

Characteristics of nonsyndromic supernumerary teeth in children and adolescents

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Aim: ‘Supernumerary teeth’ (ST) is a term used to describe extra teeth in both dentitions than those that we are predisposed to have and considered to be one of the most significant dental anomalies affecting children and adolescents. Diagnosis and management of ST is one of the main responsibilities of dentists and also physicians. The aims of this study were to document the prevalence, characteristics, and associated clinical complications of ST among children and adolescents and to summarize the management and intervention time for ST.

Materials and methods: Thirteen deciduous ST in 13 patients and 219 permanent ST in 179 patients aged up to 18 years were included in this study (in total, 192 patients with 232 ST).

Results: The general prevalence of ST determined in our study was 1.148% (deciduous ST: 0.077%, permanent ST: 1.07%). Boys (66%) were affected more frequently than girls (34%). Of the permanent ST, 183 (92%) were located in the maxilla and 56.8% were conical. Most of the ST were considered fully developed (134, 67.3%), while 60 (30.2%) had partial root formation with complete crown formation.

Conclusion: ST can cause a variety of complications. Early diagnosis of ST facilitates early intervention, minimal complications, and more favorable prognosis.

Key words: Supernumerary teeth, mesiodens, complications, intervention time

1. Introduction

‘Supernumerary teeth’ (ST), also known as hyperdontia, is a term used to describe extra teeth that develop in addition to the 20 primary and 32 permanent teeth that we are predisposed to have. ST are considered to be one of the most significant dental anomalies affecting children and adolescents, and diagnosis and management of these teeth is one of the main responsibilities of dentists and also physicians (1–5).

ST are often associated with Gardner syndrome, Fabry–Anderson syndrome, Ehlers–Danlos syndrome, cleft lip and palate, facial fissures, or cleidocranial dysplasia (3,4). In the absence of such complex syndromes and developmental disorders, ST are relatively rare.

The etiology of ST is not clearly understood and several theories have been proposed to explain their development: the phylogenetic process of atavism (“evolutionary throwback”), dichotomy of the tooth bud, and hyperactivity of dental lamina. Local and independent hyperactivity of dental lamina is the most widely accepted theory for the development of ST (1–5). Heredity may also

play a role in the occurrence of this anomaly, as ST are more common in the relatives of affected children than in the general population (3,4,6).

ST may be classified according to their morphology, shape, or location in dental arches. A diverse variety of forms is present in permanent dentition; however, in primary dentition, their morphology is usually normal or conical. The 4 different morphological types of ST can be described as conical (small structures with triangular or conical crown), tuberculate (barrel-shaped crown with multiple tubercles), supplemental (appearance of a normal tooth), or odontome (numerous small tooth-like structures or a single, irregular mass) (3,4). They can be classified into 2 types according to their shape: supplemental (appearance of a normal tooth) or rudimentary (not fully developed, immature) (3,4,7,8). ST may also be categorized as mesiodens (between the maxillary central incisors), paramolar (situated buccally or palatally to one of the maxillary molars or in the interproximal space buccal to the second and third molars), or distomolar (located distal to the third molar), according to their location

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(3,4). ST may be single or multiple, unilateral or bilateral, malformed or normal in size and shape, and erupted or unerupted in almost any region of the dental arch.

ST may maintain their positions for many years without clinical manifestations. However, they may be associated with many complications including impaction, delayed eruption or ectopic eruption of adjacent teeth, prolonged retention of deciduous teeth, crowding, development of median diastema, eruption into the floor of the nasal cavity, formation of cystic lesions, and root resorption of adjacent teeth (2–4,6,8–10).

Treatment of these cases depends on the complications arising from ST. If ST are associated with complications, the treatment is surgical extraction, whereas in the absence of complications, these cases can be followed by routine examinations (3,4,11).

The aims of this study were to document the prevalence and characteristics of ST and the associated clinical complications among the children and adolescents living in the West Mediterranean region of Turkey, and to summarize the management and the intervention time for ST.

