and then with the Department of Anatomy at University of Auckland. He worked at his researches essentially on his own with some financial support, especially from the New Zealand Dental Research Foundation, for almost 30 years. Along with a variety of smaller studies, he concentrated on two topics: morphological variation in teeth and tooth dislocation.

In his study of the palate Richard wrote: "expressing results by the maximum, minimum, and mean values cannot alone convey a true idea of variations." He took up this issue in detail as a first cause. Using his vast collection of teeth, he meticulously recorded tooth shapes by *camera lucida*. His findings were brought together in a monograph, *Variation in Morphology of Teeth*, published in 1978 by Charles Thomas. This work was submitted for the degree of Doctor of Science at the University of Auckland. The degree was conferred in 1980. In 1986, a similar account of deciduous molar variation was published in *Human Biology: 58*.

Richard Taylor then took up again a longtime interest in the dislocation of first molar teeth. His meticulous study on dislocation in Maoris had been published in 1963. He now extended this and completed a similar study of first molar dislocation in Australian Aborigines. The publication of this work was hindered by concerns about publication in Australia of photographs of aboriginal skeletal remains. The work was finally published by the department of Anatomy and the New Zealand Dental Research Foundation. In the meantime, the work had been submitted for the degree of Doctor of Science at the University of Otago. The degree was conferred in 1992.

In addition to these major studies, Richard Taylor participated in numerous carefully argued discussions on a wide variety of dental issues. These embodied a breadth of interest and a determination to use direct observation followed by careful argument. These qualities were the hallmarks of Richard Taylor, and they expressed his total devotion to meticulous research. In a time, after his retirement, when experimental biology had loomed large, his painstaking observation and recording of detail and its considered use to develop an hypothesis—or to show good cause to doubt one—was an inspiration to many of us in the Anatomy Department and to many others. We do have his outstanding skeletal collections, which were left to us in trust, and many of his personal papers as a constant reminder of a quietly determined and gifted researcher. His membership in the Dental Anthropology Association was a very tangible expression of the universality of his life-interest in dental anthropology.

Etruscan Teeth and Odontology

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ABSTRACT The results of a paleopathological examination of the teeth and supporting structures of a 4th through 2nd century BC Etruscan sample of 119 crania from central Italy reveals a relatively low incidence of caries (27.7%) and high frequencies of ante-mortem tooth loss (49.6%) and alveolar bone infection (27.7%). The mandibular anterior teeth of one individual were partially covered with a gold strip. The function of this strip may have been ornamental or possibly odontotechnical to cover a diastema which resulted from ante-mortem loss. Previous studies have shown that the Etruscans were renowned for their skill in odontotherapy.

INTRODUCTION

The Etruscans lived in central Italy, especially in Tuscany, between the 9th and 2nd centuries BC. They developed a major civilization which attained very high levels of artistic and technological achievement. The cultural aspects of this pre-Roman population are well known. Unfortunately, the paleobiological aspects of these peoples have been less studied.

We believe that the Etruscans were a biologically homogeneous population. According to Barnicot and Brothwell (1959) Etruscans may have been "a clearly differentiated physical group." For example, anthropometric studies of skeletal samples have demonstrated a substantial and significant uniformity in the distribution of the cranial index (Pardini and Bassi, 1975). Only a few anthropometric differences were found in comparisons of Etruscan groups of different geographic origin. For example, coastal region Etruscans (Tarquinia, Luni, Orbetello, Populonia) exhibit a higher skull than inland Etruscans (Chiusi, Chianciano, Volterra) (Pardini and Bassi, 1975). However, from a paleopathological perspective, we lack a detailed study of individual Etruscan diseases and their epidemiology.

MATERIALS

A paleopathological study of a large Etruscan sample from the National Museum of Anthropology of Florence University was recently carried out. The sample consists of 119 crania (M=74, F=45) from individuals between 25-50 years of age. Most crania were recovered from graves near Chiusi in Tuscany and date between the 4th and 2nd centuries BC (Etruscans of the Late Epoch). The preliminary results of this study include a detailed analysis of their dental pathology (Capasso, 1987; and below).

DISEASES AND ANOMALIES OF THE TEETH AND JAWS

Dental agenesis is present in 8.4% of the individuals studied and affects only third molars. Dysodontiasis (delayed eruption) is rare, with only 3.3% of the subjects affected. Inclusion is seen in 5.9% of the individuals and involves only molar teeth (2.6% of all molars are unerupted).

Malposition of at least one tooth affects 8.4% of the individuals and 1.25% of all the teeth examined. This percentage is low, and suggests that tooth decay in childhood was rare. Caries of deciduous teeth can lead to early tooth loss, which in turn may lead to a reduction in the space reserved for eruption of the corresponding permanent teeth and subsequent permanent tooth rotation or shift.

