



## An incidental radiographic finding of an inverted mesiodens — A case report with a comprehensive review

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### Article History:

Received on: 08 Nov 2020

Revised on: 08 Dec 2020

Accepted on: 10 Dec 2020

### Keywords:

Hyperdontia,  
Impacted,  
Nasal floor,  
Radiograph

### ABSTRACT

Supernumerary teeth (ST) are uncommon developmental disorders that can be seen in either of the dental arches. Mesiodens is the most common type of ST. The experience of observing one such case is reported along with a literature review. This article describes a clinical case of a 46-year-old female patient with an impacted inverted mesiodens that was diagnosed accidentally during the routine radiographic examination. The mesiodens was very close to the nasal floor. Advanced radiographic investigations (CBCT) was advised for locating the exact position of mesiodens. The patient was counselled regarding the potential complications of ST and was advised for the surgical removal of the mesiodens, but the patient denied the treatment as ST was not causing any immediate problem. Therefore, the patient is under the continuous follow-up to avoid any complications with the mesiodens. The present case focuses on the importance of careful clinical and radiographic assessment in the diagnosis of ST, especially when they are asymptomatic. Patients should be educated regarding the same with proper explanations of all the treatment options.

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ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL4.4553>

Production and Hosted by

IJRPS | <https://ijrps.com>

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### INTRODUCTION

Supernumerary tooth (ST), also known as hyperdontia is a developmental alteration (Miranda *et al.*, 2016) wherein an extra tooth is found in addition to the usual number of teeth. Mesiodens is the term

that refers to an erupted or impacted ST that is usually present between the two central incisors in particular on the palatal side. (Nagaveni *et al.*, 2010) Clinically, it is the most common type of ST. Its etiology is still not completely understood, although many theories are proposed that include a combination of environmental and genetic factors. (Avsever *et al.*, 2012) Depending upon different classification schemes, mesiodens could be single or multiple (mesiodentes), unilateral or bilateral, normal or morphologically malformed in size and shape and either erupted or impacted. Inverted mesiodens is a ST that occurs among the maxillary central incisors, with the inverted position. (Sarowa and Yadav, 2015)

In most of the cases, ST is impacted and so it is usually diagnosed accidentally during the routine radiographic examination. Furthermore, they are

mostly asymptomatic, but sometimes their occurrence can cause clinical problems like diastema, crowding, rotations, delayed eruption, resorption of the adjacent teeth and cystic lesions. (Saluja *et al.*, 2016) Rarely the mesiodens is seen with eruption into the nasal cavity or very near to the nasal cavity. This may lead to the concomitant tearing of the nasal mucosa, and subsequent epistaxis, nasal obstruction and the sensation of a foreign object in the airway. (Sindermann *et al.*, 2020) Therefore, it is very crucial to properly diagnose this entity for the appropriate management to prevent the complications. (Gunda *et al.*, 2017)

This report describes a case of an asymptomatic inverted mesiodens located near to the nasal floor that was found incidentally during a routine radiographic examination.

### Case presentation

A 46-year-old female reported with the complaint of multiple decayed and missing teeth with a desire to correct all her dental problems.

### Clinical examination

The extra-oral examination did not reveal any abnormalities. Intraoral examination revealed root stumps in relation to tooth no. #15, #22, #24, #47 and temporary restoration with tooth no. #23 that was tender on vertical percussion. The patient gave a history of dental visit one year back when a root canal treatment was started for a tooth no. #23 that could not be finished due to patients in compliance. Other clinical findings included the presence of temporary restoration with tooth no. #44, proximal fracture with tooth no. #43 and missing teeth no. #14, #16, #17, #25, #26, #27, #36, #37 and #46. Figure 1



**Figure 1: Initial intra-oral clinical aspect of the patient**

After the clinical examination, intra-oral periapical (IOPA) radiograph in relation to tooth no. #23 was advised.

