ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

Gubernacular cord: An incidental finding on the CBCT scan

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Manuscript Info

Manuscript History:

Received: 12 February 2015
Final Accepted: 25 March 2015
Published Online: April 2015

Key words:
CBCT,Gubernacular cord

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Abstract

The first reference to the gubernacular cord and canal occurred in 1778, by an English Scientist called John Hunter, which described these structures after observing a connection between the bone ridge of the tooth in development and the gingiva.[1] The gubernacular canal, which enables the continuity of the bone ridge of permanent incisors, canines and premolars with the tissue of the overlying gingiva itself, it is filled by the gubernacular cord, which is composed by a fibrous connective tissue containing peripheral nerves, blood and lymphatic vessels, as well as epithelial cells or cell aggregates coming from the fragmentation of the dental lamina

INTRODUCTION

Report of a case

A 16-year -old girl,was referred forCone beam computerized tomography (CBCT) for the surgical planning of horizontally impacted lower left canine (tooth no 33). Her medical and family history was unremarkable. A negative history was observed for tobacco, alcohol, or drug use. Clinical examination revealed normal range of mandibular movement and stable occlusion. Intraoral examination revealed no evidence of any soft and hard tissue pathology. Intraoral periapical radiograph and panoramic radiograph (figure 1), revealed horizontally impacted left mandibular canine 33 with normal follicular space along the lower border of the mandible in anterior region with unusual funicular structure that extended from the follicular space to the alveolar crest in between 73 and 34. A well-defined, corticated, radiolucent tract extending from crown of impacted tooth to location of normal eruption site at alveolar crest was observed. CBCTrevealed corticated tract of low density (radiolucency) contiguous with dental follicle of unerupted tooth 33and Cross-sectional CBCT slices through the tract in same patient showed that tract is in relation to follicular space of impacted 33, running from the center of the alveolus towards labial cortical plate and ends at the alveolar crest interdentally between 73 and 34(figure 2).Axial section revealed horizontal impacted tooth 33 with normal follicular space and crown close towards the labial cortical plate and causing thinning of the labial cortical plate (Figure 3).3D Reconstructed view demonstrated a canalicular structure extending from crown of impacted 33 to superiorly ends at the level of alveolar crest (Figure 4).The radiographic findings prompted an extraction of impacted canine followed by histopathological evaluation.

Radiographic Differential diagnosis:

Sinus Tract: Itserves asdrainage pathway for infectionwhich takes the path of least resistanceand can be traced back to source of infection**.**Usually located at the apical area of tooth, not on the crown hence it was excluded from our diagnosis.

Accessory Mandibular Canal: It isseen as extension of canal beyond the normal boundary in posterior mandible and the accessory canal may come off close to the mandibular foramen.In anterior mandible the canal may extend

beyond mental foramen. These canals traces back to the mandibular canal andnot associated with impacted tooth hence it was excluded from our diagnosis.

Nutrient canals: These structures carry a neurovascular bundle and appear as radiolucent lines of fairly uniform width most often seen on mandibular periapical radiographs running vertically from the mandibular canal directly to the apex of a tooth or into the interdental spaces between mandibular incisors. They also lined by thin walls of cortical bone and on radiographs appear as radiopaque hyperostotic cortical borders.These canals traces back to the mandibular canal andnot associated with impacted tooth hence it was excluded from our diagnosis.

Preoperative diagnosis: The CBCT findings which showed a well-defined, corticated, radiolucent tract extending from crown of impacted tooth 33 to location of normal eruption site at alveolar crest and the structure was diagnosed as Gubernacular canal.

Management and diagnosis: Extraction of impacted tooth along with the follicle and the cord like structure under local anesthesia.Final histopathologic examination showed a centrally oriented ribbon of dental lamina epithelium surrounded by fibrous connective tissue which was continuous superiorly withsubcutaneous connective tissue of oral mucosa and inferiorly with connective tissue of dental sac of impacted tooth 33.