Anomalies in tooth size (microdontia and macrodontia) are found in both the third molars and lateral incisors, and affect 5% of the Etruscan sample studied. Dental calculus is present in 16 individuals, with a 13.4% frequency of occurrence.

Dental caries, which are frequent (>80%) throughout present-day Italy, occur in just 27.7% of the Etruscan individuals. Only 6.6% of all teeth (95 out of 1430) are affected by dental caries. The teeth most commonly affected are first molars, followed in frequency of occurrence by third and second molars (Fig. 1). Only two decayed teeth (less than 2%) are incisors. The low frequency of caries is common in all archaic populations and may represent a diet rich in fiber, which is difficult to chew. The result is efficient tooth cleansing and reduction of the surface on which the cariogenic oral flora can develop.

Evidence of teeth lost *in vitam* (ante-mortem) is seen in only 12.25 % of the 2,072 alveoli studied. About one half of the sample (49.6%) lost at least one tooth before death (Capasso, 1984).

The frequency of teeth lost ante-mortem decreases regularly from the back to the front of the dental arch. The most affected tooth is the third molar; the least affected is the lateral incisor. About 5% of all central incisors (Fig. 1) were lost ante-mortem. These central incisors lacked dental caries, and were affected only marginally by severe attrition. Therefore, trauma may have been a contributing factor to this loss.

The most common cause of all tooth loss was probably extreme dental wear related to the abrasive quality of the diet. In fact, ante-mortem tooth loss (59 individuals) was found together with serious dental wear (degrees 5-8 of Molnar, 1980) in 34 individuals, and with carious teeth in 30 individuals.

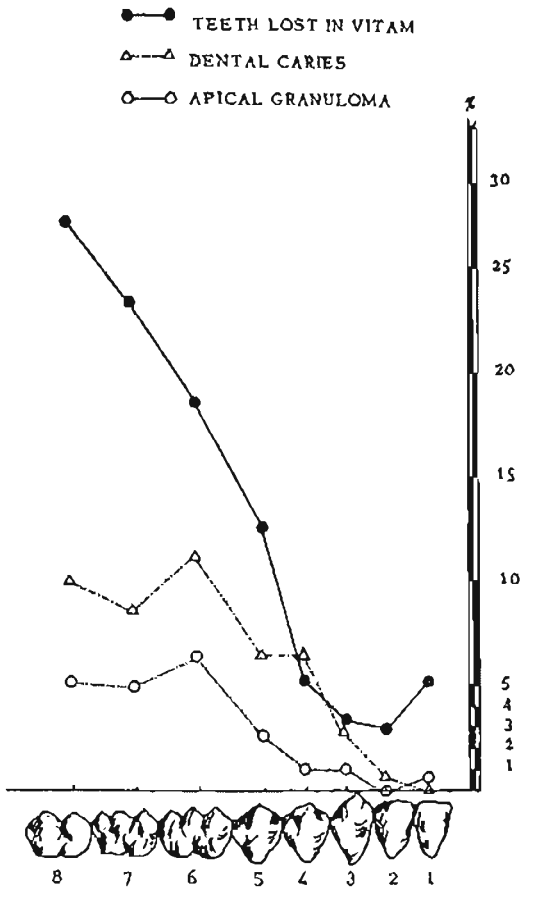

Fig. 1. Graph showing percent of teeth lost *in vitam*, caries, and apical granulomas by tooth in the Etruscan sample.

Tooth decay possibly played an important role in introducing germs into the apical paradont, and in causing some osteomyelitis localized in the maxillary bones (apical granulomas). Apical granulomas are present in 27% of the alveoli and in 27.7% of the individuals. About two-thirds of the cases are concentrated around molar roots. Indeed, these inflammatory lesions are more often found in association with dental caries (57.6% of the individuals) than with serious dental attrition (54.6%). This proposal is supported by the fact that the location of the apical granulomas within the dental arches closely follows the topographical distribution of dental caries (Fig. 1).

