ostiaks (Little Ob River)*

*Materials:* 206 adult skulls; 98 male, 108 female.

	Male		Female	
	Upper	Lower	Upper	Lower
<i>Early ablation of:</i>				
Both median incisors.....	2	1	1	1
Right median incisor.....	3	...	4	...
Left median incisor.....	2	...	4	...
Both median and lateral incisors.....	1	...	...	...
Left lateral incisor.....	1	...	1	...
All incisors and right canine.....	...	...	1	...
Both right incisors.....	...	...	1	...
Both left incisors.....	1	...	...	...
Right lateral and both left incisors.....	1	...	...	...
All incisors .....	1	1	2	...
Both right and left upper median and lower left median incisors .....	1	...	...	...
Left upper and both lateral lower incisors.....	1	...	...	...

Two doubles.

Percentage of skulls with ablation: Total 15.0; male 16.3, female 13.9.

*Giliaks (Sachalin Island)*

Materials: 23 adult skulls; 9 male, 14 female.

	Male		Female	
	Upper	Lower	Upper	Lower
Early ablation of:				
Both median incisors.....	I	...	...	...
All upper incisors.....	...	...	I	...

Most without lower jaw.

Percentage of skulls with ablation: Total 8.7.

*Ulchi (Amur River)*

Materials: 24 adult skulls (most without lower jaws); 9 male, 15 female.

	Male		Female	
	Upper	Lower	Upper	Lower
Early ablation of:				
Right median incisor.....	I	...	I	...
Left median incisor.....	...	...	I	...

Percentage of skulls with ablation: Total 16.7.

*Yakuts*

Materials: 7 male skulls (without lower jaws).

Early ablation of:

All incisors ..... I

Percentage of skulls with ablation: Total 14.3.

*Chukchi*

Materials: 116 adult skulls (few with lower jaws); 49 male, 67 female.

	Male		Female	
	Upper	Lower	Upper	Lower
Early ablation of:				
Both median incisors.....	...	I	...	...
Right median incisor.....	...	...	I	...
Left median incisor.....	I	...	I	...
Both right incisors.....	I	...	...	...
Both left incisors.....	I	...	...	...
All incisors .....	I	...	I	...

Percentage of skulls with ablation: Total 6.9; male 10.2, female 4.5.

*Mongols*

*Materials:* 179 adult skulls; 106 male (40 with lower jaw), 73 female (29 with lower jaw); 56 separate lower jaws.

## SKULLS WITH LOWER JAW:

	Male		Female	
	Upper	Lower	Upper	Lower
<i>Early ablation of:</i>				
Both median incisors.....	I	I	...	I
Right median incisor.....	I	...	...	...
Left median incisor.....	I	...	...	...
Right lateral incisor.....	I	...	...	...
Left lateral incisor.....	...	...	I	...
All incisors .....	I	...	...	...
All incisors and canines.....	...	...	...	I
Most upper front teeth.....	I	...	...	...
Both right upper incisors, right canine, and both right premolars .....	I	...	...	...
Both left upper incisors and left lateral lower incisor .....		I	...	...
Both upper median incisors and both lower canines.....		I	...	...
Both upper median incisors, lower probable, but broken .....		I	...	...
Upper ? (all lost), both lower median incisors..		2	...	...
Right upper and right lower median incisors....		I	...	...
Right upper median with both lower median and right lateral incisors.....		I	...	...
Both upper lateral and left lower median incisors.	...			I

## SKULLS WITHOUT LOWER JAW:

<i>Early ablation of:</i>	Male	Female
Both upper median incisors.....	2	I
Right upper median incisor.....	3	...
Left median incisor.....	2	4
Both left incisors.....	I	...
All incisors .....	3	...
Both median and right lateral incisors.....	2	...
Both median and left lateral incisors.....	2	...

Percentage of skulls with ablation: Total 21.2; male 28.3, female 11.0.

## SEPARATE LOWER JAWS:

<i>Early ablation of:</i>	Male	Female
Right lower median incisor.....	I	...
Both median incisors and right lateral incisors.....	I	...
Both median incisors and left lateral incisors.....	I	...
Both median incisors.....	...	I
Both median and left lateral incisors.....	...	I

Percentage of separate lower jaws with ablation: Total 8.9.

*Buriats*

*Materials:* 54 adult skulls; 28 male (10 with lower jaw), 26 female (8 with lower jaw).

## SKULLS WITH LOWER JAW:

<i>Early ablation of:</i>	Male	Female
Both upper lateral and both lower median incisors.....	...	1
Both upper median, right upper lateral, and both lower median incisors .....	...	1
All but 3 upper teeth, all lower incisors.....	...	1

## SKULLS WITHOUT LOWER JAW:

<i>Early ablation of:</i>	Male	Female
Both median incisors.....	1	3
Right median incisor.....	...	2
Left lateral incisor.....	...	1
Right median and lateral incisors.....	1	...
Both median incisors (and perhaps also right lateral and both canines) .....	...	1

Percentage of skulls without lower jaw with ablation: Total 40.—; male 18.—, female 51.43.