Discussion:

The first reference to the gubernacular cord and canal occurred in 1778, by an English Scientist called John Hunter, which described these structures after observing a connection between the bone ridge of the tooth in development and the gingiva.[1]The gubernacular canal, which enables the continuity of the bone ridge of permanent incisors, canines and premolars with the tissue of the overlying gingiva itself, it is filled by the gubernacular cord, which is composed by a fibrous connective tissue containing peripheral nerves, blood and lymphatic vessels, as well as epithelial cells or cell aggregates coming from the fragmentation of the dental lamina.[2] During the eruptive phase, according to the successor tooth moves towards the axial direction to the oral cavity, the gubernacular canal is widened by the local osteoclastic activity, with the aim of accommodating the crown of the permanent tooth undergoing eruption.[3] The tooth moves towards the mucosa, the pericoronal follicle incorporates within its connective tissue the islets and cords of epithelial cells from the gubernacular cord, progressively increasing the epithelial component at this area.

Most common signs/symptoms are failure of eruption of permanent tooth,retained deciduous tooth and there is a potential for communication with oral cavity andhence infection.

According to Hodson, the gubernacular cord was not described in association with the deciduous dentition, only with the permanent dentition with the deciduous predecessor. However, according to Scott , the permanent molar teeth, which did not have a deciduous predecessor, also have their follicles connected to the oral mucosa by gubernacular cords, the so-called as “molar gubernacular cords”.[4]

Philipsentheorized that the gubernacular cord could have implication in the development of the adenomatoidodontogenictumor (AOT), because this contains remnants of the tooth lamina. These epithelial remnants are very closer to the crown of the permanent tooth and they can move during the tooth eruption process along with the gubernacular canal and induce AOT formation, because among the many hypotheses for the pathogenesis of this tumor are the remnants of the tooth lamina.[5]

Conclusion

The present case report is one of the rare case reporting the incidence of presence of gubernacular canal on intraoral radiograph and role of CBCT in distinguishingly delineating the extent of the canal.The existence of both the gubernacular canal and cord has been proved in the permanent dentition with deciduous predecessor; however, their existence is still not proved in the deciduous dentition. As the gubernacular canal can serve as potential risk for adenomatoid odontogenic tumor, the practice of preoperative investigations that include CBCT scan can improve accuracy by outlining the exact extent of the canal in different planes which will be helpful in better planning for extraction and removal of the entire gubernacular tissue associated with tooth.

Although the tooth eruption process is a researched issue in the literature, the role of the gubernacular cord and canal in tooth eruption is still very obscure, and further studies are necessary to clarify its real function.

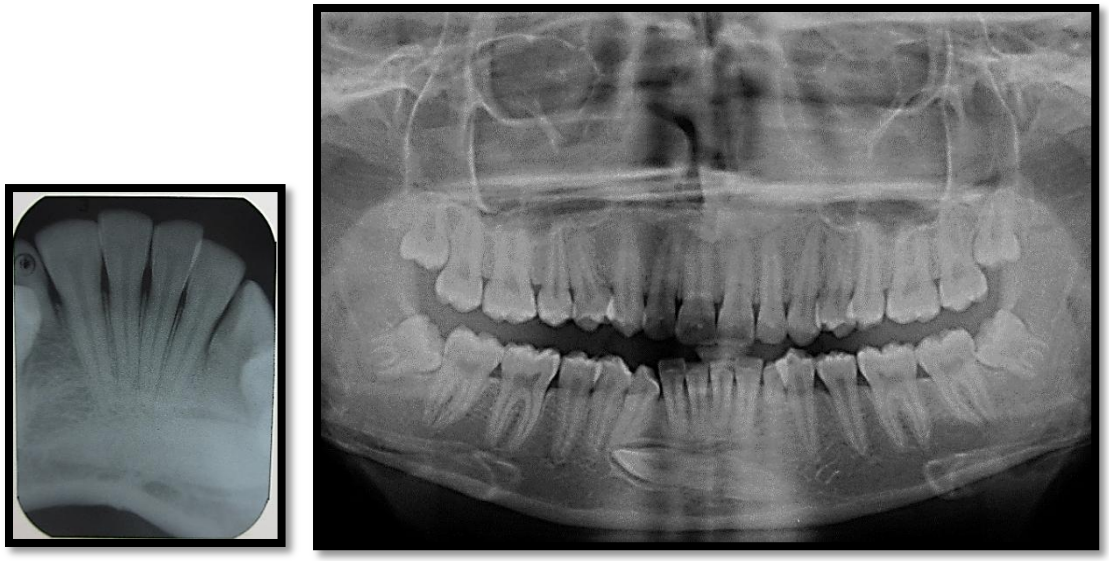

Figure 1 Intraoral periapical radiograph and panoramic radiograph showing Well-defined, corticated, radiolucent tract extending from crown of impacted tooth to location of normal eruption site at alveolar crest.