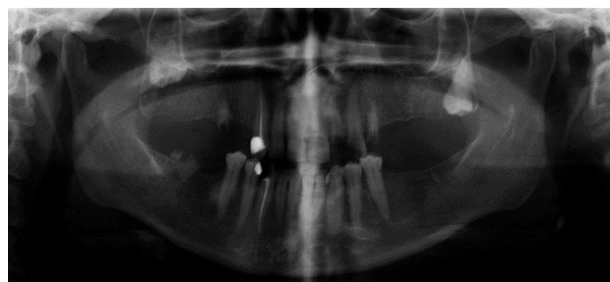
### Radiographic features

The IOPA radiograph with respect to tooth no. #23 revealed periapical radiolucency in relation to #22



**Figure 2: Intra-oral periapical radiograph showing a tooth-like structure apically to the teeth no. #21 and #22**

and #23. Also, a tooth-like structure was noticed just above the teeth no. #21 and #22, as shown in Figure 2. To further evaluate a tooth-like structure, the panorama was advised that showed partial edentulous maxillary and mandible arch with few root stumps. Due to the lack of clarity in an IOPA radiograph, the tooth-like structure could not be well appreciated in the panoramic view, as shown in Figure 3.



**Figure 3: Panoramic radiograph showing the partial edentulous maxillary and mandible arch with few root stumps**

Hence, the patient was advised for cone-beam computed tomographic (CBCT) examination to assist the nature, localization and orientation of the tooth-like structure. The image showed an inverted mesiodens with its incisal edge close to the nasal floor and positioned between the maxillary central incisors. Figure 4

### Treatment

Extraction of the root stumps, endodontic treatment for tooth no. #23, replacement of all the missing teeth and surgical removal of the mesiodens was planned. The patient was not willing for the surgical extraction of the mesiodens. Therefore, the patient was explained about the possible complications that



**Figure 4: CBCT image showing an impacted, palatal placed and inverted mesiodens**

can occur due to the mesiodens and is kept under regular follow-up. Tooth no. #22 was extracted and root canal treatment was performed on tooth no. #23 with multiple sittings. The patient is now under the process of undergoing full mouth rehabilitation.

## DISCUSSION

Balk (1917) introduced the word mesiodens that was indicative of a ST present between central incisors in the pre-maxillary region. (Gunda *et al.*, 2017) Inversion is defined as 'the malposition of a tooth in which the tooth has reversed in upside-down position'. Inverted impacted third molars and premolars in either arch are most commonly reported. (Avsever *et al.*, 2012)

### Prevalence

In the general population, their prevalence ranged from 0.15-2.2% with males affected more than females (2:1). (Bin and Roby, 2019) It is found more frequently in the permanent teeth (0.1-3.6%) than primary teeth (0.02-1.9%). (Omami *et al.*, 2015) It has been reported that in 82% of the cases, mesiodens occurs in the maxilla, specifically in the pre-maxillary region and about 75% of them are impacted. (Bin and Roby, 2019) The frequency of inverted mesiodens is nearly 9-67% of all reported cases that is, even more, rarer (0.1-1%) in case of an inverted impacted mesiodens being present in close proximity to nasal floor and nasopalatine canal. (Anusha *et al.*, 2017) Here in, a case of an impacted inverted mesiodens is presented that was observed very near to the nasal floor.

### Origin and inheritance

Despite a plethora of information about the normal tooth development, the genetic etiology and molec-

ular mechanisms that lead to congenital deviations in tooth number is still not known and have not been clearly understood. Three controversial theories had been proposed concerning the cause of mesiodens. The first one is a phylogenetic reversion theory according to which the origin and development of ST are due to atavism of extinct ancestral tissues' but this theory has now been discounted by embryologists. The second theory, known as dichotomy recommends that the splitting of a tooth bud into two teeth might result in the formation of a mesiodens. Supporters of this theory believe that dichotomy represents complete gemination that is noticed frequently in the anterior maxilla. The third theory includes the hyperactivity of dental lamina that is the most widely supported one and states that the ST is formed due to over-proliferation of remnants of the dental lamina or palatal offshoots of the active dental lamina. (Russell and Folwarczna, 2003)

Although the hereditary condition of mesiodens has not to be proved till date still the genetics are also believed to contribute to its occurrence as this anomaly has been reported in siblings, twins and sequential generations of a single-family. An autosomal dominant trait with the lack of penetrance in some generations has been the proposed genetic theory.

Also, a sex-linked pattern has been suggested as females are found to be comparatively affected less than the males. (Omami *et al.*, 2015) Few syndromes like Gardner's, Hallermann-Streiff's, cleidocranial dysplasia, oro-facial digital, etc. usually have ST. (Primosch, 1981) Mesiodens may be associated with other dental anomalies like dens invaginatus, talon cusp, fissural cysts, fusion and multiple impacted ST. (Primosch, 1981)

In the present case, a negative family history of ST was noted, thus adding to the fact that the environmental factors might have an influence on genetic predisposition.