## AMERICA

*Eskimo (St. Lawrence Island)*

*Materials:* 443 adult skulls; 239 male, 204 female; 94 separate lower jaws.

## SKULLS WITH ABLATION IN ONE JAW ONLY:

<i>Early Ablation of:</i>	Male		Female	
	Upper	Lower	Upper	Lower
Both median incisors.....	1	1	2	2
Right median incisor.....	2	...	...	...
Left median incisor.....	4	...	1	1
Both lateral incisors.....	...	...	...	...
Left lateral incisor.....	...	...	1	...
Both left incisors.....	3	...	2	...
All incisors .....	1	...	...	...
Both median and left lateral incisors.....	1	...	...	...
Both right incisors and right anterior premolar..	1	...	...	...
Both upper left incisors, left canine, and right anterior premolar .....	1	...	...	...
Right lateral incisor and canine.....	1	...	...	...
Both left incisor and probably right posterior premolar .....	1	...	...	...
All right incisors, canine, and premolars.....	...	...	1	...
All incisors and right anterior premolar.....	1	...	...	...
Both median with right upper incisors, and seemingly both premolars.....	...	...	1	...

No doubles.

Percentage of skulls with ablation: Total 6.6; male 7.5, female 5.4.

## SEPARATE LOWER JAWS:

<i>Early ablation of:</i>	Male	Female
Both median incisors.....	3	4
Right median incisor.....		1
Left median incisor.....	1	1
Both lateral incisors.....		1
Both median and right lateral incisors.....	1	1
Both median and left lateral incisors.....		2
Both incisors left side.....		1
All incisors.....		1
Both median incisors and both left premolars.....		1

Percentage of separate lower jaws with ablation: 19.2.

*Eskimo (Alaska, outside of St. Lawrence Island)*

*Materials:* 383 adult skulls; 160 male, 223 female.

## SKULLS WITH ABLATION IN ONE JAW ONLY:

<i>Early ablation of:</i>	Male		Female	
	Upper	Lower	Upper	Lower
Both median incisors.....		1	2	5
Left median incisors.....			1	1
Both median and left lateral incisors.....	2			
Both left incisors.....			1	
Right median and left lateral incisors.....	1			
Both left upper incisors and lateral incisors.....	1			
Left lateral incisor to M2 incl.....				1
All incisors.....			2	

Percentage of skulls with ablation: Total 4.7; male 3.1, female 5.8.

*Eskimo (Children and Adolescents)*

*Materials:* 137 skulls and 112 separate lower jaws.

U. S. N. M. No.	Condition	Ablation
242,823.....	both M2 fully erupted	All upper incisors
♀ 345,728.....	M3 left $\frac{1}{2}$ , right $\frac{4}{8}$ erupted	{ Max.: Both median incisors Mand.: Both median incisors

*Alcuts*

*Materials:* 281 adult skulls; 135 male, 136 female; 68 separate lower jaws.

## SKULLS WITH ABLATION IN ONE JAW ONLY:

<i>Early ablation of:</i>	Male		Female	
	Upper	Lower	Upper	Lower
Both median incisors.....	8		5	
Right median incisor.....	2		8	
Left median incisor.....	6		1	1
Both lateral incisors.....	2		1	
Left lateral incisor.....				1
Both median and right lateral incisors.....	2		2	
Both median and lateral incisors.....	1			
Left incisor.....	1			
Left median and both right incisors.....				1
Both median and left lateral incisors, left canine and both bicuspids.....	1			
All incisors.....	2	2	2	
All incisors and all premolars.....			1	

SKULLS WITH ABLATION IN BOTH JAWS:	Male	Female
All upper and both lower median incisors.....	1	...
Percentage of skulls with ablation: Total 18.2; male 20.7, female 16.9.		

## SEPARATE LOWER JAWS:

Early ablation of:	Male	Female
Both median incisors.....	1	...
Both left incisors and right lateral incisor and canine.....	1	...
Percentage of separate lower jaws with ablation: 3.0.		

*Pre-Alcuts*

Materials: 93 adult skulls; 49 male, 44 female.

SKULLS WITH ABLATION IN ONE JAW ONLY:	Male		Female	
Early ablation of:	Upper	Lower	Upper	Lower
Both median incisors.....	5	1	5	4
Right median incisor.....	3	...	2	1
Left median incisor.....	1	...	1	...
Both lateral incisors.....	3	...	...	...
Both median and left lateral incisors.....	1	...	1	...
Left median and both lateral incisors.....	...	...	...	1
Right incisor.....	3	...	...	...
Both median and lateral incisors.....	...	...	...	1
Left canine.....	1	...	...	...
All incisors.....	2	...	1	...
All teeth.....	1	...	...	...

## SKULLS WITH ABLATION IN BOTH JAWS:

Early ablation of:	Male	Female
Both upper and both lower median incisors.....	...	1
Both upper median and left lower median incisors.....	1	...
All upper and both lower median incisors.....	...	1
Right upper median and left lower median incisors.....	2	...
Left upper median, both lower median and left lower lateral incisors.....	...	1
Right upper lateral and both lower median incisors.....	...	1
Left upper lateral and both right upper incisors with right lower median incisor.....	...	1
All upper and lower incisors.....	...	1
All upper teeth on left to molars; right lower incisors.....	...	1
Percentage of skulls with ablation: Total 52.7; male 49.0, female 56.8.		

