Associated dental anomalies in an Etruscan adolescent

Tiziano Baccetti, DDS; Lorenzo Franchi, DDS; Jacopo Moggi Cecchi; Elsa Pacciani, PhD

Pathology relevant to orthodontics was known to Etruscan people, who showed pioneering capacities in treating lost or malaligned teeth. Etruscans living in the 8th to 4th centuries B.C. were able to treat gaps in dental arches by means of adjustable gold bands around the adjacent teeth.[1-3] An investigation of dental occlusion in Etruscan cranial remains, however, has revealed a very low prevalence of malocclusion.[4]

The description of newly discovered remains of an Etruscan adolescent of the 6th century B.C. exhibiting multiple tooth abnormalities in the upper jaw may, therefore, be especially interesting to orthodontists. This finding represents a historical example of association among developmental disturbances of the teeth, a topic which is gaining attention in the orthodontic research literature.[5-16]

Material and methods

The specimen was part of an Etruscan skeletal sample excavated in Italy by the Superintendency for Archeology of Tuscany from the site of Magliano in Tuscany (Grosseto), necropolis of Cancellone 1. The sample is housed in the Archeological Museum of Florence. Ten tombs were discovered and, by the archeological materials, were dated from the 6th century B.C. The tombs were used by two generations and a few of them were robbed. Two partial crania and the postcranial bones of two individuals were found in tomb 2.

The examined specimen consists of three fragments: A) fragment of left maxilla with 22, 23, 63, 24, 65, 26, 27 (teeth identified by the FDI two-digit numbering system) (Figure 2);

B) fragment of right maxilla with 14, 16, 17 (Figure 3); C) the isolated crown of 12, with root fragment (Figure 4).

Abstract

Three fragments of the upper jaw of an Etruscan adolescent of the 6th century B.C. discovered at the necropolis of Cancellone 1 (Magliano in Tuscany, Grosseto, Italy) were examined. A triad of associated dental anomalies was found: congenitally missing second premolars, "peg-shaped" permanent lateral incisors, and ectopic (palatal) eruption of a permanent canine. These findings provided the opportunity to discuss etiopathogenetic aspects of the associations among different types of tooth abnormalities.

Key Words

Dental anomalies • Etruscans • Tooth eruption • Ectopic.

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Figure 1
Etruscan jaw fragments escavated at Magliano in Tuscany, Italy.

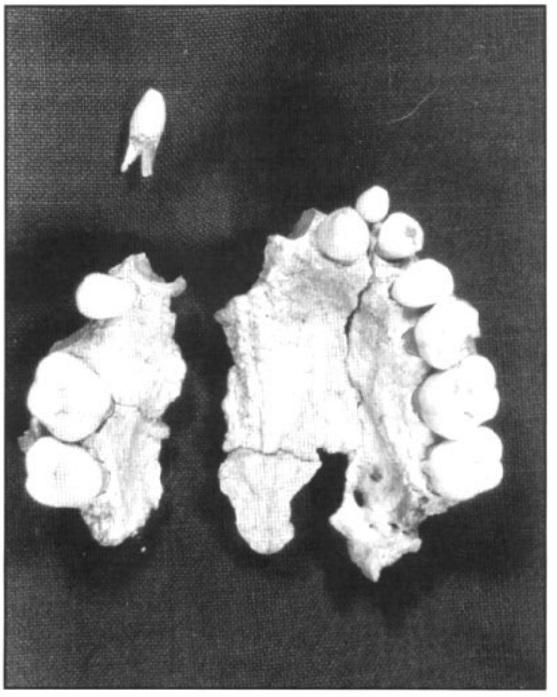

Figure 1

Observations

Descriptive examination

The teeth present in the fragments show the following features:

#63: This deciduous tooth, along with #65, is still present in the maxillary dental arch. It is slightly worn, with dentin exposed on the cusp tip and the wear facet sloping mesially. A fragment of enamel is missing on the distolingual part of the tooth.

65: Most of the enamel on the buccal face is flaked away (pre- and/or post-mortem?). Wear on this tooth is light.

12, 22: Both maxillary lateral incisors appear to be microdontic and misshapen, showing the typical peg-shaped morphology, i.e., "reducing in diameter from the cervix to the incisal edge."[17] Tiny wear facets are present on the cusp tips of both teeth and 22 is labially displaced.