### Classification

Several descriptive classification systems for mesiodens have been proposed depending upon its morphology, position, orientation and association with the nasal cavity. (Russell and Folwarczna, 2003; Primosch, 1981; Aoun and Nasseh, 2016) The present case was conical, palatal and inverted mesiodens.

Table 1 shows the various classification systems for mesiodens.

### Clinical findings

Mesiodens may occur single or multiple, erupted or unerupted, unilateral or bilateral, and in one or both jaws.

**Table 1: Different classification schemes of mesiodens**

Based on	Prevalence (%)	Characteristics
<b>A. Shape</b>		
1. Supplemental	2.8	<ul style="list-style-type: none"> <li>• Eumorphic ST of normal shape and size</li> <li>• Also known as incisiform</li> </ul>
2. Rudimentary	-	<ul style="list-style-type: none"> <li>• Dysmorphic teeth of abnormal shape and smaller size</li> <li>• Subtypes as follow-</li> </ul>
a. Conical	24-75	<ul style="list-style-type: none"> <li>• Peg-shaped, smaller than the neighbouring incisor</li> <li>• Commonly found palatally between the maxillary central incisors as isolated, single cases</li> <li>• Completely formed roots</li> <li>• Might erupt into the oral cavity whereas its inverted form might not erupt into the oral cavity</li> <li>• Also termed as "mesiodonts."</li> </ul>
b. Tuberculate	7.6	<ul style="list-style-type: none"> <li>• Barrel-shaped with several tubercles or cusps and have incomplete (stunted) or abnormal root formation</li> <li>• Develop later than conical mesiodentes and usually occupy a more palatal position</li> <li>• Predominantly bilateral cases</li> <li>• Causes labial displacement</li> <li>• Rarely erupt and often delay the eruption of the adjacent teeth</li> <li>• Also termed as "palatodonts" or "third dentition teeth" to describe them</li> </ul>
c. Molariform	Rarely reported	Has a premolar-like crown and a completely formed root
<b>B. Position</b>		
1. Buccal	6	-
2. Palatal	80	-
3. Transverse	14	-
<b>C. Orientation</b>		
1. Vertical or normal	11.7	-
2. Inverted	86.2	-
3. Transverse	0.7	-
4. Sagittal	1.4	-
<b>D. Association with the nasal cavity</b>		
1. In contact with the cortical bone of the nasal floor	20.5	-
2. In relation to the nasopalatine canal	49	-
a. In external contact with the canal	38.8	-
b. Perforated the canal	8.2	-
c. Located within the canal	2	-

**Table 2: Various studies highlighting the clinical features of mesiodens**

Author(s)/Year	Country	Age	Sex	No of mesiodens	Location
(Geethanjali and Shetty, 2020)	India	11	Male	Two	Palatal to #11 and #21
(Solhjou <i>et al.</i> , 2019)	Iran	8	Male	Two	Between #11 and #21
(Bin and Roby, 2019)	Saudi Arabia	31	Female	One	Perforating the nasal floor
(Ramadani <i>et al.</i> , 2019)	Greece	13	Female	One	Palatal to #21
(Sogi <i>et al.</i> , 2018)	India	10	Male	Two	One between #11 and #21 and other palatal to #21
(Jose <i>et al.</i> , 2018)	India	7	Male	One	between #11 and #21
(Rohilla <i>et al.</i> , 2018)	India	7	Male	One	Palatal to #11 and #21
		9	Female	One	Left central incisor area
		10	Male	One	Right central incisor area
(Ohri and Rana, 2018)	India	10	Male	Two	Palatally to the central incisors
		9	Male	Two	One erupted and one impacted palatally to the central incisors
		7	Male	Two	Palatally to the central incisors
(Krishnamurthy <i>et al.</i> , 2017)	India	15	Male	Two	Between #11 and #21
(Srinivasan and Nandlal, 2017)	India	12	Male	Two	Palatal to #11 and #21
(Sujlana <i>et al.</i> , 2017)	India	12	Male	Two	One palatally erupted and one between the roots of the #11 and #21
		8	Male	Two	Between #52 and #62