2. Materials and methods

This retrospective and descriptive study examined ST in nonsyndromic patients who attended the clinics of the Pediatric Dentistry Department at the Süleyman Demirel University Faculty of Dentistry for dental complaints (caries, malocclusion, lack of eruption, etc.) or routine dental checkups from the West Mediterranean cities (Antalya, Isparta, Burdur, Alanya, Dinar, and Fethiye) of Turkey, between January 2001 and January 2011. The records accumulated by the department over this 10-year period were searched, and 16,720 patients aged up to 18 years who had been examined both radiographically and clinically were detected.

Thirteen deciduous ST were diagnosed in 13 patients, and 219 permanent ST were diagnosed in 179 patients (total: 192 patients with 232 ST). All patient data were derived from the records held by the department. However, 17 patients with 20 permanent ST were excluded from the study because of incomplete data, resulting in a final sample size of 175 patients with 212 ST (199 permanent ST, 13 deciduous ST). Diagnosis of ST was based on clinical and radiographic examinations. Panoramic and also periapical or occlusal radiographs were taken, particularly from patients with delayed eruption, rotation, or wide diastemata of the central incisors and ectopic eruption or crowding of the teeth.

The following ST features were described: primary or permanent, single or multiple, location, eruption, impaction, morphology, development stage, and complications related to adjacent teeth. Radiographic

examination was used to describe morphological patterns, namely conical, tuberculate, or supplemental. Odontomas were excluded from the study since they are not universally considered to be ST (6). The developmental stages were described as fully developed crown, fully developed crown with root under formation, and fully developed ST. The complications, including impaction, delayed eruption or ectopic eruption of adjacent teeth, prolonged retention of deciduous teeth, crowding, development of median diastema, eruption into the floor of the nasal cavity, formation of cystic lesions, and root resorption of adjacent teeth, were investigated.

The data were subsequently processed and analyzed using SPSS 15.0 (SPSS Inc., Chicago, IL, USA). Chi-square and Fischer's exact tests were employed to compare qualitative data and determine statistical significance. The level of statistical significance was set at $P < 0.05$.

3. Results

The general prevalence of ST determined in our study was 1.148% (192 of 16,720 patients). Thirteen ST (in 13 patients) were deciduous (5.6%) and 219 ST (in 179 patients) were permanent (94.4%). The prevalence of deciduous and permanent ST was 0.077% and 1.07%, respectively. The clinical and radiographic appearance of one case are given in Figure 1.

All the patients with deciduous ST (5 girls, 8 boys) had only 1 supernumerary tooth, and the mean age was 5.38 ± 1.8 years (range: 2.5–7 years). All deciduous ST were supplemental and conical, erupted, and observed in the anterior region of the maxilla. Because of the small sample size, deciduous ST were analyzed separately from permanent ST.

The permanent ST study population comprised 107 boys (66%) and 55 girls (34%) with a boy-to-girl ratio of 1.94:1. No statistically significant difference could be established between the sexes ($P > 0.05$). The mean age of these patients (at the time of diagnosis) was 9.79 ± 2.8 years (range: 6–18 years). Most of the patients were diagnosed at the age of 8–9 years (50 patients, 30.9%), followed by 10–11 years (42 patients, 25.9%) (Figure 2). We observed that 127 patients (78.4%) had 1 supernumerary tooth, 33 (20.4%) had 2 ST, and only 2 (1.2%) had 3 ST (Figure 3).

