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Original Article

Lateral incisor agenesis, canine impaction and characteristics of supernumerary teeth in a South European male population

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ABSTRACT

Objective: To assess the prevalence of lateral incisor agenesis impacted canines and supernumerary teeth in a young adult male population. **Materials and Methods:** The panoramic radiographs of 1745 military students (mean age: 18.6 ± 0.52 years) who attended the Center of Aviation Medicine of the Armed Forces of Greece during the period 1997-2011 were initially analyzed for lateral incisor agenesis by two observers. After exclusion of the known orthodontic cases, a subgroup of 1636 examinees (mean age: 18.6 ± 0.44 years) was evaluated for canine impaction and supernumerary teeth. **Results:** Twenty-eight missing lateral incisors were observed in 22 military students, indicating an incidence of 1.3% in the investigated population. No lateral incisor agenesis was detected in the mandibular arch. A prevalence rate of 0.8% was determined for canine impaction in the sample of young adults. The majority of impacted teeth (86.7%) were diagnosed in the maxillary arch. Thirty-five supernumerary teeth were observed in 24 examinees (prevalence rate: 1.5%). The ratio of supernumerary teeth located in the maxilla versus the mandible was 2.2:1. The most common type of supernumerary tooth was the upper distomolar. **Conclusion:** The prevalence of lateral incisor agenesis, canine impaction, and supernumerary teeth ranged from 0.8 to 1.5% in the sample of male Greek military students.

Key words: Canine impaction, lateral incisor agenesis, prevalence, supernumerary teeth, young male adults

INTRODUCTION

Epidemiological studies on the prevalence of lateral incisor agenesis and canine impaction in different populations, demonstrate rates of 0.8-2%[1-3] and 0.2-2.8%,[4,5] respectively. Generally, congenital absence of teeth results from disturbances during the initial stages of tooth development, while eruption failure is caused by displacement of a permanent tooth from its normal eruption path, occasionally due to interference by pathological entities such as odontomas.

From a practical point of view, both clinical conditions induced a tooth-sized discrepancy effect in the dental arches. A multidisciplinary approach is then necessary to re-establish occlusion, function, and esthetics. In particular, the replacement of missing lateral incisors involves three treatment options: canine substitution,[6] a tooth-supported restoration,[7] or a single-tooth implant.[8] Irrespective of the treatment selected, the involvement of specialists in orthodontics is essential for site preparation and ultimately for the final outcome. The management of impacted canines requires the coordination of appropriate

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orthodontic mechanics and surgical exposure to bring the ectopically erupting tooth into occlusion.[9]

The incidence of supernumerary teeth has been reported to be between 0.1 and 3.4% in various study groups.[10-19] Overall, more frequent rates are published for permanent teeth,[15,17-20] children,[16,17,19] males,[16,17,21,22] and Asians.[23,24] Supernumerary teeth are classified with reference to their location (anterior maxillary region, posterior region, oral, or the buccal molar region) as mesiodentes, distomolars, or paramolars. Their morphology may be similar to the adjacent teeth (supplemental) or atypical (rudimentary). The latter type is further subdivided according to shape into conical, tuberculate, or molariform.

What causes the development of supernumerary teeth remains uncertain. Historically, three main theories[25] have been proposed: The phylogenetic process of atavism, the dichotomy theory, and hyperactivity of the dental lamina. The last hypothesis, the most popular one, suggests that extra teeth are formed as a result of localized increased proliferative activity, either from an extension of the supernumerary tooth buds or from the epithelial remnants of the dental lamina. Reports of a more frequent occurrence among family members[26,27] also implicate heredity in the etiology of supernumerary teeth. In addition, a number of craniofacial anomalies and syndromes, such as, cleidocranial dysplasia, Gardner's syndrome, and cleft lip and palate, are associated with supernumerary teeth.[25,28]

The aim of this article is to report on the incidence of lateral incisor agenesis and canine impaction in Greek military students, a population previously not evaluated in the literature. Additionally, the goal of the study was to provide data on the prevalence, type, and location of the non-syndromic supernumerary teeth in this population.