*Koniags (Kodiak Island)*

Materials: 83 adult skulls, 51 male, 32 female.

SKULLS WITH ABLATION IN ONE JAW ONLY:	Male		Female	
Early ablation of:	Upper	Lower	Upper	Lower
Right median incisor.....	1	...	...	...

## SKULLS WITH ABLATION IN BOTH JAWS:

<i>Early ablation of:</i>	Male	Female
Right upper median incisor and all lower incisors as well as lower left premolars .....	1	...

Percentage of skulls with ablations: Total 2.4; male 3.9, female 0.

*Pre-Koniags (Kodiak Island)*

*Materials:* 200 adult skulls; 67 male, 133 female.

## SKULLS WITH ABLATION IN ONE JAW ONLY:

<i>Early ablation of:</i>	Male		Female	
	Upper	Lower	Upper	Lower
Both median incisors.....	3	2	3	2
Left median incisor.....	...	...	1	...
Left upper incisor.....	...	...	1	...
Right median and lateral incisors.....	...	...	1	...
Both median and both lateral incisors.....	...	...	...	1
All incisors except left lateral.....	...	...	1	...
Right canine .....	...	...	...	1
All incisors .....	...	...	1	2

## SKULLS WITH ABLATION IN BOTH JAWS:

<i>Early ablation of:</i>	Male	Female
Both upper and both lower median incisors.....	...	1
Upper median and lower median with lower left lateral incisors..	1	...
Right teeth .....	1	...

Percentage of skulls with ablation: Total 11.—; male 10.4, female 11.3.

*Alaska Indians*

*Materials:* 85 adult skulls; 41 male (32 with lower jaw), 44 female (37 with lower jaw); 2 separate lower jaws.

*Early ablation of frontal teeth:*

*Male:* None

*Female:*

- |                           |   |
|---------------------------|---|
| a. Holy Cross (Yukon) ... | Both right upper incisors                             |
| b. Holy Cross .....       | } Upper jaw: all incisors and right anterior premolar |
|                           |   |
| c. Shageluk .....         | } Upper jaw: all incisors                             |
|                           |   |

Percentage of skulls with ablation: Total 3.5; male 0, female 6.8.

## SEPARATE LOWER JAWS:

*Male:* Prince William Sound... Right lateral incisor, canine and anterior premolar; left canine and anterior premolar

*Sex uncertain:* Knight Island... Right median incisor and left canine (unless congenitally absent)



*California<sup>a</sup> Indians*

*Materials:* 648 adult skulls; 337 male (170 with lower jaw), 311 female (138 with lower jaw).

	Male		Female	
	Upper	Lower	Upper	Lower
<i>Early ablation of:</i>				
Both median incisors.....	1	...	4	1
Right median incisor.....	3	...	5	...
Left median incisor.....	3	...	1	...
Right lateral incisor.....	...	1	...	...
Left lateral incisor.....	...	1	1	...
Both median and right lateral incisors.....	...	...	1	...
Both left incisors.....	1	...	1	...
All incisors.....	...	...	1	...
All incisors and apparently also right canine....	1	...	1	...
Both median incisors and probably all premolars..	1	...	...	...
Both median incisors with left lateral incisor and probably both left premolars.....	1	...	...	...
Left median incisor and both left premolars.....	...	...	1	...
Right lateral incisor and both anterior premolars. ...	...	1	...	...
All incisors, both canines, and both anterior premolars.....	...	...	1	...
All premolars.....	...	...	...	1

Percentage of skulls with ablation: Total 5.1; male 4.2, female 6.1.

SEPARATE LOWER JAWS (540; 10 with ablation):

Both median incisors.....	6
Left median incisor.....	2
Both median and right lateral incisors.....	1
Both median with left lateral incisor and right anterior premolars.....	1

Percentage of separate lower jaws with ablation: 5.4.

<sup>a</sup> Numerous localities; both mainland and islands; none recent.

*Pueblos (prehistoric, New Mexico and Arizona)*

*Materials:* Adult skulls, 500; 233 male (137 with lower jaw), 267 female (138 with lower jaw).

	Male		Female	
	Upper	Lower	Upper	Lower
<i>Early ablation of:</i>				
Both median incisors.....	2	1	1	3
Right median incisor.....	1	...	1	...
Left median incisor.....	5	...	...	1
Both median and right lateral incisors.....	...	...	...	...
Right lateral incisor.....	...	...	1	...
Both lateral incisors.....	...	...	1	...
Both right incisors.....	...	1	4	...
Both left incisors.....	1	...	...	1
Right median and left lateral incisors.....	...	...	1	...
Left lateral incisor and canine.....	...	...	1	...

Ablation in both jaws only in 1 male and 1 female.

Percentage of skulls with ablation: Total 5.6; male 5.1, female 6.0.