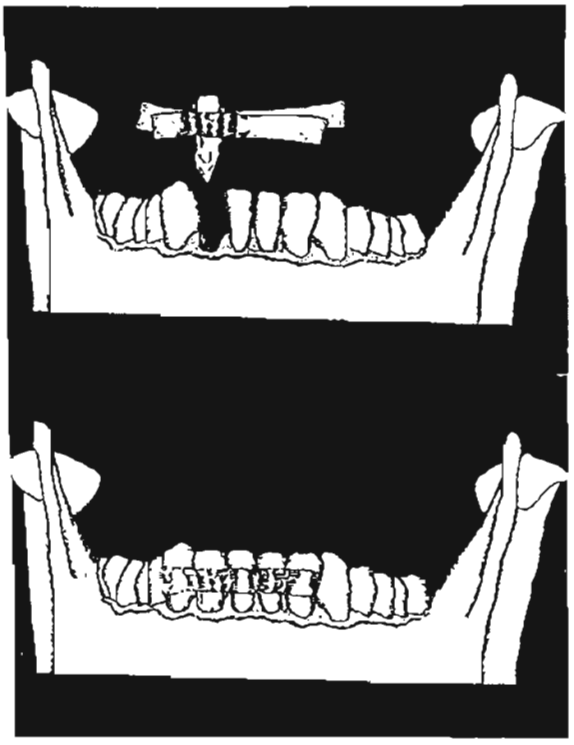

Fig. 2. Illustration of Etruscan fixed prostheses.

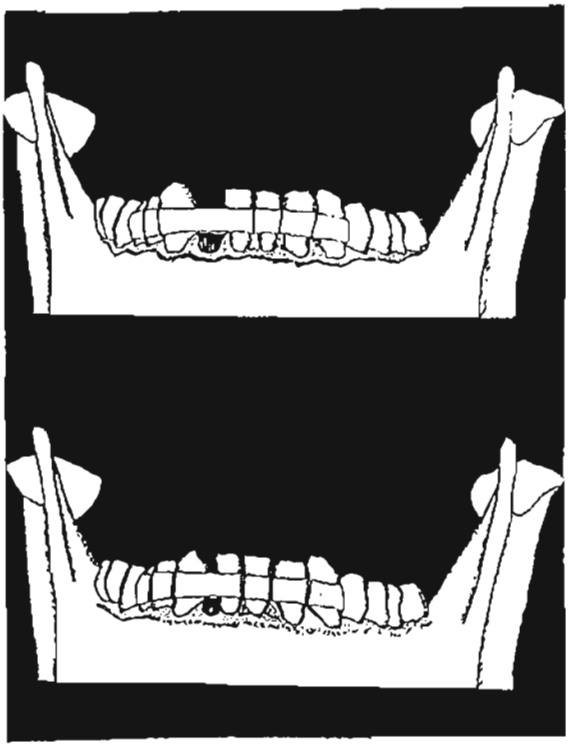

Fig. 3. Illustration of the possible therapeutic function of the gold strip for reduction of the ante-mortem diastema.

These dental data permit us to calculate the "dental lesion absolute index" of Bisel (1980), which in our sample is 18.5. The value of this index, along with the epidemiological and topographical information presented here, allows us to state that the dental health of the Etruscan sample apparently represents an "archaic character" of nutrition. The low incidence of caries and severe dental wear suggests a low carbohydrate and high fiber diet.

GOLD DENTAL STRIP

During our study we examined a vast amount of osteological and odontological material from different Etruscan tombs, some of which are well-known for the high quality and quantity of their funerary objects. For this reason, we hoped to identify some traces of the famous fixed dental prostheses that Etruscans are known to have made with both human and artificial teeth (Weiss, 1989). In these prostheses, the replacement teeth were often fixed to gold strips which served to attach the device to sound teeth adjacent to the diastema (Fig. 2).

In a lower jaw from Pieve (near Perugia) we did find a number of teeth covered with gold. Pale gold leaf covered the teeth on both the lingual and buccal sides. At first, we thought this gold strip was ornamental. However, a more exhaustive examination revealed that the gold leaf covered a group of teeth, one of which had been lost ante-mortem.

The specimen (No. 11782) is a skull from a female, about 16 years of age (Corruccini and Peccieni, 1992). The gold strip and the mandible around the symphysis are broken, and accurate analysis of the relationship between the teeth and strip is difficult. This damage occurred during a flood which damaged collections in the Archaeological Museum of Florence. Nevertheless, it can be seen that the gold strip covers all teeth between the lower first left premolar and the second right premolar. The lower left canine is missing, and the corresponding alveolus is nearly resorbed (Fig. 3).

The gold band may have had an ornamental purpose and we cannot decide whether it had been applied before or after the individual's death. Additionally, whether the absent tooth was lost antemortem or was never present (agenesis) is difficult to assess. However, the fact that the missing tooth is a canine makes the possibility of agenesis seem questionable.