The number of permanent ST detected in 162 patients was 199, and the average number of permanent ST per patient was 1.23. The clinical and radiographic characteristics of permanent ST are summarized in the Table. Of the 199 ST, 96 (48.2%) were erupted, whereas 103 (51.8%) were unerupted. Of the permanent ST, 183 (92%) were located in the maxilla, whereas 16 (8%) were found in the mandible. Of the 183 ST located in the maxilla, 175 ST were located in the anterior region of the maxilla (of these, 118 were located in the central region [mesiodens]



Figure 1. Clinical and radiographic appearance of a ST case.

and 54 in the lateral region), 88 ST were erupted, and 95 were unerupted. In the mandible, the most frequent locations were the premolar region (6 ST) and lateral region (5 ST). All 5 of the distomolar ST diagnosed in our study were unerupted. The most frequently observed morphological type of ST was conical (113, 56.8%), followed by supplemental (84, 42.2%) and tuberculate (2, 1.0%). Of the conical ST, 62 ST were unerupted, whereas 51 ST were erupted. All the tuberculate ST were unerupted and diagnosed in the maxilla. Of the total ST, most (134, 67.3%) were considered fully developed, while 60 (30.2%) had partial root formation with complete crown formation. The 5 ST with only crown formation were unerupted (Table).

The reason for referral to the clinic was general clinical and radiographic examinations in almost half of the patients (n = 80, 49.4%), followed by crowding arising from ST eruption (33, 20.4%), failure of permanent

teeth eruption (24, 14.8%), displacement of permanent teeth (15, 9.2%), primary teeth retention (9, 5.5%), and unusual diastema (1, 0.6%). All the erupted ST were surgically removed. Ninety-seven of the permanent ST were surgically removed and clinically followed, 69 were surgically removed and orthodontically treated, and 33 were followed without removal.

Statistical analysis showed that the eruption status of ST was not significantly correlated with the number of ST in each of the jaws (P = 0.883), location within the jaws (P = 0.217), morphology (P = 0.196), or developmental stage (P = 0.08).

4. Discussion

The reported prevalence of ST in various populations ranges from 0.1% to 3.8% (3–5,8,12–19). The prevalence has been estimated to be 1.05% in Spanish (20), 1.53% in Hungarian (13), 2.1% in British (19), 2.7% in Chinese (14), 2.96% in Brazilian (18), and 3.2% in Mexican (15) populations. In a recent study, it was reported that the

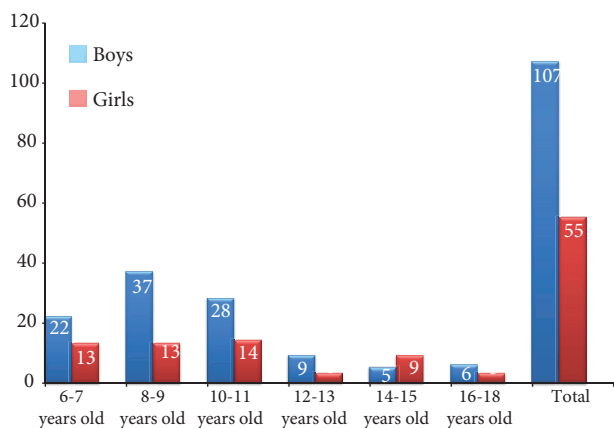


Figure 2. Distribution of the number of permanent ST patients according to ages.

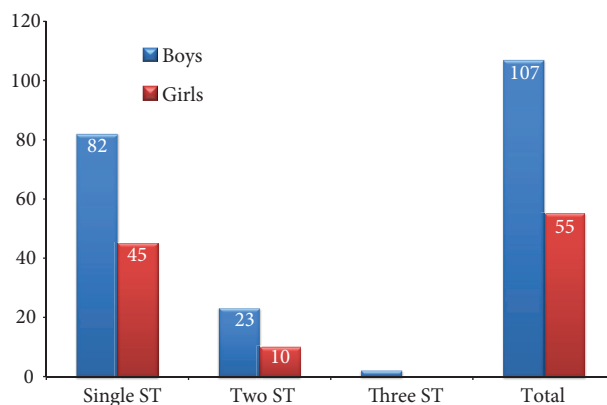


Figure 3. Distribution of the number of permanent ST per patient.

Table. Clinic and radiographic characteristics of ST.