*Apache*

*Materials:* 32 adult skulls; 20 male (17 with lower jaw), 12 female (3 with lower jaw); 17 separate lower jaws.

*Early ablation of frontal teeth:**Male:*

- |                           |   |  |
|---------------------------|---|--|
| 1. San Carlos, Ariz. .... | } | Upper jaw: left median incisor and right anterior premolar |
|                           |   | Lower jaw: right median incisor                            |
| 2. Yuma Apache .....      | } | All upper incisors   |
|                           |   | Lower jaw absent   |

*Female:*

- |  |   |   |
|--|---|---|
| a. San Carlos, Ariz. ....              | } | Upper jaw: all incisors   |
|  |   | Lower jaw: right median incisor   |
| b. White River, Ariz. <sup>a</sup> ... | } | Upper jaw: section of alveolar process with all incisors, right canine and right anterior premolar, cut out |
|  |   | Lower jaw: absent   |

Percentage of skulls with ablation: Total 12.5; male 10.0, female 16.7.

## SEPARATE LOWER JAWS:

San Carlos, Ariz. .... Left lateral incisor

<sup>a</sup> This skull presents a unique lesion (pl. 5). A large portion of the alveolar process in the front has been cleanly cut off, together with the teeth, and there was a normal healing. This is a unique case and difficult of exact explanation. But it appears certain that the operation was not performed for any pathological condition.

*Sioux (19th century)*

*Materials:* 94 adult skulls; 53 male, 41 female. Skulls with lower jaws; 35 male, 31 female.

*Early ablation of frontal teeth:**Male:*

1. Both upper median incisors (lower jaw absent)
2. Both upper left incisors (none in lower jaw)
3. Both upper lateral incisors (lower jaw absent)
4. Right upper median and left lateral incisors, with several front teeth in lower jaw
5. Both upper lateral and right lower median incisors
6. Left upper lateral incisor (lower jaw absent)
7. Left upper lateral incisor (lower jaw absent)
8. Left upper lateral incisor (none in lower jaw)

*Female:*

- a. Both upper median incisors (lower jaw absent)
- b. Left upper median incisors (lower jaw absent)

Ablation in both jaws: 2.

*Dakotas (older burials)*

*Materials:* 112 adult skulls; 63 male (46 with lower jaw), 49 female (40 with lower jaw); 14 separate lower jaws.

*Early ablation of frontal teeth:**Male:*

Both upper median incisors (no lower).....	2
Left upper median incisor (no lower).....	2
Left upper median incisor (lower jaw absent).....	1
Both median and left upper lateral incisors (no lower)....	2

*Female:*

Both upper median incisors (no lower).....	1
Both upper median incisors (lower jaw absent).....	1
Right upper median incisor (left median incisor).....	1
Left upper median incisor (no lower).....	1
No upper (both lower left incisors).....	1

## SEPARATE LOWER JAWS:

Left median incisor.....	1
--------------------------	---

*Ohio Mounds (prehistoric)*

*Materials:* 204 adult skulls; 112 male, 92 female; 83 separate lower jaws.

*Early ablation of frontal teeth:**Male:*

1. Both lower median incisors (no upper)
2. Both upper median incisors (lower ?)
3. All upper incisors (no lower)
4. Right upper median incisor (no lower)
5. Left upper median incisor (no lower)
6. Both upper median and right lateral incisors (lower ?)
7. Both right and left lateral incisors (no lower)
8. All upper and both lower median incisors

*Female:*

- a. Both upper and both lower median incisors
- b. Right upper median incisor (lower ?)

Percentage of skulls with ablation: Total 4.9; male 7.1 (7 upper, 1 both upper and lower), female 2.2 (1 upper, 1 both upper and lower).

## SEPARATE LOWER JAWS:

*Male:*

Right median incisor.....	3
Both median incisors.....	1

*Female:*

Both median incisors.....	1
All incisors .....	1

Percentage of separate lower jaws with ablation: 9.5.

*Kentucky Indians (pre-White)*

*Materials:* 107 adult skulls; 59 male (29 with lower jaw), 48 female (24 with lower jaw); 5 separate lower jaws.

*Early ablation of frontal teeth:**Male:*

1. Upper jaw: all incisors  
Lower jaw: none
2. Upper jaw: left median incisor  
Lower jaw: none
3. Upper jaw: left median incisor  
Lower jaw: none
4. Upper jaw: both left and right lateral incisors  
Lower jaw: right median incisor

*Female:*

- a. Upper jaw: both lateral incisors  
Lower jaw: left median incisor

Percentage of skulls with ablation: Total 4.7; male 6.8 (3 upper alone, 1 both upper and lower), female 2.1.

*Iroquois and New York Algonquins*

*Materials:* 26 adult skulls; 12 male (10 with lower jaw), 14 female (11 with lower jaw).

*Early ablation of frontal teeth:*

*Male:* None

*Female:*<sup>a</sup>

- |                            |   |   |
|----------------------------|---|---|
| a. Staten Island . . . . . | { | Upper jaw: all incisors and canines<br>Lower jaw absent   |
| b. New York . . . . .      | { | Upper jaw: all incisors, canines, and probably premolars<br>Lower jaw: none (as far as discernible) |

Percentage of skulls with ablation: Female 14.0, both upper (lower ?).