*Continued on next page*

<i>Table 2 continued</i>					
Author(s)/Year	Country	Age	Sex	No of mesiodens	Location
(Salgado and Mesquita, 2017)	Portugal	10	Male	Two	Buccal and palatal to #21
(Miranda <i>et al.</i> , 2016)	Brazil	7	Male	One	Midline region
(Jain <i>et al.</i> , 2016)	India	27	Male	One	Between #11 and #21
(Aoun and Nasseh, 2016)	Lebanon	50	Male	One	In the path of the nasopalatine canal
(Hundal <i>et al.</i> , 2016)	India	10	Female	Two	Palatal to #11
		11	Male	One	Palatal to #21 between 11 and 21
(Omami <i>et al.</i> , 2015)	North Africa	8	Female	One	Mid-palatal region
(Singaraju <i>et al.</i> , 2015)	India	23	Male	Two	One palatal and the other labial to #11 and #21
(Villavicencio <i>et al.</i> , 2015)	Colombia	11	Male	Two	Between #11 and #21
		10	Male	Two	Between #12 and #22
		9	Male	Two	Between #11 and #21
(Manne <i>et al.</i> , 2015)	India	25	Male	Two	Between #11 and #21, Palatal to first mesiodens
(Rajwar <i>et al.</i> , 2014)	India	25	Female	Two	One between #11 and #21, palatal to left maxillary central incisor
(Avsever <i>et al.</i> , 2012)	Turkey	18	Male	One	Middle of the hard palate
(Prasad <i>et al.</i> , 2011)	India	8	Female	One	In the nasal cavity
(Srivatsan and Babu, 2007)	India	19	Female	One	Between #11 and #21

All the above reported cases are non-syndromic

Although the most common position of the mesiodens is at the midline level, they can also be seen in place of incisors or may emerge in the palate, or be impacted in the palatal vault. The clinical findings like an over retention of maxillary primary incisors, asymmetry in the eruption pattern of the maxillary incisors or an ectopic eruption of one or both permanent maxillary incisors might be suggestive of the presence of a mesiodens. (Geethanjali and Shetty, 2020)

Mesiodens may remain in position for many years without any changes or associated with no complications. Majority of cases are an incidental finding during routine dental radiographs. (Geethanjali and Shetty, 2020) In this case also, an impacted inverted mesiodens was found without causing clinical manifestations. Thus, mesiodens, which is impacted and inverted emphasizes the importance of a radiographic protocol.

However, symptoms do become apparent in cases associated with any cystic changes or with mesiodens eruption into the nasal cavity. (Solhjou et al., 2019) The latter causes the concomitant tearing of the nasal mucosa, and subsequent epistaxis, nasal obstruction and the sensation of a foreign object in the airway. (Sindermann et al., 2020)

Table 2 highlights the clinical features of mesiodens, as reported in the previous studies.

### Diagnosis

Comprehensive radiographic imaging is a must for an accurate diagnosis of the location and number of unerupted mesiodens. Intra-oral radiographs like periapical and occlusal; extra-oral radiographs like panoramic aids inappropriate diagnosis and in the formulation of the proper treatment plan. (Anusha et al., 2017)

However, these types of 2D imaging often provide a limited evidence due to the image superimposition. The radiographic technique, wherein two periapical or maxillary occlusal films that are analyzed according to the parallax rule, is of great diagnostic importance in identifying and locating a mesiodens.

Other than this, CBCT has been found to be an important diagnostic tool in a cost- and the dose-efficient manner by providing alternatives detailed in 3 planes, thus leading to an accurate assessment while overcoming the limitations of the conventional imaging techniques. (Russell and Folwarczna, 2003)

In the current case scenario, CBCT provided valuable details in assessing the morphology and the exact 3D position of the mesiodens.

### Complications

A mesiodens has been known to be asymptomatic in many cases; however, it can occasionally cause clinical complications. The common complications associated with mesiodens are the failure of the eruption of adjacent permanent teeth (30-60%) and diastema (50%). In childhood, these complications may cause masticatory, phonation and esthetic problems. The other complications noticed are the crowding, displacement of an adjacent tooth, ectopic eruption of either tooth, root resorption of adjacent teeth, malformation and loss of vitality of adjacent teeth. (Sarowa and Yadav, 2015) Very rarely, the presence of ST can allow the development of cysts or the supernumerary incursion to the nasal cavity. The presence of mesiodens in patients with cleft lip and palate may compromise the secondary alveolar bone grafting. Moreover, in a potential implant site, the presence of a mesiodens may compromise implant placement. Furthermore, ST is also found to be a risk factor in the treatment of trauma cases due to dental factors like insufficient lip closure and open bite. (Miranda et al., 2016)

None of these problems was associated with the ST found in the present clinical scenario.