MATERIALS AND METHODS

Study population

The study sample initially comprised 1849 first-year student pilots and engineers of the Hellenic Air Force Academy, who attended the Center of Aviation Medicine in Athens, Greece. These subjects were consecutively examined between the years 1997 and 2011, during the annually scheduled medical tests. All 40 female army students and all non-native individuals within this initial study population were excluded from further analysis. Moreover, 11 subjects with unclear radiographic images were eliminated from the investigation. As a consequence, the study group for analysis of lateral incisor agenesis comprised of 1745 male military students, with a mean age of 18.6 ± 0.52 years at the time of the examination [Figure 1].

After exclusion of subjects with a previous history of orthodontics, 1636 examinees (mean age of 18.6 ± 0.44 years) were analyzed for canine impaction and supernumerary teeth [Figure 1].

Methods of analysis

All included subjects underwent an extraoral and intraoral clinical examination, followed by standardized panoramic radiographs (PM 2002 CC, Planmeca, Helsinki, Finland). The panoramic radiographs were evaluated on a light-box for potential numeric abnormalities by two observers. Registration of the missing lateral incisors, impacted canines, and supernumerary teeth was made on a consensus basis. For reproducibility and standardization of the radiographic observation, five-minute intervals were set in between the scoring of a series of 50 panoramic images, and the number of viewed radiographs did not exceed 300 images per day. The evaluation was performed in a darkened room to enhance visibility of the radiographs.

The data were collected using software (Microsoft Office Excel 2007, Microsoft, CA, United States) for descriptive statistics.

RESULTS

Lateral incisor agenesis

Twenty-eight missing lateral incisors were detected in 22 out of 1745 military students, indicating a prevalence of 1.3% in the investigated population. The distribution of these findings is illustrated in Table 1. No lateral incisor agenesis was observed in the mandibular arch. Sixteen missing lateral incisors (57.1%) were detected in the right segment, while the rest (42.9%) were seen in the left segment. Bilateral occurrence was found in six subjects.

Canine impaction

Canine impaction was found in 14 of the 1636 military students (0.8%; Table 2). Most of the teeth (86.7%/13 teeth) were diagnosed in the maxillary arch and the remainder (13.3%/two teeth) in the mandible. There was also a predominance of canines (ratio 4: 1) located at the right side of the jaw. Bilateral impaction occurred in a single case. Of the 14 subjects with impacted canines, 11 exhibited persistent deciduous predecessors.