23: The maxillary left permanent canine is palatally displaced, and it is also shifted mesially close to the lateral incisor. The tooth is also rotated distally, with the labial surface facing the palatal portion of the deciduous canine. A wear facet is present on the mesial border of the cusp.

15, 25: These teeth are missing.

14, 24: These teeth show no apparent morphological alterations. The right first premolar is rotated slightly to the distal. Light wear is evident on the buccal cusps.

16, 26: The first permanent molars show no apparent morphological alterations. Cusps are flattened by wear but with no dentin exposure.

17, 27: The second permanent molars exhibit reduction of the hypocone, more marked on the left side. The enamel margin on the palatal side of 27 is extended toward the roots 3.2 mm, almost forming a nodule. Wear facets are present on the protocone and on the paracone.

18, 28: Third molars are not present, although part of the tooth crypts can be observed.

Radiographic examination

Left fragment (Figure 5): congenital absence of 25; thin, short root of the peg-shaped 22 (the root is labially bent); presence of the crypt of 28.

Right fragment (Figure 6): absence of 15; presence of the crypt of 18.

The apical root formation of the second permanent molar[18] suggests an estimated age for this person ranging from 11 to 13 years.

Discussion

Associations among different types of dental anomalies are extensively described in the literature of the last century. (See Stewart et al.[19] and Brook[11] for reviews.) The presence of anomalies of tooth number, size, eruption, and position may generate malocclusion and creates the need for orthodontic treatment today.

Though malalignment of the teeth was found to be significantly less frequent in Etruscans when compared with samples of later industrialized populations,[4] the present report reveals a complex condition of tooth disturbances and severe tooth displacement in a Tuscan specimen of the 6th century B.C. The remains of the upper jaw of the 11- to 13-year-old Etruscan show retained deciduous teeth, aplasia of second premolars (radiographically assessed in the left fragment and presumed in the right fragment), anomalies in size and shape of lateral incisors (peg-shaped), ectopic eruption of the permanent canine (in the palatal side of the left fragment). A triad of associated dental anomalies can be identified in the historical specimen: congenital tooth absence, reduction in size/anomaly in shape, and anomalous eruption pathway.

Apart from the archeological significance of this finding, the evidence of different tooth disturbances in the same individual calls for a discussion about the pathogenetic aspects of associated tooth anomalies. This represents an increasingly debated speculative field in dental research.