### Treatment

A proper treatment plan should be made soon after the diagnosis of an ST to minimize further problems. The management of the mesiodens is discussed here according to the timing of removal, tooth type and stage of eruption.

### Timing of Removal

The timing of surgical extraction of ST is highly controversial and two options exist as to the optimal time for surgical intervention: immediate versus delayed. Immediate intervention denotes that the ST should be removed as soon as it has been diagnosed whereas delayed intervention means that the ST should be untouched till the root development of adjacent teeth is complete so as to prevent damage to their root apices, generally between 8 to 10 years of age. If mesiodens is not causing any complications and is not likely to interfere with orthodontic tooth movement, it can be monitored with the yearly radiographic assessment. (Solhjou et al., 2019)

The merits of the immediate intervention of such teeth when no apparent pathologic complication or adverse sequelae is present are 1) reduction in the occurrence of future complications (~39%); 2) the prognosis of surgical intervention is good (recurrence is extremely rare); 3) reduction in an additional surgical/orthodontic treatment by 45%; and 4) the teeth serve little if any, function. But the

greatest fear of early intervention is the risk of possible damage or displace of the developing adjacent teeth that could be avoided by a delayed intervention. Then again, delayed intervention until the lateral incisors have erupted may increase the risk for 1) loss of anterior arch space or midline shift leading to malalignment; 2) loss of eruption potential of the incisors; and 3) more complex surgical and orthodontic treatment for correction. (Primosch, 1981)

### Tooth type and stage of eruption

Conical-shaped forms, especially midline types, should be observed for early eruption unless creating complications as the associated permanent incisor is almost twice as likely to erupt spontaneously as when the ST was of the tuberculate form. Tuberculate and inverted conical forms, which do not erupt, but more frequently create complications, should be removed immediately if causing adjacent central incisors to remain unerupted. It has been found that the tooth type is critical in making the judgment when to surgically intervene. Also, the clinician should be aware that inverted conical types are harder to remove if delay allows them to migrate deeper into the alveolus. (Primosch, 1981)

In either case, close monitoring of the dentition for approximately six months is needed after the surgical removal of a mesiodens. In case of an insufficient arch space, additional space can be re-established by orthodontic traction. If a tooth fails to erupt within 6 to 12 months after the removal of a mesiodens and sufficient arch space is available, surgical exposure and orthodontic eruption of an unerupted incisor are highly recommended. In case a central incisor cannot be erupted orthodontically due to varied reasons like its position or ankylosis, the treatment option exists either surgical repositioning or extraction and placement of an implant. After an eruption of the incisors, adjunctive procedures may be appropriate, for example, gingival surgery to recontour the attachment levels between the adjacent incisors might be done. (Primosch, 1981)

As the ST in the current case was asymptomatic and without any complications, it was decided to simply monitor the ST.

### Recurrence and follow-up

Although the recurrence of ST after being surgically removed has been reported in 8% of the cases reviewed, there is a lack of proper explanation responsible for recurrence. It has been often hypothesized that recurrence could be either due to the reactivation of a portion of a follicle or due to an incompletely resorbed dental lamina that is

reactivated at the time of crown completion of normal permanent teeth. (Solares and Romero, 2004) All the aforementioned factors make the periodic follow-up of these patients as an extremely important step (Pasha *et al.*, 2013) owing to which the patient, in this case, is recalled every six months to avoid any complications.

### Clinical significance

This case focusses on the importance of careful clinical and radiographical examination of the patients with mesiodens to provide comprehensive care and improve their quality of living. A long term follow-up is also indicated whether or not a supernumerary tooth is surgically removed.

### CONCLUSIONS

The current case is unique as it is a rare incidental finding of an asymptomatic inverted mesiodens in the anterior maxilla that is seen very close to the nasal cavity. Furthermore, the previously published case scenarios are mostly reported in a pediatric population.

### Conflict of Interest

The authors declare that they have no conflict of interest for this study.

### Funding Support

The authors declare that they have no funding support for this study.

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