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Gemination and Twinning in  
Permanent Dentition.

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ABSTRACT

Gemination and twinning are uncommon developmental anomalies of the hard dental tissue. These aberrations are manifested either as an anomalous tooth or a supernumerary tooth. Six cases of gemination and twinning are presented in this paper. A simplified classification of these anomalies has been suggested.

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### Review of the Literature

Variation in the size and form of teeth is not an uncommon finding. In a 12-year period, Clayton<sup>1</sup> examined 3,557 children and found seventeen cases of either fused or geminated teeth (0.48 per cent). Many different cases of gemination and fusion have been reported.<sup>2-8</sup> Menezes<sup>9</sup> states that fusion is the third most common anomaly occurring in the primary dentition (0.5 per cent), anodontia being the first and supernumerary teeth the second.

Little information is available on the incidence of gemination and twinning in the permanent dentition. Boyne<sup>2</sup> reported two cases of gemination among 2,000 men in the U. S. Naval service (0.1 percent) and Grover<sup>10</sup> et al. found 14 cases (5 gemination and 9 twinning) during a panoramic survey of 5,000 U. S. Army recruits (0.28 per cent). The literature reporting gemination and twinning in permanent dentition consists mainly of case reports. The terminology describing gemination and twinning is confusing.

Gemination and twinning are the results of a developmental aberration of both the ectoderm and mesoderm. These disturbances are caused by local metabolic interferences occurring during morphodifferentiation of the tooth germ. The etiology of gemination and twinning remains unknown. Shafer<sup>11</sup> and Moody<sup>12</sup> suggest a hereditary tendency.

This paper presents six different, unusual and uncommon cases of gemination and twinning in permanent dentition. Also, a simplified classification of these anomalies has been suggested.

### Report of Six Cases:

#### Case I:

A 17-year-old caucasian male was called in for a routine dental examination. His mandibular left third molar (tooth number 17) was not erupted. There was no evidence of pericoronitis or other oral abnormality. There were no clinical signs or symptoms diagnostic of an impacted tooth. A panoramic radiograph revealed an impacted large third molar and the presence of a fourth maxillary molar (Fig 1). A periapical radiograph revealed a mesio-angular impacted tooth with a relatively large occlusal table, fibid crown appearance, large common pulp chamber and three common roots. This anomalous tooth formation itself gave the appearance of true gemination of tooth number 17 (Fig 2).

#### Case II:

A 22-year-old black male was seen for a routine dental examination. A bilaterally anomalous tooth development of the maxillary second molar was observed (Fig 3). The clinical examination revealed the right second molar had a relatively larger occlusal table; the tooth measured 15mm mesiodistally and 9mm buccolingually. A very prominent buccal groove between the two crowns was noticed. A periapical radiograph revealed (Fig 4) a large pulp chamber and common roots. Since the maxillary first molar (tooth number 3) had been extracted several years previously, the anomalous tooth had moved mesially. The left side of the same arch revealed a similar tooth. The maxillary left second molar (tooth number 15) measured 14mm mesiodistally and 10mm buccolingually. This case demonstrated the bilateral occurrence of a true gemination. Figure 5 is a

periapical radiograph of tooth number 15.

Case III:

A 19-year-old black male came to the dental clinic to seek treatment for his double tooth (Fig 6). A clinical examination revealed complete twinning of two fully erupted second premolars on the left side of the mandibular arch (tooth number 20). The presence of these two teeth, occupying the space of the second premolar, suggest twinning of tooth number 20. Patient complained of tongue biting and frequent entrapment of food. Clinically, both teeth seemed identical. A periapical radiograph demonstrated two separate, fully formed teeth (Fig 7).

Case IV:

A 23-year-old female presented with two lateral incisors. These teeth looked identical; both measured 6mm mesiodistally (Fig 8). A periapical radiograph confirmed twinning (Fig 9).

Case V:

A 24-year-old white male had the maxillary right central incisor bigger mandibular left central incisor. A clinical exam (Fig 10) revealed that tooth measured 15mm buccolingually and had a well-defined lateral and lingual groove and a distinct incisal notch. PAX of this tooth confirmed gemination (Fig 11).

Case VI:

A 23-year-old female had two mandibular right permanent canines, fully erupted, causing some crowding in the mandibular arch (Fig 12). A periapical X-ray revealed two fully formed teeth and confirmed twinning (Fig 13).

Discussion:

Gemination and twinning are generally asymptomatic, however, teeth may cause clinical problems due to poor esthetics, caries or periodontal destruction.