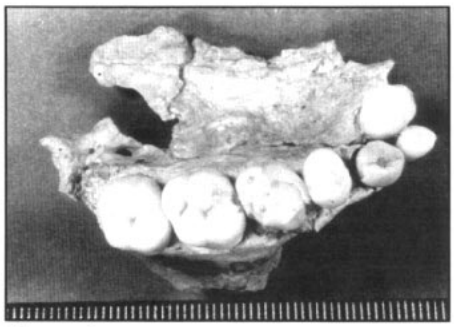

Figure 2

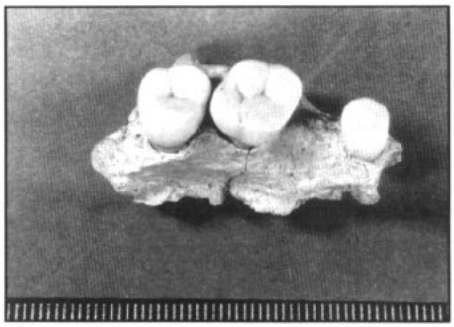

Figure 3

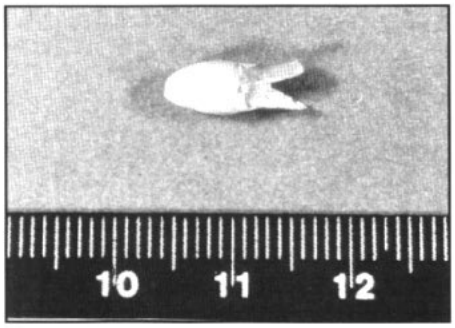

Figure 4

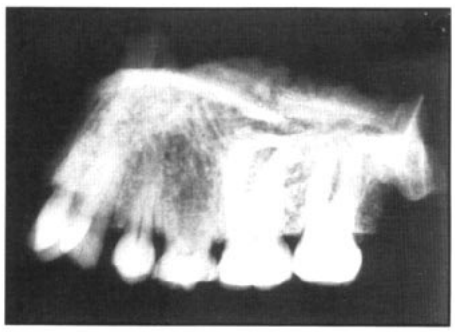

Figure 5

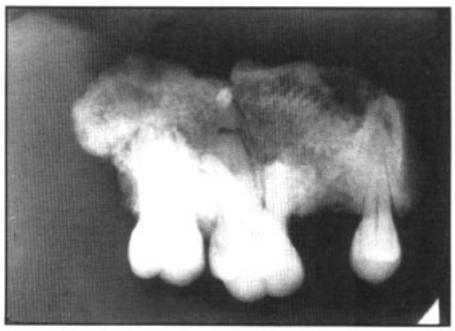

Figure 6

Figure 2
Fragment of left maxilla

Figure 3
Fragment of right maxilla.

Figure 4
Crown of tooth #12 with root fragment.

Figure 5
Radiographic aspect of the fragment of left maxilla.

Figure 6
Radiographic aspect of the fragment of right maxilla.

From an etiological standpoint, analysis of the patterns of association among tooth abnormalities can be approached in two ways. First, a common genetic background for concomitant tooth developmental disturbances is demonstrated by the increased prevalence of associated anomalies in individuals selected according to one anomaly when compared to the prevalence found in the general population. The ectopic eruption of maxillary canines is significantly associated with aplasia of premolars (as well as infra-occlusion of primary molars and the ectopic eruption of maxillary first permanent molars).[14] A genetic basis for the association between anomalies of tooth number and size is supported by twin studies[20] and by combined prevalence and family studies.[21, 22] A significant association among missing, microdontic, misshapen and hypoplastic (in relation to enamel development and maturation) teeth was found in a large sample of Mendelian hereditary syndromes.[16] Alvesalo and Portin[5] established that missing and peg-shaped upper lateral incisors are different expressions of the same gene. The genes that codify for human enamel amelogenesis lie on the sex chromosomes, where the genes controlling general development and size of the teeth are also located.[23-25] Garn and coworkers[6,26] reported disturbances in tooth eruption in individuals affected by missing and/or microdontic teeth. Tooth agenesis and/or peg-shaped maxillary lateral incisors accompany maxillary permanent canine-first premolar transpositions with four to ten times the rate of occurrence in the normal population.[5] Genetic influences within a multifactorial inheritance model are responsible for these dental findings.[5,16] According to Iseri and Uzel,[27] isolated or associated dental anomalies have been with humans from the very beginning of their life on earth as a result of inherited factors.

A second approach that has attracted the attention of orthodontic researchers concerns the relationship between anomalies of the maxillary lateral incisors and disturbances in the eruption pathway of the maxillary canine. An anatomical, "mechanical" aspect has been investigated in the association between these anomalies, involving crown size, root length, or congenital absence of the lateral incisor and delayed, ectopic, or failure of eruption of the canine. Definite links have been described between reduced lateral incisor crown size, short lateral incisor root, and palatal displacement of the adjacent canine.[28-31] The short root (best exemplified in peg-shaped lateral incisors) appears to be the critical factor, together with the late dental development, depriving the canine of needed "guidance" in the early phases of its eruptiion.[31]

This descriptive and radiographic investigation of the Etruscan specimen offers additional

data both to general (genetic) and local (anatomical) theories regarding causality of associated dental anomalies. Moreover, it must be stressed that these two pathogenetic interpretations are not dichotomous, as a common genetic background is not excluded by the guidance theory. In the Etruscan adolescent, the short, labially bent root of the peg-shaped maxillary lateral incisor may have implemented the possibility of ectopic eruption of the canine (Figure 5). An additional genetic influence, involving either the lateral incisor or the canine and affecting the development of the entire dentition (aplasia of premolars), may be hypothesized as well.