	Erupted	Unerupted	Total	Maxillary	Mandibulary	Total
Maxillary	88, 44.2%	95, 47.7%	183, 92%			
Mandibulary	8, 4%	8, 4%	16, 8%			
Erupted				88, 44.2%	8, 4%	96, 48.2%
Unerupted				95, 47.7%	8, 4%	103, 51.8%
Mesiodens	59, 29.6%	61, 30.7%	120, 60.3%	118, 59.3%	2, 1%	120, 60.3%
Lateral	31, 15.6%	28, 14.1%	59, 29.6%	54, 27.1%	5, 2.5%	59, 29.6%
Canine	2, 1%	2, 1%	4, 2%	3, 1.5%	1, 0.5%	4, 2%
Premolar	4, 2%	7, 3.5%	11, 5.5%	5, 2.5%	6, 3%	11, 5.5%
Distomolar	0	5, 2.5%	5, 2.5%	3, 1.5%	2, 1%	5, 2.5%
Supplemental	45, 22.6%	39, 19.6%	84, 42.2%	72, 36.2%	12, 6%	84, 42.2%
Conic	51, 25.6%	62, 31.2%	113, 56.3%	109, 54.8%	4, 2%	113, 56.8%
Tuberculate	0	2, 1%	2, 1%	2, 1%	0	2, 1%
Developed crowns	0	5, 2.5%	5, 2.5%	2, 1%	3, 1.5%	5, 2.5%
Root under formation	28, 14.1%	32, 16.1%	60, 30.2%	57, 28.6%	3, 1.5%	60, 30.2%
Fully developed ST	68, 34.2%	66, 33.2%	134, 67.3%	124, 62.3%	10, 5%	134, 67.3%
Total	96, 48.2%	103, 51.8%	199, 100%	183, 92%	16, 8%	199, 100%

mean prevalence value for the European white population was lower than that of the southern Chinese population (12). The differences in patient population samples, age groups, ethnicity, and radiographic techniques are important factors that may have influenced these varying results.

The prevalence of ST in the Turkish population is not well documented. In a study of 2599 children from a middle-eastern region of Turkey, Esenlik et al. (16) reported a prevalence of 2.7%, whereas another study from a northeastern region, which included 3491 subjects, reported a prevalence of 1.2% (17). A lower prevalence of ST (0.87%) was reported by Ezirganlı et al. (21) for an eastern region of Turkey.

The Faculty of Dentistry of Süleyman Demirel University, in the province of Isparta in the West Mediterranean region of Turkey, was the only dental faculty in the region until the year 2012. In this study, all the records of ST were obtained from the Department of Pediatric Dentistry of this faculty and all patients were Caucasian. In this study, we observed a prevalence of ST of 1.15%.

In accordance with previous studies (3,5,6,8,16,22,23) that reported that ST were found more frequently in permanent dentition than in deciduous dentition, the percentage of deciduous ST observed in our study was 5.6%. This underestimated percentage for the deciduous ST could result from exfoliations or extractions (16). Probably because of the space created in the primary

arch by normal growth, all of these teeth were erupted, confirming the findings of Pashley (24).

Our finding that all of the deciduous ST observed were located in the anterior region of maxilla is in agreement with the findings of Miyoshi et al. (25). In this study, most of the patients were diagnosed at the age of 8–9 years (30.9%), followed by 10–11 years (25.9%). This is in agreement with the findings of Rajab and Hamdan (3) and De Oliveira Gomes et al. (5), who also studied a population of children and adolescents.

The boy-to-girl ratio of our study population was 1.94:1, and this is in agreement with previous studies that reported that boys are affected approximately twice as frequently as girls in cases of permanent dentition (1,3,5,6,17,20). However, Davis (14) reported a boy-to-girl ratio of 6.5:1 in a study of Chinese children, whereas Bäckman and Wahlin (26) reported that girls had more ST than boys among 7-year-old Swedish children. Differences in findings may be because of the differences of the samples studied and may reflect ethnic, genetic, and environmental differences.