The terms gemination and twinning have been defined in the literature using various synonyms like dichotomy,<sup>13</sup> connation,<sup>14</sup> double tooth,<sup>15</sup> linking tooth,<sup>16</sup> synodontia<sup>17</sup> and schizodontia,<sup>11</sup> mirror image double tooth,<sup>18</sup> fused teeth,<sup>19</sup> and geminated composite odontoma.<sup>20</sup> Tannenbaum<sup>21</sup> described the phenomena of gemination and twinning diagrammatically.

A suggested scheme of classification is given below.

Gemination (a cleavage single tooth germ)

Partial cleavage (true gemination).

Complete cleavage (twinning).

Fusion (two separate tooth germs during formative stage).

Fusion by enamel and dentine (true fusion).

Union by dentine and/or cementum (late fusion).

A late fusion by cementum is called concrescence.

A radiograph, clinical exam and history will usually provide enough information to arrive at definite diagnosis of gemination, twinning or fusion. A union between a supernumerary and normal tooth, sometimes referred to as diphyodontic gemination<sup>26</sup> may be merely the gemination of a single tooth bud resulting in the fusion of a normal tooth and the small rudimentary tooth.



Experimental Geminatio:

Zajicek<sup>22</sup> demonstrated, using a tinfoil partition, the capability of the odontogenic organ of a rat to produce two separate teeth from a single organ. The work by Glasstone<sup>23</sup> demonstrated that when a rabbit's molar tooth germ was halved prior to the differentiation of odontoblasts and dentine, each half possessed the ability to form a complete tooth. It seems evident that gemination is the formation of the equivalent of two teeth from the same follicle. This may result in the formation of either teeth that are equal in size and of normal dimensions, or of a pair of teeth where one is of normal size and the other is rudimentary in form. Generally, these teeth are not fused with each other, but may do so depending upon the stage of differentiation of odontoblasts. Other studies<sup>24,25</sup> reported the similar findings.

It is suggested that there may be some relationship between gemination, twinning and odontoma. In gemination and twinning, the epithelium and mesenchymal cells exhibit complete differentiation with the result that the functional ameloblast and odontoblast lay down enamel and dentin in a normal fashion, whereas, in an odontoma, ameloblasts and odontoblasts lay down enamel and dentin in small rudimentary tooth-like structures during morphodifferentiation. This could be a result of a multiple, complete cleavages of single-tooth germ due to unknown epigenetic factors.

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#### LEGEND

- Fig 1: Panoramic radiograph showing mandibular left third molar and maxillary fourth molar.
- Fig 2: Periapical radiograph of geminated third molar.
- Fig 3: Abnormally formed right and left second molars.
- Fig 4: Periapical X-ray of maxillary right second molar.
- Fig 5: Periapical X-ray of maxillary left second molar.
- Fig 6: Twinned lower second premolars.
- Fig 7: Periapical X-ray of twinned premolars.
- Fig 8: Twinned maxillary right lateral incisors.
- Fig 9: Periapical of twinned laterals.
- Fig 10: Maxillary right central - gemination.
- Fig 11: Periapical of geminated right lateral.
- Fig 12: Twinned mandibular right permanent canines.
- Fig 13: Periapical X-ray of mandibular canine showing two separate, fully formed teeth.

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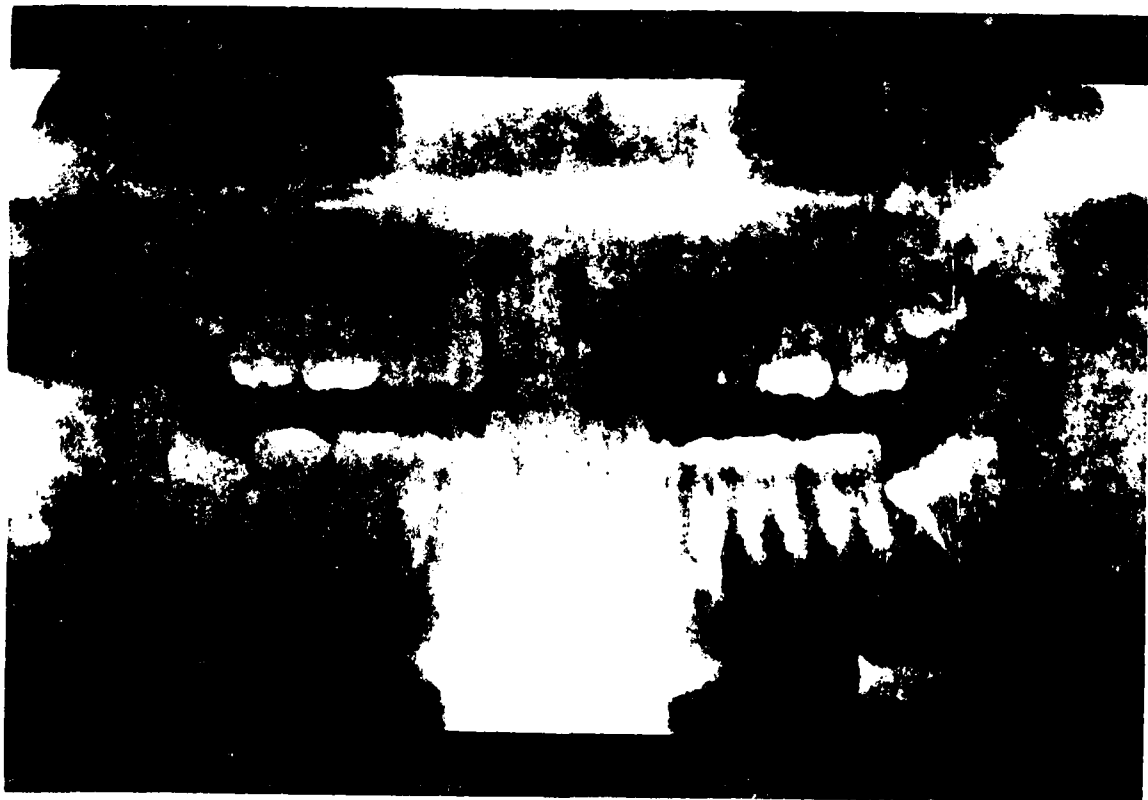