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References

1. Capasso L. L'origine delle malattie. Chieti: Marino Solfanelli, 1985.
2. Capasso L. Etruria: le meraviglie dei dentisti. In: Capasso L. La medicina nell'antichità. Archeo Dossier 1986;13.
3. Menconi A, Fornaciari G. L'odontoiatria etrusca. In: Vogel G, Gambacorta G eds. Storia della odontoiatria. Milan: Ars Medica Antiqua 1985;p.88-97.
4. Corruccini RS, Pacciani E. Orthodontistry and dental occlusion in Etruscans. Angle Orthod 1989;59:61-64.
5. Alvesalo L, Portin P. The inheritance pattern of missing, peg-shaped, and strongly mesio-distally reduced upper lateral incisors. Acta Odontol Scand 1969;27:563-575.
6. Garn SN, Lewis AB. Effect of agenesis on the crown-size profile pattern. J Dent Res 1969;48:1314.
7. Garn SM, Lewis AB. The gradient and the pattern of crown-size reduction in simple hypodontia. Angle Orthod 1970;40:51-58.
8. Cohen MM. Agenesis and tooth size in the permanent dentition. J Int Assoc Dent Child 1971;2:88.
9. Hoffmeister H. Mikrosymptome als Hinweis auf vererbte Unterzahl, Uberzahl und Verlagerung von Zähnen. Dtsch Zahnärztl Z 1977;32:551-561.
10. Becker A, Smith P, Behar R. The incidence of anomalous lateral incisor in relation to palatally displaced cuspid. Angle Orthod 1981;51:24-29.
11. Brook AH. A unifying aetiological explanation for anomalies of human tooth number and size. Archs Oral Biol 1984;29:373-378.
12. Brin I, Becker A, Shalhav M. Position of the maxillary permanent canine in relation to anomalous or missing lateral incisors: a population study. Eur J Orthod 1986;8:12-16.
13. Zilberman Y, Cohen B, Becker A. Familial trends in palatal canines, anomalous lateral incisors and related phenomena. Eur J Orthod 1990;12:135-139.
14. Bjerklin K, Kurol J, Valentin J. Ectopic eruption of maxillary first permanent molars and association with other tooth and developmental disturbances. Europ J Orthod 1992;14:369-375.
15. Peck L, Peck S, Attia Y. Maxillary canine-first premolar transposition, associated dental anomalies and genetic basis. Angle Orthod 1993;63:99-109.
16. Baccetti T. Analisi della prevalenza di anomalie dentali isolate ed associate nelle sindromi ereditarie: modello per la valutazione del controllo genetico sulle caratteristiche della dentatura. Minerva Stomatol 1993;42:281-294.
17. LeBot P, Salmon D. Congenital defects of the upper lateral incisors (ULI): condition and measurements of the other teeth, measurements of the superior arch, head and face. Am J Phys Anthrop 1977;46:231-44.
18. Schour I, Massler M. The development of the human dentition. J Am Dent Assoc 1941;28:1153-1160.
19. Stewart RE, Witkop CJ Jr, Bixler D. The dentition. In: Stewart RE, Barber TK, Troutman KC, Wei SHY eds. Pediatric Dentistry. St Louis: Mosby, 1982.
20. Gravely JF, Johnson DB. Variation in the expression of hypodontia in monozygotic twins. Dent Pract Dent Rec 1971;21:212-220.
21. Grahnén H. Hypodontia in the permanent dentition. A clinical and genetical investigation. Odont Revy 1956;7:Suppl 3.
22. Chosack A, Eidelman E, Cohen T. Hypodontia: a polygenic trait-a family study among Israeli Jews. J Dent Res 1975;54:16-19.
23. Alvesalo L, Portin P. 47,XXY males: sex chromosomes and tooth size. Am J Human Genet 1980;32:955-959.
24. Alvesalo L, Tammisalo E, Therman E. 47,XXX females, sex chromosomes, and tooth crown structure. Human Genet 1987;77:345-348.
25. Lau EC, Mohandas TK, Shapiro LJ, Slavkin HC, Snead ML. Human and mouse amelogenin gene loci are on the sex chromosomes. Genomics 1989;4:162-168.
26. Garn SM, Lewis AB, Vicinus JH. Third molar polymorphism and its significance to dental genetics. J Dent Res 1963;24:1344-1363.
27. Iseri H, Uzel I. Impaction of maxillary canines and congenitally missing third molars. Description of an ancient skull (7250-6700 B.C.). Eur J Orthod 1993;15: 1-5.
28. Broadbent BH. Ontogenetic development of occlusion. Angle Orthod 1941;11:223.
29. Miller BH. Influence of congenitally missing teeth on the eruption of the upper canine. Trans Br Soc Study Orthod 1963-64;50:17-24.
30. Bass TB. Observations on the misplaced upper canine tooth. Dent Pract 1967;18:25-33.
31. Becker A, Zilberman Y, Tsur B. Root length of lateral incisors adjacent to palatally-displaced maxillary cuspids. Angle Orthod 1984;54:218-225.