<sup>a</sup> Both specimens probably Algonquin, both elderly (but not *old*), conditions not as clear as desirable, caries and numerous teeth lost; but main facts seem definite.

*Hurons (Canada)*

*Materials:* 21 adult skulls; 11 male (no lower jaws), 10 female (2 with lower jaw); 2 separate lower jaws.

No ablation.

*Potomac River Algonquins (prehistoric and earliest historic)*

*Materials:*<sup>a</sup> 365 adult skulls; 171 male, 194 female; 353 separate lower jaws; 57 skulls of children.

<i>Early ablation of:</i>	Male <sup>b</sup>		Female <sup>b</sup>	
	Upper	Lower	Upper	Lower
Both median incisors.....	I	...	I	5
Right median incisor.....	...	...	I	...
Left median incisor.....	...	...	2	...
Both median and right lateral incisors.....	3	...	2	2
Both median and left lateral incisors.....	...	I	I	2
Both incisors left side.....	I	...	...	...
Left lateral incisor.....	I	...	I	...
All incisors .....	...	...	I	...
All incisors and right canine.....	...	...	...	I
All incisors, canines, and anterior premolars....	I	...	...	...

Percentage of skulls with ablation: Total 4.4; male 4.1, female 4.6.

SEPARATE LOWER JAWS:<sup>b</sup>

Both median incisors.....	6
Left median incisor.....	I
Both median and left lateral incisors.....	I
All incisors .....	4

Percentage of separate lower jaws with ablation: 3.4.

<sup>a</sup> Very many damaged, both skulls and jaws.

<sup>b</sup> In a number of others there is evidence of early ablation of front teeth, but the bones are in such bad condition that definite determination is impossible.

*Florida Indians (old)*

*Materials:* 663 adult skulls; 356 male (132 with lower jaw), 317 female (97 with lower jaw); 301 separate lower jaws.

<i>Early ablation of:</i>	Male		Female	
	Upper	Lower	Upper	Lower
Both median incisors.....	3	5	2	3
Right median incisor.....	2	I	...	...
Left median incisor.....	2	...	4	...
Both median and right lateral incisors.....	...	...	...	I
All incisors .....	I	...	...	...
All upper and both lower median incisors.....	I	...	...	...
Both median upper and right median lower incisors .....	I	...	...	...
Left upper and both lower median incisors.....	I	...	...	...
Right upper lateral incisor and right upper canine.	I	...	...	...
All upper and both lower median incisors.....	I	...	...	...

Percentage of skulls with ablation: Total 4.4; male 5.3, female 3.1.

## SEPARATE LOWER JAWS:

*Early ablation of:*

	Male	Female
Both median incisors.....	3	3
Right median incisor.....	2	...
Left median incisor.....	1	...
All incisors and right canine.....	1	...

Percentage of separate lower jaws with ablation: 3.4.

*Indians of Mexico*

*Materials:* 52 adult skulls; 24 male (4 with lower jaw), 28 female (3 with lower jaw); 18 separate lower jaws.

*Early ablation of frontal teeth:**Male:*

1. San Luis Potosi..... { Upper jaw: all incisors and probably left canine  
Lower jaw absent
2. Valley of Mexico..... { Upper jaw: all incisors and canines  
Lower jaw: none
3. Maya, Yucatan ..... { Probably several upper front teeth—uncertain due to loss of back teeth  
Lower jaw absent

*Female:*

- a. San Luis Potosi..... { Upper jaw: both right incisors  
Lower jaw: absent
- b. Valley of Mexico..... { Upper jaw: left median incisor  
Lower jaw: none

Percentage of skulls with ablation: Total 9.6; male 12.8, all upper (lower ?); female 7.1, all upper.

## SEPARATE LOWER JAWS:

*Male:*

San Luis Potosi..... Both median incisors

*Child of about 12 years:*

San Luis Potosi (both M2 fully erupted).... Both median incisors

Percentage of separate lower jaws with ablation: 11.1.

*Indians of Old Peru*

*Materials:* 3,600 adult skulls without lower jaws; 1,780 male, 1,820 female.

<i>Early ablation of:</i>	Male	Female
Both median incisors.....	16	26
Right median incisor.....	7	10
Left median incisor.....	4	13
Right lateral incisor.....	1	...
Left lateral incisor.....	...	2
Both lateral incisors.....	...	1
Right median and left lateral incisors.....	...	1
Left median and right lateral incisors.....	...	1
Both median and right lateral incisors.....	3	6
Both median and left lateral incisors.....	5	8
Right median and both lateral incisors.....	...	1
Both right incisors.....	...	1
Both left incisors.....	2	3
All incisors.....	3	7
All incisors and both canines.....	1	5
All incisors and right canine.....	...	5
All incisors and left canine.....	...	1
Left lateral incisor and left canine.....	1	...
All incisors and premolar.....	2	...
Both right incisors with right canine and right anterior premolar.....	...	1
Both right incisors with left canine and left anterior premolar.....	1	...
Both left incisors with right lateral incisors, canine and anterior premolar.....	1	...
All incisors, both right premolars and left posterior premolar.....	1	...
Right median, with both lateral incisors and left canine.....	...	1
All incisors, canines, and anterior premolars.....	...	1
Right lateral incisors and both right premolars.....	...	1

Percentage of skulls with ablation in upper jaw (lower ?): Total 4.9; male 2.7, female 5.2.