Fig 3



Fig 4



Fig 5



Fig 6

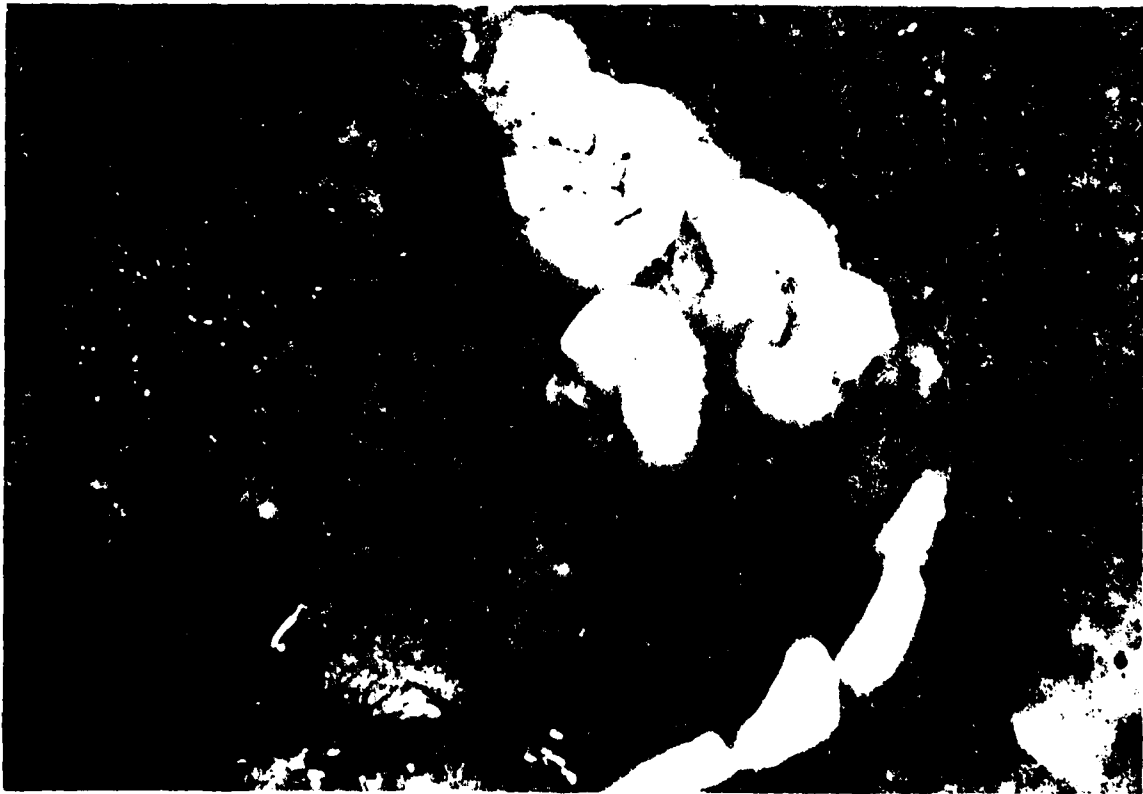




Fig 7



Fig 8



Fig 9



Fig 10