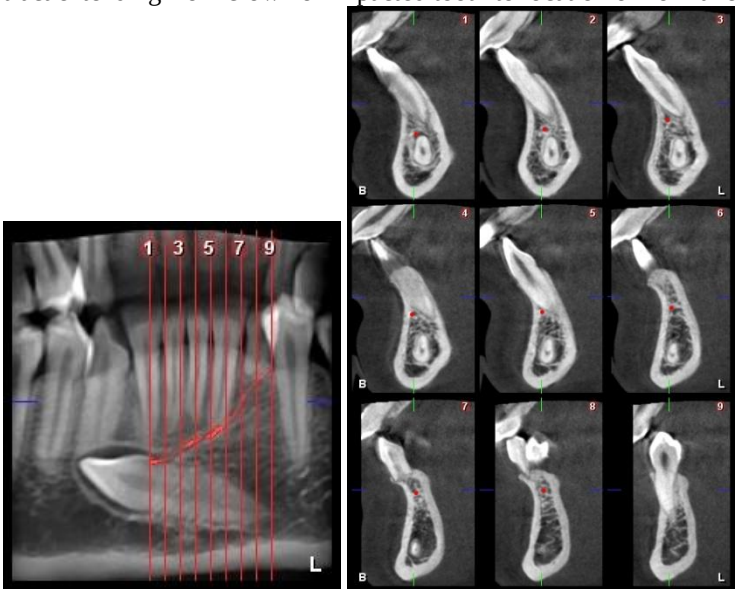

Figure 2 (Left) Cropped CBCT panoramic reformat demonstrates impaction of the mandibular left canine 33.The tract of the gubernaculum dentis (GD) is clearly visible contiguous with the dental follicle on the superior aspect. The GD is thought to guide the tooth to its normal site of eruption at the alveolar crest. (Right) Cross-sectional CBCT slices through the tract in same patient shows that tract is running from the center of the alveolus towards labial cortical plate and ends at the alveolar crest interdentally between retained deciduous tooth 73 and 34.

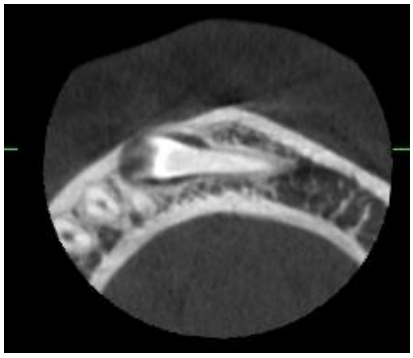

Figure 3: Axial section reveals horizontal impacted tooth 33 with normal follicular space and crown close towards the labial cortical plate and causing thinning of the labial cortical plate

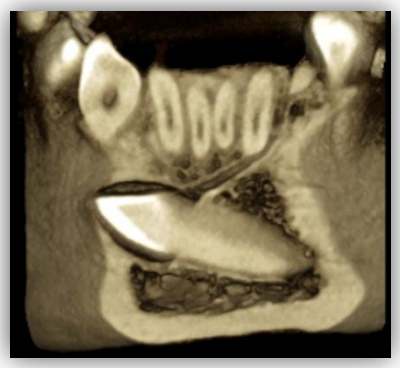

Figure 4: 3D Reconstructed view demonstrating Gubernacular canal

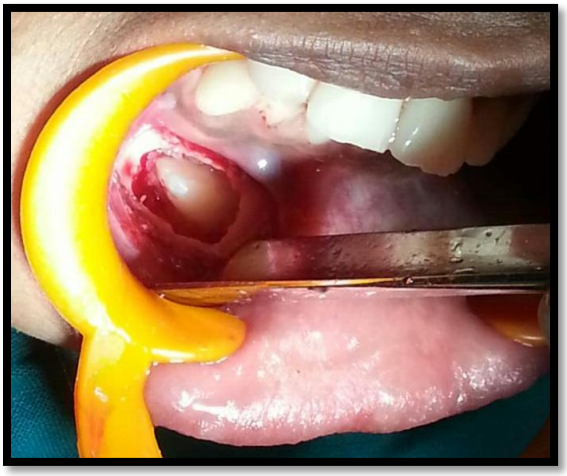

Figure 5: clinical photograph of horizontal impacted canine 33

Figure 6: Gross surgical specimen

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