## SEPARATE LOWER JAWS:

<i>Early ablation of:</i>	Male	Female
Both median incisors.....	4	5
Right median incisor.....	...	1
Left median incisor.....	...	4
Left lateral incisor.....	...	1
Both median and right lateral incisors.....	1	1
Right median and both lateral incisors.....	...	1
All incisors.....	3	1
All incisors and right canine.....	1	...

Percentage of separate jaws with ablation: 5.3.

## ABSTRACT OF NEW DATA

*Percentages of ablation in the upper jaw, disregarding the lower jaw**Siberia*

People	Skulls examined			Early ablation of front teeth in maxillae			% total	% male	% female
	Total	Male	Female	Total	Male	Female			
Neolithic, Irkutsk District ...	66	40	26	(5)	(5)	(0)	7.6	12.5	0
Encolithic, Gorni Altai .....	8	7	1	(2)	(1)	(1)	25.0	...	...
Samoyeds .....	21	12	9	(3)	(2)	(1)	14.3	...	...
Voguls .....	45	18	27	(4)	(0)	(4)	8.9	0	14.8
Ostiaks .....	206	98	108	(28)	(14)	(14)	13.6	14.3	13.0
Giliaks .....	23	9	14	(2)	(1)	(1)	8.7	...	...
Ulchi .....	24	9	15	(3)	(1)	(2)	16.7	...	...
Yakuts .....	7	7	...	(1)	(1)	...	14.3	...	...
Chukchi .....	116	49	67	(7)	(4)	(3)	6.0	8.2	4.4
Mongols .....	179	106	73	(36)	(29)	(7)	20.1	27.4	9.6
Buriats .....	54	28	26	(12)	(2)	(10)	22.2	7.1	38.5

*America*

Eskimo (St. Lawrence Island) .....	443	239	204	25	17	8	5.6	7.1	3.9
Eskimo (other) ....	383	160	223	10	4	6	2.6	2.5	2.7
Aleuts .....	281	135	136	45	25	20	16.0	18.5	14.7
Pre-Aleuts .....	93	49	44	40	23	17	43.0	51.1	38.6
Koniags (Kodiak) ..	83	51	32	2	2	...	2.4	3.9	0
Pre-Koniags (Kodiak) .....	200	67	133	14	5	9	7.0	7.5	6.8
Alaska Indians .....	85	41	44	3	...	3	3.5	0	6.8
California Indians...	648	337	311	28	11	17	4.3	3.2	5.5
Pueblos .....	500	233	267	19	9	10	3.8	3.9	3.7
Apache .....	32	20	12	4	2	2	12.5	(10.0)	(16.7)
Sioux .....	94	53	41	10	8	2	10.6	15.1	4.9
Dakotas (older burials) .....	112	63	49	12	7	5	10.7	11.1	10.2
Ohio Mounds .....	204	112	92	9	7	2	4.1	6.2	2.2
Kentucky Indians (pre-White) .....	107	59	48	5	4	1	4.7	6.8	2.1
Iroquois and New York Algonquins..	28	12	14	2	0	2	14.0	(0)	(14.0)
Potomac River Algonquins .....	365	171	194	16	7	9	4.4	4.1	4.6
Florida Indians ....	663	356	317	19	13	6	2.9	3.7	1.9
Indians of Mexico...	52	24	28	5	3	2	9.6	12.5	7.1
Indians of Old Peru .....	3,600	1,780	1,820	143	48	95	4.0	2.7	5.2



## DISCUSSION AND SUMMARY

Cranial evidence shows that ritual ablation of one or more of the front teeth at puberty, and possibly other forms of noncurative removal of such teeth, were practiced in parts of the Old World since upper paleolithic and neolithic times. Ritual ablations at puberty are still common in Africa and Australia.

The data brought forth on the preceding pages show definitely that the practice of removing some of the front teeth was widely spread from prehistoric to fairly recent times over both Siberia and America. In Siberia and Japan it existed from the neolithic period, if not earlier, and was in all probability brought by the migrants of that period to the American continent. How it came to Siberia and Japan is as yet doubtful; it may have reached there over southwestern Asia, or from the south over Japan, or from both directions. In view of the peculiarity and complexity of the practice it seems improbable that it could have arisen independently in any of the regions here under consideration.

Such removals in some places were associated, but only very exceptionally in the same individuals, with filing of the front teeth; the filing however is a separate practice with different significance, and in a large majority of cases the removals existed alone and independently.