Fig 11

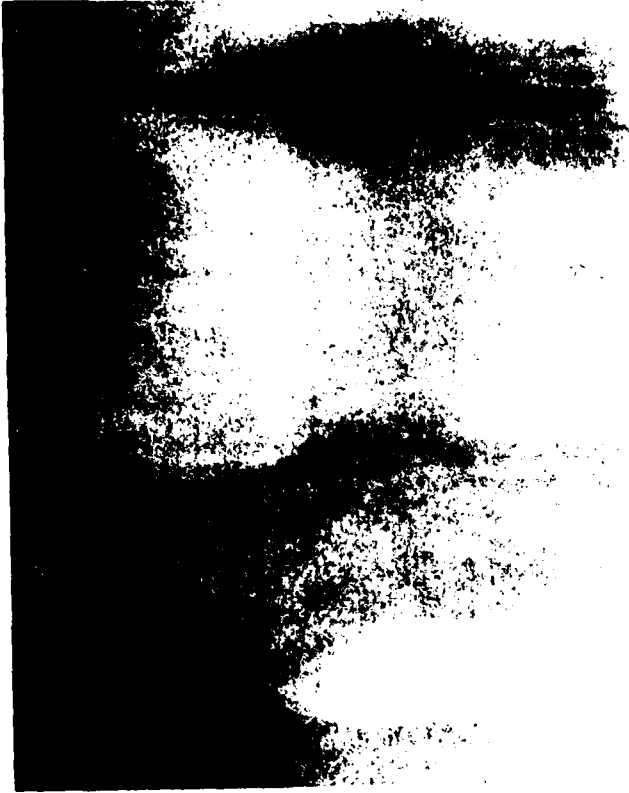


Fig 12

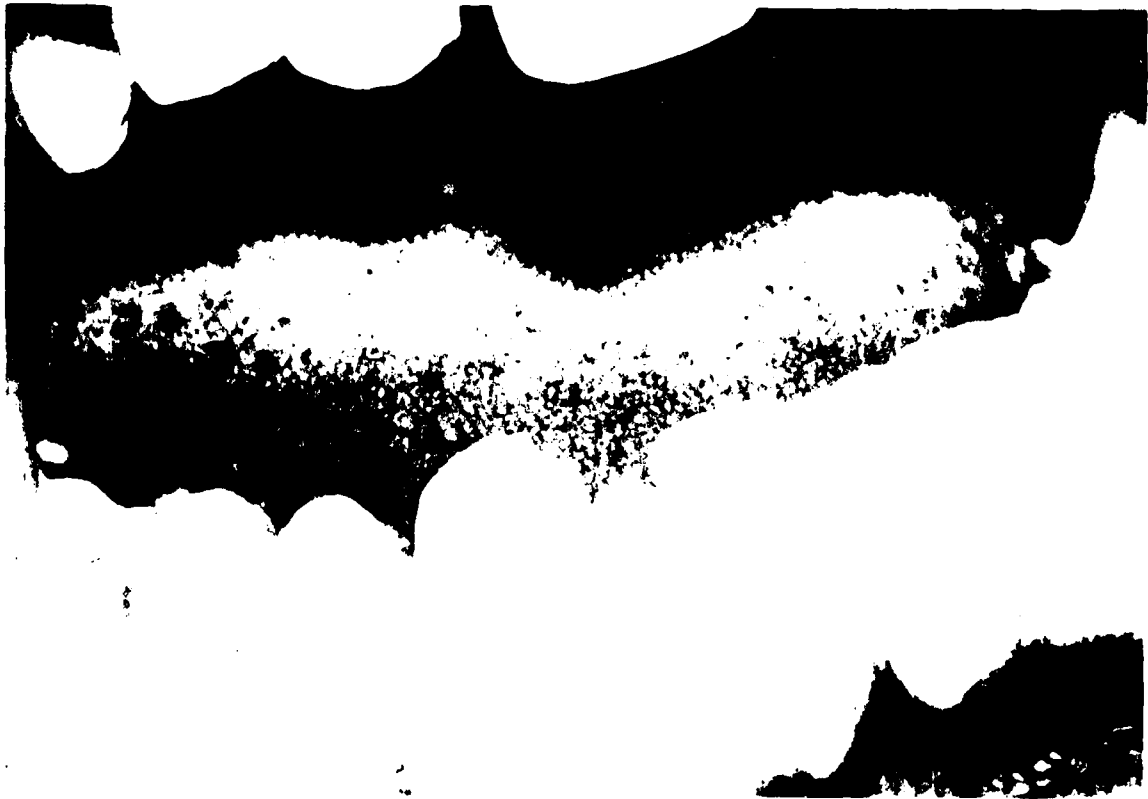


Fig 13.