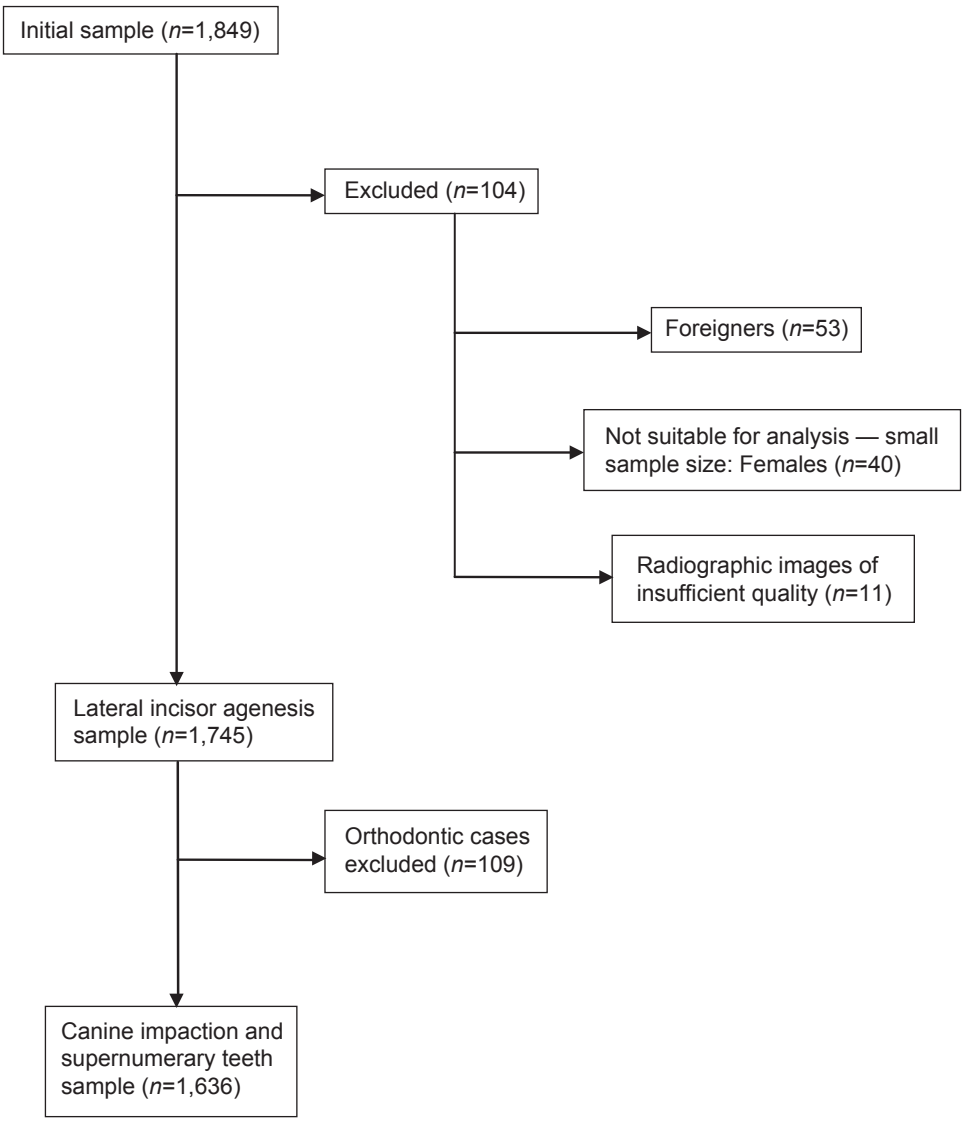

Figure 1: Flow-chart of inclusion/exclusion parameters of the study group

Table 1: Distribution of lateral incisor agenesis

	Maxilla		
	Right segment	Left segment	Total
N	16	12	28
%	57.1	42.9	100

Table 2: Distribution of the impacted canines

	Maxilla		Mandible	
	Right segment	Left segment	Right segment	Left segment
N (%)	11 (73.4)	2 (13.3)	1 (6.75)	1 (6.75)
Total	13 (86.7)		2 (13.3)	

Supernumerary teeth

A total of 35 supernumerary teeth were found in 24 of the 1636 military students (1.5%). Twenty-four supernumerary teeth were observed in the maxilla and 11 in the mandible (maxilla/mandible ratio: 2.2: (1). The distribution of the supernumerary teeth in the study is presented in Table 3. Fifteen examinees exhibited single supernumeraries (63%), and the rest exhibited two (29%) or three (8%) supernumerary teeth.

The most common site in the upper arch was the distomolar region (84%), followed by the premaxilla (16%). In the lower arch, the most frequent location was the premolar region (91%), with the rest of the supernumeraries being detected in the distomolar region (9%). Out of 31 distomolars and premolars, 17 teeth (55%) were detected in the right segment, and 14 teeth (45%) in the left segment. In one subject, the coexistence of two mesiodentes in the maxilla was confirmed.

Table 3: Location and type of the supernumerary teeth

	Maxilla (%)	Mandible (%)	Total (%)
Mesiodentes	4 (11)	0	4 (11)
Premolars	0	10 (29)	10 (29)
Distomolars	20 (57)	1 (3)	21 (60)
Total	24 (68)	11 (32)	35 (100)

DISCUSSION

The current study design was based on the utilization of data collected for the assessment of the oral health status of military personnel. Due to the low numbers of females in the Military Academy, the female students were excluded from the present analysis. Thus, conclusions about gender-based differences in the incidence of the examined tooth abnormalities could not be drawn based on the data presented. However, our study group was considered representative of the general Greek male population of the same age, as the military students came from the urban and rural areas throughout the country.