In northern Asia both ablation and filing are known to have been in vogue among the prehistoric Aino, and in America filing of teeth has been reported from parts of old Mexico; but there was little knowledge hitherto of noncurative removals of teeth in Siberia and among the American Indians and Eskimo. Examinations by the writer, with this point in view, of large Siberian and American cranial collections has shown that noncurative and in most cases evidently ritual ablation of some or all the front teeth has in older times been widespread in both these great regions. In pre-Columbian America, in fact, it appears to have been almost, if not quite, universal.

The removal of the teeth, according to all indications, took place early in life, but not in childhood—the numerous skulls of children up to 10 years of age in our collection show no case of the ablation. In general, it seems, the removal of the teeth was done during adolescence, which strongly suggests association with puberty and its initiations. From this life-period, regrettably, specimens in all collections are very scarce, so that it is impossible to assemble an exact demonstration of the facts.

As to the teeth removed, there was a wide variety. The same fact had been observed in the neolithic Aino. In no one group was there but a single type of the removal, though predominance in one way or another was common. The teeth most frequently removed were one or more of the incisors, especially those of the upper jaw ; but in some cases the ablation was more extensive, including even the canines and some of the premolars. And the upper teeth on the whole suffered more than the lower.

The ablations were done generally in both sexes, though mostly they are found in a more or less larger proportion of the males. And in none of the Siberian or American groups did the practice affect all persons. There was evidently some selection. In the American tribes, barring the Aleutian Islands, the proportion of persons thus treated was always small to moderate, seldom reaching over 10 percent of the adult total.

The practice differed in the various tribes, the removal of certain teeth having evidently been more favored in some groups than in others ; but there was no rigid rule in this respect, and every group presents a number of individual variations in the removals.

The strong probability is that in general, or at least in a majority of the cases, the ablations both in Siberia and America were of a ritual nature. It would be difficult to attribute any material proportion of them either to disease or to accident ; and the evidence, especially the variety of the removals, speaks against any large proportion of the losses of the teeth here reported being due to branding or to punishment.

Cases of loss of teeth from accidents, punishment, or for simple branding, cannot be clearly distinguished from the ritual ablations ; but the nature of the losses, their sex distribution, the indications that they occurred early in life, and the presence or absence of other lesions, are helpful in the diagnosis.

The actual ways of removal of the teeth in all probability differed, including knocking out, prying, and especially pulling with sinews, or a combination of these efforts. The general lesion produced on the alveolar process was the breaking through and subsequent loss of the labial wall of the alveolus from which the tooth had been removed.

The meaning of the ritual ablation could only have been sacrificial, with secondarily a test of endurance. The practice falls into the same class with circumcision and could have had no connection, it would seem, with decorative, cosmetic, or simple torture mutilations.

The removals were undoubtedly practiced by other persons, relatives or shamans. The lesions, where still visible, indicate a good deal of resemblance in the essentials of the practices with considerable diversity in details. The teeth, in both Siberia and America, were probably more often pulled or pried out, than knocked out, with the breaking open of the labial wall of the alveolus, while the lingual wall remained unaffected. Generally, the removal was very successful and the subsequent healing without incident, but rarely a root of the tooth was broken, or the damage to the alveolar process was more extensive—but even in these cases there was a good healing. In general the removal was followed by an obliteration of the alveolus and absorption with marked thinning of the process, so that the same ended in a sharp border. In some cases the space left by the removal remained evidently but little affected; in most, however, it also shrank laterally. The teeth on the sides of the space either inclined to or approached each other, or both. The teeth opposite the lesion extruded somewhat, but were not lost. In unilateral ablations, especially where they affected more than one tooth, the alveolar process in front occasionally became asymmetric.

The extraction, if of but one tooth, caused presumably but little inconvenience; but where more than one tooth was removed both chewing and speech, and even the form of the lips and the neighboring parts, must have been more or less affected.

The ablations, curiously, though differing considerably in frequency in different groups, were never universal. In most of the tribes or localities they were in fact rather rare, affecting but a few percent of the individuals. There evidently was some selection—based perhaps on clan or other form of social organization.

In neolithic Japan and possibly in parts of pre-Columbian Mexico, the practice of ablation was contemporary with tooth filing; but in a large majority of the cases both in northern Asia and in America there is no such association.

The removals of more than one of the front teeth had such an effect on the structure and dimensions of the alveolar processes that they affected, more or less, the anthropometric determinations on the face. This interference calls for careful consideration and appraisal on the part of the measurer, and in cases makes the measurement of the height of the face quite impossible. The results of the practice constitute another nuisance with which American and Siberian craniometry will have to contend.

The similarity, and to a large extent contemporaneity, of this complex ritual practice forms one more link that connects the Asiatic and American native peoples. In America the practice was evidently later, having been brought over by the immigrant Siberian groups. Just when and whence it came into Siberia, is still a matter of conjecture; it was there certainly since neolithic times and may have been there even earlier.

#### ILLUSTRATIONS

The accompanying illustrations show a number of variants of the lesions produced by the ablations.



## Upper:

Left, Old Pueblo, New Mexico, male, elderly. U.S.N.M. No. 263063.

Right, Old Zuni, male, about 24 years. U.S.N.M. No. 314279.