In accordance with most studies (3,15–18,26,27), we observed that 92% of the ST were located in the maxilla, and this percentage was very close to that reported by De Oliveira Gomes et al. (5), that is, 91.3%. It has been reported in our study in accordance with the other studies that the most commonly diagnosed ST were mesiodens (3,5,15–17,26). As previously reported (1,3,5,16,17), we also observed that the most frequently seen type of ST was

conical (56.3%), followed by supplemental (42.2%) and tuberculate (1%). Developmental stage and eruption status of ST are important factors for surgical management. De Oliveira Gomes et al. (5) stated that 41.3% of the ST were fully developed. In the present study, 67.3% of the ST were fully developed and half of these (50.7%) were erupted (Table).

ST may cause crowding, diastema, cyst formation, resorption, and rotation of adjacent teeth and may delay or impede the eruption of the permanent teeth, or it may be symptomless (28). In our study, 49.4% of the ST were not associated with clinical complications. The most common clinical complications arising from ST were crowding (20.4%), failure of permanent teeth eruption (14.8%), and displacement of permanent teeth (9.2%). Cyst formation and eruption into the nasal cavity are clinical complications that have been reported to occur less commonly. Nasal teeth may develop because of the ectopic eruption of ST and may cause a variety of symptoms and complications such as facial pain, nasal obstruction, headache, epistaxis, and external nasal deformities (10,29). Neither cyst formation nor eruption into the nasal cavity was observed in this study.

Early diagnosis and treatment of patients with ST is important to prevent or minimize complications. If there is a significant delay in the eruption of the maxillary primary or permanent incisors, dentists and also physicians should investigate the existence of ST. Radiographic examination is essential to confirm the diagnosis of ST. Furthermore, the position of ST in relation to the adjacent teeth can be determined by means of radiographic examination. Treatment depends on: (i) the type and the localization of the ST, (ii) the age at diagnosis, (iii) the degree of clinical complications caused by ST, (iv) the developmental stage of adjacent teeth, (v) the psychological ability of the patient to tolerate the surgical procedure, and (vi) the occlusion of the patient (2,3,6,27). Controversy exists regarding the optimal treatment of delayed eruption because of ST involvement.

The treatment options include: (i) removal of the ST only, (ii) removal of the ST and orthodontic treatment to reestablish sufficient space for the delayed tooth, and (iii) follow-up without removal. In our study, 48.7% of all the ST were surgically removed and clinically followed up with, 34.7% were surgically removed and orthodontically treated, and 16.6% were followed without removal.

Timing for the surgical removal of ST is also another controversial issue. Whereas some authors recommend immediate removal of ST following the initial diagnosis, others prefer postponement of the surgical intervention until the age of 8 to 10 years, when the root development of the central incisor is nearly complete (8,11,30,31). Indications for ST removal include: (i) delayed or inhibited eruption of an adjacent tooth, (ii) evident displacement of an adjacent tooth, (iii) presence of pathology caused by the extra tooth, and (iv) spontaneous eruption of the ST (3). However, surgical removal of the ST is not the always the recommended treatment option. Immediate surgical removal soon after diagnosis may create dental phobia problems for a young child and has been said to cause devitalization or deformation of adjacent teeth. These teeth may be monitored without removal when: (i) acceptable eruption of adjacent teeth has occurred; (ii) there is a lack of pathology caused by the ST; (iii) removal would damage adjacent teeth, e.g., via loss of vitality and root malformation; and (iv) the child can be seen regularly by a dentist (1,3,6).

In conclusion, ST are relatively common and can cause a variety of complications. These complications detected in this study were crowding arising from ST eruption, failure of permanent teeth eruption, displacement of permanent teeth, primary teeth retention, and unusual diastema. Early diagnosis of ST by dentists and also by physicians facilitates early intervention, minimal complications, and more favorable prognosis. Therefore, each case should be individually assessed clinically and radiographically and the appropriate treatment option should be determined.

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