The incidence of lateral incisor agenesis in our study is within the range reported for other European populations.[1,2] However, the estimated rate falls short of the published data on samples of orthodontic patients.[29,30] A possible explanation may be the higher dental awareness and esthetic anxiety of individuals seeking orthodontic treatment.[12] With respect to the location of agenesis, missing mandibular laterals are rarely encountered in literature,[31,32] and none have been diagnosed in our study sample. There is a difference in agenesis between the right and left sides, which is consistent with the previous investigations.[3,33] Unilateral tooth absence is more common than bilateral, also described elsewhere.[3]

There were 109 former orthodontic patients excluded from the evaluation of canine impaction and supernumerary teeth because active orthodontic treatment might have exerted a positive effect on the eruption status of the canines or supernumerary teeth might have already been surgically removed as part of the treatment plan. A recent publication revealed a prevalence of 8.8% for impacted canines in a sample of 1239 cases in a North Greek population,[34] which greatly exceeded our reported percentage (0.8%). This contrast might be attributed to the source of the study material, that is, the individuals in that study had been referred to a Radiology Department. It could be speculated that individuals who were referred for radiographic assessment might present tooth abnormalities more often than a randomly selected population. In the present study, the frequency of canine impaction in the maxilla was 6.5 times higher than that in the mandible. In contrast, Yavuz *et al.* concluded that impacted maxillary canines occurred twice as often as impacted mandibular canines.[35] The results of the present investigation suggested that out of all students with impacted maxillary canines, 7% had bilateral impactions. In the literature, failure of eruption is reported to occur unilaterally in a majority of the cases.[36,37] The presence of deciduous canines in 11 examinees in the present study might indicate the importance of timely extraction, to help the eruption of the canines. Removal of a deciduous tooth in young individuals is recommended by several authors, to correct abnormally erupting maxillary canines, provided normal space conditions are present.[38,39]

The pre-required physical fitness of the young Air Force students ruled out the possible occurrence of odontogenesis and dental eruption anomalies due to syndromic diseases. Thus, the prevalence of non-syndromic supernumerary teeth in the radiographic records of 1636 military students was 1.5%, a rate that lay within the range of the published data.[21-25,28] The ratio of the maxillary/mandibular supernumerary teeth was within the range established by other authors, from 1.15 to 3.8:1.[40-43] With regard to the intra-arch location of the supernumerary teeth, no differences were noticed between the right and left segments.

Our study demonstrated that the most common supernumerary teeth were distomolars for the upper arch and premolars for the lower arch, a finding that was also supported by Lecco-Berrocal and colleague.[43] When considering both jaws, the upper distomolars were the most frequent type of supernumerary teeth (57%), followed by lower premolars (29%), mesiodentes (11%), and lower distomolars (3%). The high incidence of supernumerary molars in the general population was also confirmed in literature.[17,43] This differed from the well-established viewpoint that the most common supernumerary tooth was the mesiodens.[12,15,28,42-44] The lower percentage of mesiodentes reported for the present population might have been caused by the inclusion of individuals in whom supernumerary removal had been carried out during childhood or adolescence, a detail that might have been missed during the anamnestic data collection. Supernumerary premolars occupied the second place in frequency ranking in our study group, which was in agreement with investigations in the Jordanian and Spanish populations.[28,42]

The present sample is entirely adult-based, in contrast to the great majority of studies on supernumerary teeth that focused on children or populations mostly composed of children and adolescents. Several authors have demonstrated that supernumeraries undergo delayed development in relation to normal teeth.[45-50] It can be speculated that at younger ages, and subsequently in the earlier stages of dental development, the occurrence of supernumerary teeth is likely to be underestimated. Apart from the age of the subjects included, the discrepancies in prevalence rates may have been influenced by the methodology used for detection or the population studied.[28]

Moreover, previous studies have reported that single supernumeraries occur in 76-86% of the cases, two supernumeraries in a single patient in 12-23% of the cases, and three or more supernumeraries in less than 1% of the cases.[22,33] The recorded percentages of single, double, and triple supernumerary teeth in the same patient in the present group are closer to those described by Peker *et al.* (54.1, 21.6, and 13.5%, respectively).[41]

CONCLUSIONS

1. The prevalence rates for lateral incisor agenesis and canine impaction are 1.3 and 0.8%, respectively, in a population of male Greek military students. Both tooth abnormalities are more common in the maxilla. Unilateral missing lateral incisors and impacted canines are more frequent than bilateral cases.
2. The prevalence rate of supernumerary teeth in the investigated population was 1.5%. The most common type of supernumerary tooth was the upper distomolar, followed by the lower premolar, and mesiodentes.

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