## Middle:

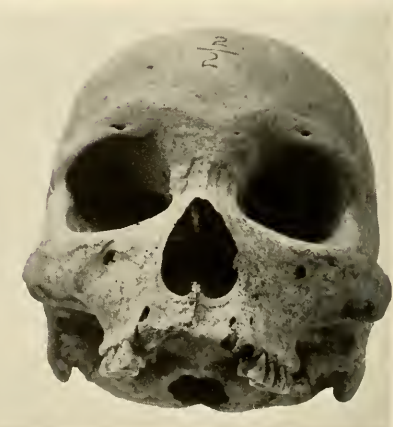
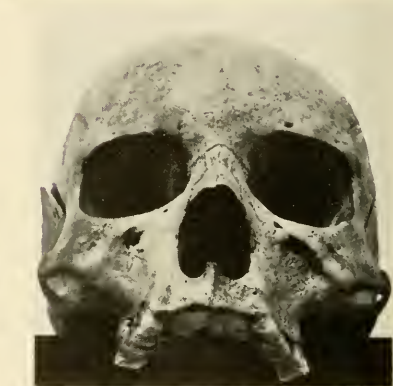
Left, Eskimo, St. Lawrence Island, female, adolescent. U.S.N.M. No. 24283.

Right, Eskimo, St. Lawrence Island, male, about 22 years. U.S.N.M. No. 368270.

## Lower:

Left, Yukon Indian, female, about 25 years. U.S.N.M. No. 332520.

Right, Ohio Mound, male, about 45 years. U.S.N.M. No. 328829.



## Upper:

Left, Pueblo (Old Zuni), male, about 45 years. U.S.N.M. No. 314322.  
 Right, Eskimo, St. Lawrence Island, male, about 50 years. U.S.N.M. No. 279525.

## Middle:

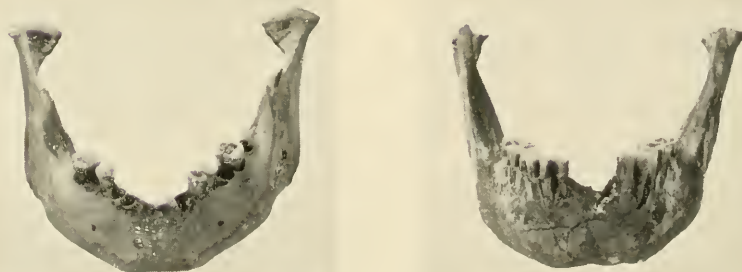
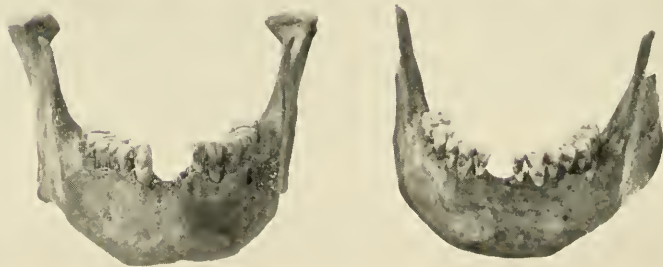
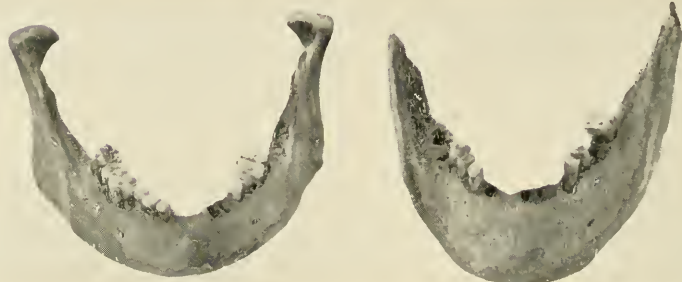
Left, Pre-Meute, male, elderly. U.S.N.M. No. 242913.  
 Right, Alaska Indian, female, elderly. U.S.N.M. No. 345353.

## Lower:

Left, Pre-Aleut, male, elderly. U.S.N.M. No. 243974.  
 Right, Algonkin, Md., female, about 40 years. Provis. No. 2/2.



*a.* Old Zuni, female, elderly. U.S.N.M. No. 308670.  
*b.* Florida, male, elderly.  
*c.* Florida, male, elderly. U.S.N.M. No. 352100.



## Upper:

Left, Aleut, male, elderly. U.S.N.M. No. 17479.

Right, Prince William Sound, Alaska, male, elderly. U.S.N.M. No. 332020.

## Second row:

Left, St. Lawrence Island, female, elderly. U.S.N.M. No. 364793.

Right, Alaska Indian, male, elderly. U.S.N.M. No. 262170.

## Third row:

Left, Old Zuni, male, about 30 years. U.S.N.M. No. 308620.

Right, Eskimo, St. Lawrence Island, male, about 30 years. U.S.N.M. No. 352422.

## Lower:

Left, Eskimo, St. Lawrence Island, female, about 50 years. U.S.N.M. No. 242766.

Right, Florida, female, about 50 years. U.S.N.M. No. 332077.





Apache, female about 30 years, showing cutting off of frontal part of upper alveolar process with teeth.  
U.S.N.M. No. 228044.