The probability of a relationship between the absent anterior tooth and the gold strip appears quite likely. The strip may have been attached to the tooth surfaces with bindings which are now missing because they were either made of a decomposable material or were very thin. The strip passed through the spaces between the teeth with the aim of bringing the lingual gold leaf closer to the buccal one. In this way, the band could be used to keep all teeth

next to the lost tooth in tension. Initially, this device may have been employed only on the teeth closest to the missing one. However, more teeth eventually may have been included within the gold band. In this way, teeth on both sides of the missing tooth underwent mechanical stress, resulting in continuous remodelling of the alveolar bone. Thus, shifting of teeth adjacent to the lost one may have occurred until the diastema closed.

This is a plausible, although difficult to prove, hypothesis. Etruscan dentists performed orthodontic interventions with provisional equipment. Yet, the orthodontic function of the gold strip is possible if we consider the technological level that the Etruscans reached. The gold strip may have been left on the teeth as an ornament after its potential mechanical function was completed. Thus, a therapeutic function may have been associated with an aesthetic one, which perhaps was related to the use of gold as a feminine ornament.

LITERATURE CITED

Barnicot NA, and Brothwell DR (1959) The evaluation of metrical data in the comparison of ancient and modern bones. Ciba Foundation Symposium on Medical Biology and Etruscan Origins. London: J&A Churchill Ltd. pp. 131-149.

Bisel SLC (1980) A Pilot Study in Aspects of Human Nutrition in the Ancient Eastern Mediterranean, with Particular Attention to Trace Minerals in Several Populations from Different Time Periods. Thesis submitted to the Faculty of the Graduate School. Smithsonian Institution, Washington.

Capasso L (1984) Dental pathology and alimentary habit reconstruction in Etruscan population. Proceeding of the V European Meeting of the Paleopathology Association (Siena). pp. 59-67.

Capasso L (1987) Dental pathology of the Etruscan Population. Studi Etruschi *53*:177-191.

Corruccini R, and Peccieni E (1992) Ortodontie e occlusione deurele nepli Etruschi. Studi Etruschi *57*:189-194.

Pardini E and Bassi P (1975) Gli Etruschi. Atti della Societa' Toscana di Scienze Naturali (Memorie) *81*:161-196.

Weiss MM (1989) Etruscan medicine. Journal of Paleopathology *2*:129-164.

What Are Mulberry Molars?

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In 1987 Jacqueline A. Turner and I spent five months collecting dental and other anthropological data in six institutions, laboratories, and museums in Moscow, St. Petersburg, and Novosibirsk, Russia; and Tallinn, Estonia. At the Institute of Ethnography in St. Petersburg, we studied several skeletal series. One of these, a series of 145 historic Russians, was especially noteworthy because of the presence of numerous dental and osteological pathologies and anomalies, including what appeared to be extensive syphilis. The series had been excavated during the 1950's by the late Academician Valeri Alekseev (1969) from a presumed Russian Orthodox cemetery located inside Sebezh, Russia, a city south of Pskov near the Latvian border. Mortuary offerings of datable coins suggest that the cemetery had been in use during the 18th century—at least 200 years after syphilis was supposed to have been introduced to Europe from the Americas.

Figures 1-A, 1-B, and 1-C illustrate the severely malformed first permanent molars, and slightly hypoplastic deciduous second molars of a six to seven year-old Sebezh child. Figure 1-D shows one of the adult crania, several of which had marked syphilitic lesions.

The occlusal surfaces of the child's permanent molars possess numerous supernumerary ridges and *cusps*. Deep furrows are associated with the supernumerary ridges, and pitting occurs on the cusps. Some of this extra pitting can be seen on the deciduous second molars (Figs. 1-A, 1-B, 1-C). The unerupted second permanent molars also appear to be hypoplastic, but to a lesser degree than are the deciduous teeth.

The hypoplasia probably exposed the deciduous molars to increased risk of caries because of the pitting and uneven enamel formation. The mandibular left deciduous molar has occlusal and buccal surface caries (Fig. 1-A). The mandibular right deciduous tooth also appears to be carious in the deep occlusal furrows (Fig. 1-B). There are no caries on the permanent molars because they had erupted only a few months before death. The mandibular left permanent molar has only one cusp tip (cusp 1, protoconid) with any exposed dentine. Calculus deposits are extensive, as can be seen on the maxillary right deciduous molar (Fig. 1-C).

Massler and Schour (1952:plate 16), in their discussion of teeth with congenital syphilis, note that the disease can affect only the teeth developing during neonatal and early infancy periods. "Therefore, the permanent incisors, cuspids and first molars, which are at the stage of *morphodifferentiation* at the time of the [infection] show a disturbance in *tooth form*; the deciduous teeth, which are active in the *formation of enamel* and dentine show *hypoplastic defects*, but no effects upon tooth form; whereas the bicuspids and